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**Providing Agri-environmental Public
Goods through Collective Action:
Lessons from New Zealand Case Studies**

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Paper presented at the 2012 NZARES Conference

Tahuna Conference Centre – Nelson, New Zealand. August 30-31, 2012

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Providing Agri-environmental Public Goods through Collective Action: Lessons from New Zealand Case Studies¹

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Summary

Agriculture is a provider of food and, to a certain extent, public goods such as biodiversity and landscape, but it can also have negative impacts on natural assets such as biodiversity and water quality. In addition to implementing policies that target individual farmers, different approaches are needed to promote collective action. The literature review and three New Zealand case studies (Sustainable Farming Fund, East Coast Forestry Project and North Otago Irrigation Company) have identified some findings including benefits and barriers of collective action and key factors for its success. Collective action should be given serious consideration in addressing agri-environmental problems.

Keywords:

Collective action, public goods, agri-environmental policy, social capital

1. Introduction

Agriculture is a provider of food and, to a certain extent, public goods such as biodiversity and landscape, but it can also have negative impacts on natural assets such as biodiversity and water quality. The provision of public goods and the reduction of negative externalities have become increasingly important with the growing awareness of environmental issues, such as loss of biodiversity and climate change.

Many researchers and organisations have undertaken studies on public goods and externalities, and related policy measures. However, previous research on public goods, externalities and agri-environmental policies has focused on individual farmers, and much less on collective action. For example, maintaining landscape usually requires the participation of several farmers working within the same area. This means that in addition to implementing policies that target individual farmers as a means to overcome market failure associated with public goods and externalities, different approaches may also be needed to promote collective action.

The purpose of this study is to analyse collective action for agri-environmental public goods and externalities. The literature review and three New Zealand case studies, i.e. Sustainable Farming Fund, East Coast Forestry Project and North Otago Irrigation Company, have identified some findings including benefits and barriers of

¹ Note the views expressed in this paper are the author's personal ones and do not necessarily reflect those of the OECD or its member countries. This paper is a part of an ongoing OECD study on providing agri-environmental public goods through collective action.

collective action and some key factors for its success. This paper also presents some policy implications².

The outline is as follows. Section 2 provides typologies of collective action, Section 3 briefly explains the results of the three New Zealand case studies, Section 4 summarises some findings, and Section 5 provides policy implications.

2. Definition and typologies of collective action

Collective action is a complex activity as the form it takes depends on the distribution of benefits and costs to those within a group and those external to it. It is a hybrid governance structure because of its broad and dynamic management (Menard, 2004). A general definition of collective action is: “action taken by a group (either directly or on its behalf through an organisation) in pursuit of members’ perceived shared interests” (Scott and Marshall, 2009). Meinzen-Dick and Di Gregorio (2004) also define it as a “voluntary action taken by a group to achieve common interests”. These definitions are broad, and almost all kinds of voluntary group activities can be categorised as collective action. However, considering the fact that there are numerous types of co-operative activities which include various actors’ or stakeholders’ co-operation, both private as well as public, it is difficult to give a more specific definition.

Nevertheless, previous studies have tried to establish some typologies of collective action related to agri-environmental policies. When considering the policy aspects for collective action, as done by Davies *et al.* (2004), two types of collective action can be distinguished: co-operation (bottom-up, farmer-to-farmer collective action) and co-ordination (top-down, often agency-led collective action). This typology is more useful than others because some collective actions do not need government intervention, while others need some support and it is important to understand under what conditions government should provide support. Moreover, among government policies, the degree of compulsion is different. Some policies are voluntary and others are compulsory. Implementing agencies also differ. Some policies are implemented by local governments and others by central governments.

Table 1 provides a typology of collective action based on these points. Pure bottom-up collective action does not involve government intervention at all. This collective action is a case of private-private partnership (Type 1). Most collective action cases, to some extent, involve government intervention. These government policies are divided into two types: voluntary programmes and compulsory programmes. If governments force farmers to act together, for instance, by agri-environmental regulations, this is a top-down collective action case (Type 3). However, even if governments intervene, most collective actions are bottom-up in nature if programmes are voluntary (Type2). This bottom-up collective action with government support is important to be analysed, since it can help us to identify how governments can promote collective action and how government policies affect farmers’ behaviour.

² More case studies will be included and more detailed implications will be presented in the OECD study.

Type 2 and Type 3 can be further divided into three groups: 1) support from local governments, 2) support from central governments and 3) support from both central and local governments. Most collective actions take place locally and local governments tend to have a better knowledge of local issues. They can provide more locally adjusted support for each case. On the other hand, central governments can promote collective action at a national level through national programmes. These national policies can affect a large number of farmers' behaviour. In fact, in some cases, both local and central policies are mixed for promoting collective action. Considering roles of both central and local governments is important when promoting collective action.

Table 1. Types of collective action

Bottom-up collective action (Co-operation)	←————→	Top-down collective action (Co-ordination)
Non-governmental intervention	Voluntary programme	Compulsory programme
	Support from <i>local governments</i>	
	Type 2-A: Collective action with support from local governments	Type 3-A: Collective action coerced by local governments
	Support from <i>central governments</i>	
Type 1: Collective action without government support	Type 2-B: Collective action with support from central governments	Type 3-B: Collective action coerced by central governments
	Support from both <i>central and local governments</i>	
	Type 2-C: Collective action with support from both central and local governments	Type 3-C: Collective action coerced by both central and local governments

Referring to the above typology of collective action, this study examines three New Zealand case studies: Sustainable Farming Fund (SFF), East Coast Forestry Project (ECFP) and North Otago Irrigation Company (NOIC). The SFF is a collective action with support from central government (Type 2-A), the ECFP is a collective action with support from both central and local governments (Type 2-C) and the NOIC is a collective action with support from local governments (Type 2-A), respectively.

3. Summaries of the New Zealand case studies³

3.1. Sustainable Farming Fund and Aorere Catchment Project

The Sustainable Farming Fund (SFF) is a national voluntary programme which promotes collective action (Type 2-B). Although local governments also provide

³ The author thanks Neil Fraser, Chris Arbuckle, Louise Askin, Helen Percy, Sebastian Rattansen and Avinash Shrivastava from the Ministry for Primary Industries *Manatu Ahu Matua*, New Zealand government, for their valuable comments on the New Zealand case studies.

support for SFF projects frequently, it is not necessarily the case for all projects. The Ministry for Primary Industries of New Zealand (MPI) launched the SFF in 2000 to fund grass-root activities and help innovation, research and other environmental projects by farmers, growers and foresters. All SFF projects are collaborative projects often initiated by farmers, growers or foresters with the support of a wider *community of interest* involving industry organisations, agribusiness, researchers or consultants. The purpose of the fund is to support rural communities to undertake applied research and extension projects that tackle a shared problem or address an opportunity (MAF, 2010). This case study picks up a specific example in SFF projects: Aorere Catchment Project.

The Aorere Catchment is located in the Western Golden Bay of the South Island. About 30 dairy farms operate throughout the catchment, covering about 16 % of the catchment's land use. The Aorere Catchment project was established because, in 2005, coastal water quality of Golden Bay became a problem. Mussel farming that had operated near the Aorere River mouth had almost become unviable due to restrictions on the number of harvesting days resulting from poor freshwater water quality entering the Bay. Dairy farming, in this high rainfall environment, was thought to be affecting the water quality which was having a detrimental impact on the mussel farms. Local dairy farmers began to proactively address the issue, with the help of the NZ Landcare Trust (MAF, 2010; OECD, 2012a).

In 2006, local dairy farmers applied for SFF funding to run a three-year project in the catchment. By using SFF, first, the Aorere Catchment Group commissioned a scientific investigation to understand possible causes of water deterioration. They found that although the Aorere River does not have a nutrient contamination problem, coastal waters near the mouth of the river are very sensitive to faecal bacteria, which affects harvesting shellfish (NZ Landcare Trust, 2009). Next, based on the results of the scientific research, dairy farmers agreed to take action to improve water quality by reducing the levels of bacteria reaching their waterways. Farmers developed environmental plans and changed their farming practices (NZ Landcare Trust, 2009).

The project used local science, farm-scale environmental plans and farmer leadership as the tools to improve water quality, and indeed, water quality in the Aorere Catchment improved greatly (MAF, 2010). In 2002, local shellfish harvest days were as low as 28%, but in 2006, they increased to about 50%, and after the three-year project, mussel farmers can now harvest shell fish 79% of the days per year⁴ (NZ Landcare Trust, 2009). Although the first project finished in 2008, from 2009 the project extended the Aorere approach to the neighbouring Rai catchment.

3.2. East Coast Forestry Project

The Gisborne region is located in the north eastern corner of the central North Island in New Zealand. Hill country of the East Coast area was once covered by native forests and its underlying geology is dominated by allochthonous unstable rocks, such as mudstone and argillite which make the area susceptible to erosion. A significant area of native forests was cleared for pastoral farming in the nineteenth century following European settlement. The clearance of native forests exacerbated

⁴ There will always be some days that they can't harvest but this is due to poor weather conditions and not the water quality.

the soil erosion problem, i.e. negative externalities associated with agriculture. Now, 26 % of Gisborne region's land is susceptible to severe erosion. This is much higher than the New Zealand national average, which is 8 % (MAF, 2007). Severe erosion causes long-term damage to the industry including agriculture and rural infrastructure. It also lowers water quality by increasing the amounts of sediment in rivers.

The ECFP was established by the MPI in 1992 to achieve sustainable land management in the Gisborne region. It aims to promote sustainable land management in the area by providing a grant for planting trees or encouraging natural reversion to native forests (MAF, 2007). It targets the worst 60 000 hectares of eroding land in the Gisborne region. Since the first planting in 1993, by 2010, the ECFP has provided grants to 356 grantees, which covers 35 552 hectares (MAF, 2011).

The ECFP is a voluntary programme by the central government, which is complemented by the land use rule of the Gisborne District Council (GDC) that requires treatment of severe erosion. In this programme, landowners, the GDC and the MPI work together to prevent soil erosion in the Gisborne region. All erosion problem areas have been mapped at property scale by the GDC. The MPI and the GDC approach landowners together and develop plans to treat erosion, including technical advice. Landowners are free to obtain independent advice. Once the landowner is satisfied with the plan, s/he applies to the MPI for funding. If an application is accepted, landowners can start a project up to three years after the approval. By using funds, they implement treatments such as planting trees or reversing lands to native forests. Therefore, this collective action can be categorized as Type 2-C, collective action with support from local and central governments.

3.3. North Otago Irrigation Company

Otago is the second biggest region in New Zealand. It spans from east coast to west coast of the South Island. North Otago is a sub region on the east coast. The extensive dry tussock grassland hills and lowland down lands in North Otago area provide the important agricultural base. However farmers had been struggling to access reliable water supply due to its dry environment and existing allocation pressure on the main rivers in the area. In order to provide farmers with reliable water on a large scale, the North Otago Irrigation Company Ltd (NOIC) started a scheme to deliver a large volume of water from a nearby reliable resource, the Waitaki River in 2006. The NOIC scheme pumps water from the Waitaki River up to a head pond. Then, the water is delivered to the farm gate via natural water courses and a piped network by using gravity and secondary pump stations to maintain water pressure.

The NOIC is a company owned by the users of the scheme, with a strong governance structure. Farmers can obtain water rights and have access to water if they hold shares and have also completed a registered Water Supply Agreement with NOIC, which nests water use efficiency, nutrient and farm management. Once farmers become shareholders, they have to pay charges for maintenance, operation and administration of the irrigation scheme. This funds the board and staff that run the scheme. In sum, the NOIC service is exclusive to shareholders only (excludable), but reliable water access is guaranteed for all shareholders up to a certain point (non-rival). Therefore, this service represents club goods, and the NOIC can be regarded

as a club. Farmers formed a new organisation in order to manage the irrigation system and become members of the club.

NOIC also provides significant benefits to the local community, and the wider Otago community, not only economically but also environmentally. The NOIC scheme enhances in-stream flows and hence biodiversity values, and maintains cultural values, in particular respecting Māori values in relation to water and the natural environment. These additional values associated with the irrigation system are public goods, i.e. non-excludable and non-rival goods.

Farmers also need to improve environmental performance through the NOIC's Environmental Farm Plan System, in order to maintain access to water supplied by the NOIC scheme. For achieving environmentally sustainable irrigation development, NOIC promotes responsible and efficient use of water through education and technological innovation. Farmers are required to implement the best practices for achieving environmentally sustainable farming, and every year one third of farms are audited to ensure that they are implementing the best practices detailed in their farm plans. If a farm fails the audit, farmers are required to review their performance and undergo further auditing. In addition to the Environmental Farm Plan audit process, NOIC also undertakes weekly unscheduled compliance checks throughout the irrigation season.

Local governments provide support for this collective action. Otago Regional Council (ORC) develops water run-off policies with NOIC and has been involved in negotiating drainage agreements between neighbours. Waitaki District Council, a founding funder of the NOIC scheme, invests NZD10 million in infrastructures. Therefore, this collective action can be categorized as Type 2-B, collective action with support from local governments, according to the typology of Table 1.

3. 4. Comparative analysis

Although it would have been more desirable to examine all cases that match several groups defined in Table 1, we should make a horizontal comparison of the cases discussed in this paper so that we could obtain preliminary policy implications. Table 2 summarizes the observations.

Table 2. Comparative analysis of the New Zealand cases

	Sustainable Farming Fund- Aorere Catchment Project-	East Coast Forestry Project	North Otago Irrigation Company
Brief description of the case	MPI launched the Sustainable Farming Fund (SFF) in 2000 to fund grass-root activities. The Aorere Catchment Project is led by members of the local community, including dairy farmers and marine farmers. SFF funds the farmers' group and helps to address sustainable water management.	Gisborne region has a severe erosion problem. The East Coast Forestry Project (ECFP) of MPI provides landowners with a grant for planting trees and preventing severe soil erosion, which is complemented by the land use rule of the Gisborne District Council (GDC).	In order to provide farmers with reliable water on a large scale in North Otago, the North Otago Irrigation Company Ltd (NOIC) started the scheme for delivering water in 2006, collaborating with local partners such as Otago Regional Council (ORC) and Waitaki District Council.
Public goods/ Negative externalities	Water deterioration (Negative externalities) Aorere Catchment (Common pool resources)	Soil erosion (negative externalities) Carbon sequestration, improved water quality and biodiversity (public goods)	Reliable water supply (club goods) Biodiversity, Cultural values (public goods)
Group size	33 dairy farmers	356 grantees, which covers 35 552 hectares. Targeted areas are 60 000 hectares.	100 shareholders, covers approximately 14 000ha of farmland in North Otago.
Participants	Dairy farmers, NGOs, Local government and Central government	Landowners, Local government and Central government.	Farmers, NOIC, Local governments
Activities taken by the group	Commissioning a scientific investigation for identifying possible causes of water deterioration; Changing management practices.	Sustainable land management including afforestation and planting; Providing information to landowners of eroding land; Commissioning research on soil conservation issues.	Providing farmers with reliable water; Improving water quality and the environment

Farmers' (landowners') role	Forming a farmer group to improve water quality; Changing farming practices for water quality improvement.	Recognising soil erosion problem and contacting GDC/MPI; Applying to MPI for funding; Implementing treatments.	Having access to reliable water from the NOIC scheme; Implementing Environmental Farm Plan for achieving sustainable farming.
Non-Farmers' role	Giving advice including scientific information; Helping farmers to organise groups; Funding projects.	-	NOIC: Providing shareholders with reliable water; Auditing farmers; Regularly reviewing environmental performance; and Promoting responsible and efficient use of water.
Governmental role	<i>MPI</i> : providing three-year funding (<i>SFF</i>) for the activity from 2006 to 2008, and expanding the programme to adjacent areas from 2009 to 2011. <i>Tasman District Council</i> : providing fencing materials to help farmers to exclude stock from streams.	<i>MPI</i> : Designing the ECFP and providing grants to landowners; auditing the annual claims for payment. <i>Gisborne district Council</i> : Helping landowners to prepare application and develop plans; establishing rules for targeting areas in the District Plan; and implementing a local project to address soil erosion.	<i>Otago Regional Council</i> : developing water run-off policies with NOIC and has been involved in negotiating drainage agreements between neighbours. <i>Waitaki District Council</i> , a founding funder of the NOIC scheme, investing NZD10 million in infrastructures.
Factors affecting collective action	Sharing the recognition of keeping common pool resources; Knowledge of environmental resources; Social capital and small group; Farmer-led initiative; Communication; Tailored individual planning; Financial support; Involving wider community	Severe resource problem; Scientific knowledge; Large group with strong support from governments; Financial support from governments; Effective collaboration between central government and local government	Covering broad areas; Strong need for the resource (water); Club goods (one provider delivers services to many club members); Additional environmental requirements; Monitoring; Financial support from governments; Close work with local governments

4. Findings and analyses

There is a large body of studies on collective action. In Olson's seminal work (Olson, 1965), the difficulty of co-operation because of the free rider problem is addressed. Although it is often believed that groups are expected to act on behalf of their common interests as individuals, Olson argues against this belief as all individuals in a group gain if they achieve their group objective, thus individuals tend to be free riders. Hardin (1968) also points to the difficulty of collective action by using the example of a pasture open to all. According to him, each herder tries to add more animals to increase his benefits, which results in overexploitation of the common pasture. He calls this situation "the tragedy of the commons". His argument shows the individuals' pursuit of their own benefits may hinder the maximization of benefits of collective action.

Recent studies on common pool resources (CPRs) (e.g. Wade, 1988; Ostrom, 1990; Baland and Platteau, 1996; Agrawal, 2001) found that, in certain cases, voluntary collective action can manage CPRs and overcome the problem of "the tragedy of the commons". Collective action can be useful to provide public goods and reduce negative externalities as well. This section synthesises some findings from the literature review and the New Zealand case studies.

4.1. Collective action and public goods associated with agriculture

4.1.1. Collective action and public goods

Many non-market outputs from agricultural activities are public goods or externalities (positive or negative). Pure public goods are goods which satisfy two criteria of being non-excludable and non-rival (Samuelson, 1954, 1955). *Non-excludability* is the situation where it is impossible to exclude anyone from consuming the goods, while *non-rivalry* means that goods can be consumed by anyone without diminishing the consumption opportunities available to others from the same goods. However, in reality, few products meet both criteria. Many goods are somewhat excludable and/or rival (Cooper *et al.*, 2009). The goods that are not private goods (i.e. rival and excludable goods) and pure public goods (i.e. non-rival and non-excludable goods) are called impure public goods. They can be further subdivided into two main groups, common pool resources (CPRs) (non-excludable and rival goods) and club goods (excludable and non-rival goods), according to the degree of their excludability and rivalry.

Externalities occur when production or consumption by one person affects someone else involuntarily without compensation. If one action has a positive impact on another, the externality is defined as positive. An example of a positive externality is agricultural landscape because farmers who produce it can, along with others, enjoy the benefits (positive effects on others). It is an example of pure public goods as well because many people can enjoy the benefits (non-excludable) without decreasing the benefits for others (non-rival). As in this example, public goods and externalities often overlap (OECD, 1999).

When the externality decreases the production or utility of the affected person, it is defined as negative. A typical example of a negative externality is pollution.

Agriculture produces negative externalities such as water pollution and soil erosion as a result of the use of fertilisers and pesticides or unsustainable farming methods.

The New Zealand case studies show that collective action is useful not only for managing CPRs and overcoming the problem of “the tragedy of the commons,” but also providing pure public goods and club goods as well as reducing negative externalities. Table 3 summarises public goods and negative externalities which each collective action case targets. In the Aorere Catchment case, the main purpose of the collective action is to reduce negative externalities (non-point pollution), but at the same time, it manages the CPRs (the Aorere Catchment) not only for dairy farmers but also for marine farmers and others. The ECFP reduces negative externalities (soil erosion), and produces public goods (benefits related to carbon sequestration, improved water quality and biodiversity). The NOIC provides club goods (reliable access to water) for their shareholders. It also enhances in-stream flows and hence provides public goods, i.e. biodiversity values and maintenance of cultural values.

Table 3. Public goods and negative externalities targeted by the NZ case studies

Case studies		SFF -Aorere Catchment Project-	East Coast Forestry Project	North Otago Irrigation Company
Public Goods				
Public Goods	Pure Public Goods	NA	X (Carbon sequestration, Improved water quality and biodiversity)	X (Biodiversity, Cultural values)
	Common Pool Resources (CPR)	X (Aorere Catchment)	NA	NA
	Club Goods	NA	NA	XX (Access to Water)
Negative Externalities		XX (Non-point pollution (water))	XX (Soil erosion)	NA

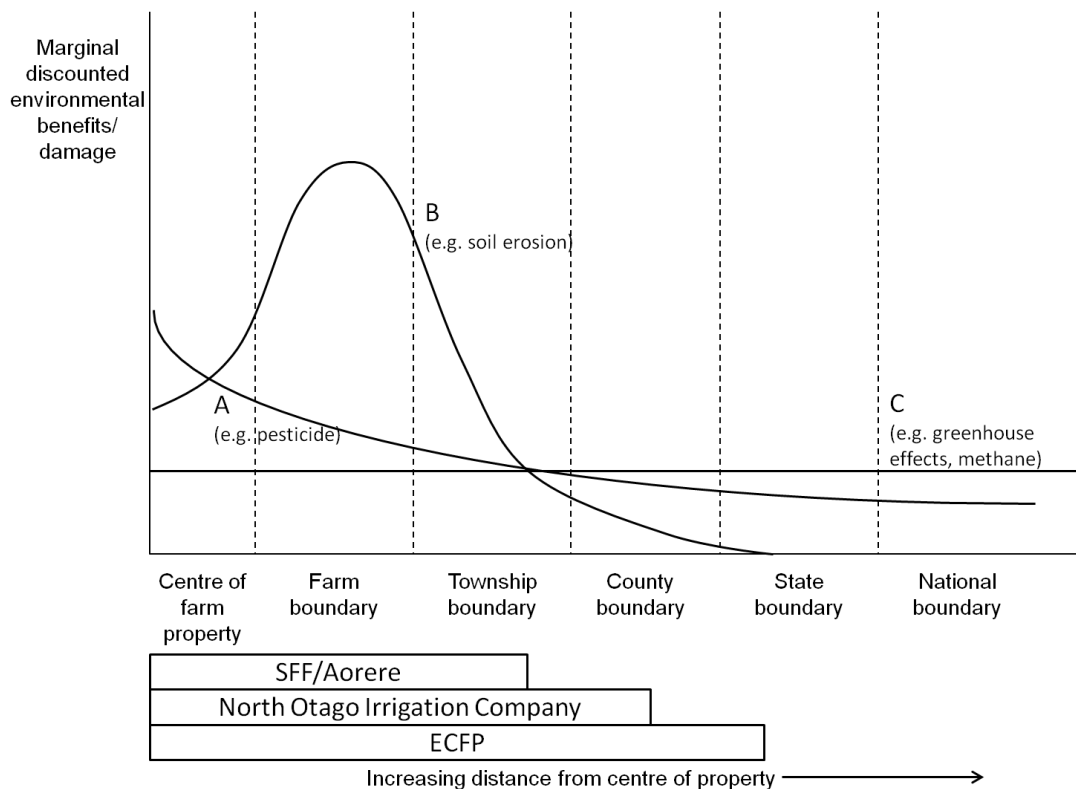
NA: Not applied or marginal; X: Important; XX: Very important.

4.1.2. Collective action and geographical scale of externalities

Collective action is also related to geographical boundaries, on which externalities associated with agriculture have impacts. There are various externalities associated with agriculture, and their impacts to other farmers differ depending on the distance from the centre of farm property. OECD (1998) explains this relationship and indicates that collective action would be useful to manage externalities whose boundaries are from the centre of farm property to around township or county boundaries. Figure 1 depicts the total discounted benefits/damage per hectare associated with farming activities in highly stylised form. Three types of agri-

environmental externalities are represented. Curve A shows an example of chemical pesticides. Their dispersion into the environment is assumed to decline gradually with distance. Curve B depicts an example of activities that affect wind-borne soil erosion. They may result in relatively little damage to soils on the farm where these activities are carried out, but considerable damage to neighbouring farms. Lastly, Curve C represents an example of the greenhouse effect, such as methane. The diffusion to the environment from emissions of gases takes place within a global system, and is widespread. Thus the marginal damage is shown as uniform over the globe.

Figure 1. Stylised representation of farming activities that create externalities



Source: Adapted from OECD (1998)

Collective action could be especially useful for the externalities represented in the *Curve A* and *Curve B*. In the case of *Curve A*, the net costs to a farmer of reducing his use of pesticides could be quite high compared with the off-site impacts borne by surrounding land owners. However, the need for those pesticides may be affected as well by the practices used by neighbouring farmers, such as increased pest resistance as a result of inappropriate pesticide use by neighbouring farmers. In such a situation, farmers may have an incentive to work together to use their pesticides appropriately.

In the case of *Curve B*, a large proportion of the environmental costs generated from a farmer's activities are externalised to his neighbours' farms. If he were the only farm creating such an externality, it might be worth it for affected land owners to pay him to take remedial measures. In a typical case he would himself be affected by similar externalities generated by neighbours, and those neighbours by other

neighbours in turn. In this case, they may devise some solutions that attempt to get every farmer in the area to commit to a common plan of action.

On the other hand, in the case of Curve C, both the farmer and his neighbours have little economic incentive to reduce their environmental impact on any large degree, since the share of local benefits to be gained, even collectively, are likely to be tiny compared with those of the rest of the world. Moreover, such benefits are unlikely to be realised by the current generation. The idea of all interested parties working out solutions within a group is difficult due to the large numbers involved, millions or billions of people. Such transboundary issues require co-ordination among larger, representative institutions, i.e. governments.

The New Zealand case studies cover the geographical boundaries from the centre of farm property to township or county boundaries. The geographical boundary of the SFF/Aorere Catchment Project is based on the catchment level, since negative externalities affect the whole catchment and covering all areas is required to improve water quality. 33 dairy farmers try to reduce negative externalities which affect areas beyond their farm boundaries. The geographical boundary of the ECFP is also beyond the area of each landowner. It tries to cover the severely eroding area, 60 000 hectares, in the Gisborne region. In addition to these negative externalities cases, the NOIC case shows that collective action is necessary to provide services to a large number of members in a same watershed. The NOIC provide services for more than 100 farmers and covers approximately 14 000 hectares of farmland in North Otago. These case studies confirm that collective action could be especially useful for dealing with the externalities represented by the *Curve A* and *Curve B*.

4.2. Benefits of collective action

Previous sections explain how collective action is useful for managing CPRs and providing public goods and club goods as well as reducing negative externalities. It also shows that effective collective action is related to geographical boundaries. This section and the next section discuss benefits and difficulties of the collective action. The literature review on collective action and the New Zealand case studies identify several benefits of collective action. The main benefits are i) scale merits; ii) increasing capacity; and iii) tackling local issues.

4.2.1. Scale merits

Collective action has scale merits. These include geographical and ecological scale merits, and economy of scale and scope. First, collective action allows individual farmers to manage at a geographically and ecologically appropriate scale, across legal and administrative boundaries as seen in the previous section (Figure 1). Although some public goods, such as landscape and biodiversity, cannot be provided or protected in many cases by a single farmer, collective action makes it possible to provide these goods which need a large geographical scale (Davies *et al.*, 2004). In addition, land management at a landscape-scale can deliver greater public goods than at the individual farm scale (Mills *et al.*, 2010).

Second, collective action has an economy of scale and scope, i.e. it can reduce costs. Collective action includes various people who have different skills and who can pool their assets to provide public goods (Polman *et al.*, 2010). By sharing and mobilising

resources, it is possible to reduce the costs for the provision of goods (OECD, 1998; Davies *et al.*, 2004). In fact, the Aorere Catchment group could reduce marginal costs for changing agricultural practices for improving water quality by sharing knowledge and information among members. The ECFP also helps landowners to identify appropriate treatments for planting, which varies depending on the type of soil erosion. Hodge and McNally (2000) also found that large-scale collective action could reduce marginal costs for wetland restoration in Wales (economy of scale). Moreover, neighbouring farmers provide different types of public goods such as biodiversity and landscape. The co-ordinated provision of these goods through collective action may reduce the cost for their provision, compared with a single provision of public goods (Shobayashi *et al.*, 2011). In fact, Table 3 shows that each New Zealand case provides multiple public goods while reducing negative externalities. Collective provision of public goods and reduction of negative externalities can reduce costs (economy of scope).

4.2.2. Increasing capacity

Collective action makes it possible for members to collect and share knowledge and information, which can enhance farmers' capacities in ways that cannot be achieved by an individual farmer. For example, collective action can draw different stakeholders and landholders together and utilise their knowledge, skills and institutions (Hodge and Reader, 2007). This type of sharing can facilitate the harmonisation of multiple objectives for resources, attract funding by increasing credibility and legitimacy in decision making, and build understanding and a capacity to cope with future changes (Davie *et al.*, 2004). In order to increase these capabilities, creating a co-operative environment by stakeholders is important (Hodge and Reader, 2007). The Aorere Catchment Group maintains good communication among members by holding group meetings, which increases capacities of the group.

4.2.3. Tackling local issues

Collective action can make it possible to tackle local issues which may be difficult to deal with by central authorities. It can identify critical sites that are central to different environmental objectives. It can signal opportunities for groups of landholders, conservation groups and local authorities to collaborate in a joint project (Hodge and Reader, 2007). This local focus of collective action is useful not only for public goods, but also for negative externalities. Collective action can utilise local knowledge to identify pollution risks by using local expertise (Pollard *et al.*, 1998; Vojtech, 2010). This would be particularly effective for non-point pollution. Although central approaches may not be able to provide solutions for dispersed pollution problems, local approaches could find better measures to deal with them by adjusting activities to each local situation, like the Aorere Catchment Project. Collective action can allow greater flexibility, responsiveness and local relevance (Davie *et al.*, 2004).

4.3. Barriers to collective action

In addition to the numerous advantages to collective action, the literature review and the New Zealand case studies identify several barriers to promoting collective action. The main challenges are free rider problems and transaction costs.

4.3.1. Free rider problem

Many studies on collective action have pointed to the problem of free riders where some group members tend not to contribute to group activities because they can benefit from other member's activities without contributing. Olson (1965) stated that "rational, self-interested individuals will not act to achieve their common or group interests", i.e. individuals have incentives to free ride in collective action because one who cannot be excluded from the benefits of a collective good has little incentive to make a voluntary contribution to the provision of that good. This free rider problem is known to occur in repeated public goods experiments (Ledyard, 1995). Thus, it can be difficult to provide public goods by collective action. They are, by definition, non-excludable and non-rival, and it is difficult to limit these benefits to active group members.

However, previous studies have also found that people tend to contribute to the production of public goods more than expected due to pure self-interest (OECD, 2012b). Although there are several possible explanations, one of them relates to "social norms" or "heuristics (rules of thumb that individuals have learned over time regarding responses that tend to give them good, but not necessarily optimal outcomes in particular kinds of situations (Ostrom, 2010))". For example, the strong social capital of the Aorere Catchment helps farmers to act together.

Several previous studies also argue that successful collective action can prevent free rider problems by enforcing a monitoring system among members, and can move production closer to a Pareto optimum (Davies *et al.*, 2004). Olson (1965) himself points out the possibility of being able to prevent free rider problems by limiting the benefits of group activities to active group members. NOIC prevents free-riding by asking farmers to comply with the environmental agreements and also auditing them. Indeed, it has experiences to stop supplying water to farmers due to failing the requirements set by NOIC. This system of monitoring and sanctions lets farmers contribute to the collective action and reduces free riding.

4.3.2. Transaction costs

Collective action involves additional transaction costs when compared with individual activities, especially at the initial stage and its implementation (Ostrom 1990; Davies *et al.*, 2004) and which may hinder collective action from taking place. Davies *et al.* (2004) summarise the transaction costs related to collective action based on the study by Singleton and Taylor (1992) (Table 4). There are three types of related transaction costs: 1) search costs; 2) bargaining costs; and 3) monitoring and enforcement costs. Some of them can be, to some extent, reduced by incorporating mechanisms such as an assistance of local governments and NGOs. For example, in the case of Aorere Catchment project, search costs (e.g. gathering information and identifying funding source) were reduced by assistance from an NGO, NZ Landcare Trust. It provides farmers with the information on the SFF and other related information and helps them to organise collective action. However, still, some additional costs are inevitable for collective action. In order to make collective action work, benefits from collective action need to cover these costs incurred by the action.

Table 4. Transaction costs in collective action

Transaction Costs	Explanation	Examples
Search Costs	Cost incurred in identifying possibilities for mutual gain	<ul style="list-style-type: none">• Costs of identifying relevant stakeholders• Costs of gathering information• Costs of identifying funding source for collective action
Bargaining Costs	Cost associated with negotiating an agreement	<ul style="list-style-type: none">• Time spent at meetings• Effort expended in verbal and written communications• Costs of acquiring support from external agencies
Monitoring and Enforcement Costs	Cost involved in making sure all parties keep to the agreement	<ul style="list-style-type: none">• Time and effort spent monitoring others• Employment of external monitor• Costs of enforcing sanctions

Source: Adapted from Davies *et al.* (2004) and Singleton and Taylor (1992).

On the other hand, some studies argue that collective action may be able to reduce transaction costs, such as those related to contracting, monitoring and making payments, because of the economy of scale and scope (e.g. Hodge and McNally, 2000; Shobayashi *et al.*, 2011). For example, collective action helps to reduce transaction costs as the number of parties which authorities need to negotiate with is reduced (OECD, 1998). In the NOIC case, local governments closely work with NOIC for improving on-farm environmental practices. NOIC plays a role of intermediary and helps governments to promote sustainable farming among individual farmers. As a result, governments can reduce transaction costs related with, for instance, monitoring. Davies *et al.* (2004) pointed out that social networks, trust and norms of reciprocity among group members can reduce transaction costs. Indeed, the small Aorere group and strong social capital seem to help them to negotiate agreements and reduce bargaining costs and other transaction costs. Hodge and McNally (2000) also find that external agents, such as water management organisations, can reduce transaction costs by playing the role of information provider as well as being a forum for establishing co-ordination among members. The NOIC case is the example of this type as well. Thus, the important point for successful collective action is to identify how to reduce transaction costs incurred by collective action.

4.4. Key factors for successful collective action

Collective action is a complex activity involving various stakeholders. This implies that several things affect any decision or action. Many authors have analysed the factors affecting collective action and pointed out various factors that are necessary for its success (e.g. Ostrom, 1990).

Some studies have tried to synthesise factors that are necessary for successful collective action. Agrawal (2001) summarised the key factors for collective action to govern CPRs by reviewing the three most significant book-length analyses of local community efforts to manage and govern CPRs (Wade, 1988; Ostrom, 1990; and Baland and Platteau, 1996). Davies *et al.* (2004) also summarised the key factors for it by examining 12 academic studies. However, these all present several limitations. First, the number of variables is too great and too complex. For example, the total number of factors identified in the last two studies mentioned above is more than 35. Complex links of these numerous variables at multiple levels make the research on collective action extremely challenging (Ostrom, 2010). Second, as Agrawal (2001) explains, these variables are samples in a specific case rather than general theories of collective action because it is difficult to undertake systematic tests to evaluate these factors due to the lack of available data. Therefore, the existing work has not yet developed a theory of what makes for successful collective action in sustainable resource management.

However, deepening the understanding of these factors and examining some common factors identified in the New Zealand case studies helps us to develop better methods for providing public goods and mitigating negative externalities through collective action. Agrawal (2001) divides these variables into four sets: 1) the characteristics of resources; 2) the nature of groups that depend on resources; 3) the particulars of institutional regimes through which resources are managed; and 4) the nature of the relationship between a group and external forces and authorities. Mills *et al.* (2010) uses this typology developed by Agrawal and analyses variables influencing collective action in Wales. This framework is useful for categorising variables and deepening the understanding of them. Table 5 synthesises variables identified in Agrawal (2001) and Davies *et al.* (2004) and those identified in the New Zealand case studies.

Table 5. Key factors for successful collective action

1) Resource system characteristics	2) Group characteristics
Knowledge of environmental resources Sharing community of interests	Social capital Small group or large group with functional institutions Heterogeneity of endowments and homogeneity of identities and interests Leadership Communication
3) Institutional arrangement	4) External environment
Locally devised management rules Monitoring and Sanctions	External support (both financial and non-financial) Cooperation between local and central governments

Source: Author, based on Agrawal (2001) and Davies *et al.* (2004).

4.4.1. Resource system characteristics

The characteristics of the resource system (e.g. biodiversity, water pollution) affect collective action. Among the factors related to this point, 1) knowledge of environmental resources and 2) sharing community of interests seem particularly important for collective action.

- Knowledge of environmental resources

Having good knowledge of environmental resources, including both local knowledge and scientific expertise, is one of the key factors for local groups to be able to work collectively in order to use natural resources sustainably (Agrawal, 2001; Pretty, 2003). Even if private benefits are high enough, collective action may not happen due to lack of information on, for example, technical requirements (Wade, 1988; Hodge and McNally, 2000).

Generally speaking, communities have relatively accurate knowledge on how the biophysical system operates because such knowledge is essential to manage resources successfully (Ostrom, 1999a). Through managing resources, they have learned what has impacted their resources, especially if impacts are internal to the communities.

However, communities do not always have the correct knowledge about the kind of impact they have on resources, especially when impacts are external to the communities. For instance, local groups may not have access to scientific knowledge concerning the type of resource system involved. They may not know how transported nutrients affect the environment hundreds of kilometres away. In these cases, they may need support from external authorities (Ostrom, 1999a; Pretty, 2003).

Local government, universities or other regional organisations can take on the role of an external agent, and they can facilitate communication among farmers and provide necessary information (Ostrom, 1999a; Hodge and McNally, 2000). In fact, in the case of the Aorere Catchment, external experts undertake scientific research to identify the causes of the non-point pollution. In the case of ECFP, governments provide expertise on soil erosion and help landowners to identify suitable measures for soil erosion. It is often true that no one holds all the necessary information for an environmental resource and thus the farmer, the regulator, agricultural advisors, and other specialists need to join a multi-disciplinary team and share expertise to tackle problems they are facing (Pollard *et al.*, 1998).

- Sharing community of interests

Collective action involves a large number of individuals and organisations, and usually covers areas beyond an individual farm level. To make this group activity feasible, everyone needs to share why they need to act collectively. Typically, collective action deals with common issues or community or interest, such as managing CPRs (e.g. Aorere Catchment), tackling severe resource problems (e.g. severe soil erosion such as Gisborne region) and answering common strong needs for resources (e.g. access to reliable water as in the NOIC case), but not issues related with individual farming (e.g. risk-assessment of individual farms). Dealing with these common issues helps stakeholders to recognise the utility of taking action together. However, sometimes, participants may still face difficulties to share objectives, since most actions usually take a long time and a lot of resources are necessary to achieve the goals. In this case, as discussed, knowledge of environmental resources can help them to share the objectives, since it provides them with science-based evidence.

4.4.2. Group characteristics

The nature of groups affects collective action. Indeed, the literature review and the New Zealand case studies identify the significant roles of social capital, group size, heterogeneity of endowments and homogeneity of identities and interests, leadership and communication among group members.

- Social capital

Social factors are broad factors related to society such as norms, social networks, institution and trust. Methodologies based on social norms can complement traditional public policy approaches focusing on regulation, taxation, and pricing (World Bank, 2009). In fact, many studies have pointed to the importance of social capital for collective action (e.g. Pennigton and Rydin, 2000; Rudd, 2000; Ahn and Ostrom, 2002; Pretty, 2003; Davies *et al.*, 2004).

Although there is no formal definition of social capital, it is conceived as aspects of social relationships that are necessary for achieving individual and/or collective goals. For example, Ahn and Ostrom (2002) define it as “a set of values and relationships created by individuals in the past that can be drawn on in the present and future to facilitate overcoming social dilemmas.” It usually includes social networks, norms, trust, reciprocity, obligations and expectations, values and attitudes, culture,

information and knowledge, formal groups, institutions and rules, and sanctions (Davies *et al.*, 2004).

Many kinds of factors are included in this broad concept. According to Ahn and Ostrom (2002), there are three basic forms in social capital: trustworthiness, networks and institutions. Trust is essential for establishing social relationships. Networks, such as communities and neighbours, encourage and embody trust and stimulate social interaction. Individuals need to be linked together in social networks to generate social capital (Dowling and Chin-Fang, 2007). Institutionalised systems including rules can further promote trust at an aggregated level. They can increase returns through enhanced levels of generalised social trust (Rudd, 2000).

This social capital can lower the transaction costs of working together, facilitate harmonisation of interests among groups, and enhance predictability of reactions among members (Pretty, 2003; Davies *et al.*, 2004). In fact, social capital of the Aorere community significantly helps farmers to act collectively. In the community, farmers and their families have been farming for a long time. Their historical relationship helps them to trust one another and take actions together.

- Small group or large group with functional institutions

The appropriate size of groups has been analysed in many studies. Much of the literature argues that small groups are more favourable for collective action (e.g. Olson, 1965; Wade, 1988; Ayer, 1997), but large groups also work with functional institutions. Regarding small groups, Olson (1965) argued that these can prevent free riders and work better. His argument is based on costs and benefits of collective action. Large groups pay relatively high costs to take collective action and their benefits from actions are relatively small per capita (Olson, 1965). Although large groups can reduce the initial costs per member, as the group becomes larger, costs associated with negotiation, monitoring and enforcement increase (McCarthy, 2004). On the other hand, small groups pay relatively small costs to organise collective action and their participants can have relatively high gains per capita (Olson, 1965). These smaller groups can reduce the transaction costs associated with co-ordinating, monitoring and enforcing group activities (Ayer, 1997).

In addition, small groups are good for establishing relationships among members. The limited number of club members allows the individuals to know each other's particularities which can facilitate effective co-operation among members (Dowling and Chin-Fang, 2007). Baland and Platteau (1996) examined the role of rural communities for managing CPRs in developing countries and they noted that in a repeated prisoner's dilemma game, small-group size was important for cooperation. This is because individuals know each other better and can better observe one another's behaviour. As a result, people take into consideration the more indirect and long-term consequences of their choices, instead of paying exclusive attention to the immediate costs and benefits.

What constitutes an adequate number of group members has also been discussed. Dunbar (1992) suggested that a group in which the number of people is larger than a certain level requires more rules and norms to maintain a stable group because there is a cognitive limit within which people can maintain stable social relationships. Although this level is not clearly identified, some studies on collective action have

given specific numbers. For example, according to Pretty (2003), from the early 1990s to the early 2000s, about 400 000 to 500 000 new local groups were established all over the world for managing agricultural and rural resources and most of them were small groups, usually having 20 to 30 active members. Mills *et al.* (2010) argues that a maximum number of members should be initially about ten in order to make it possible to facilitate communication and development of the organisation. The Aorere catchment project is also a small group, composed of 33 local farmers and other stakeholders including marine farmers and local NGOs. This small group size helps them to understand one another and act collectively.

However, large groups can still provide public goods if institutions are well established. On the contrary, if larger groups work, they can cover larger geographical areas and bring greater environmental benefits. Ayer (1997) shows three possible cases of provision by a larger group: 1) there is a possibility that one person, whose benefits from the provision of a public good outweigh his costs, provides the public goods for all; 2) rules can be set for requiring that those who benefit the most from the provision of a public good pay more of the costs; and 3) a government institution can divide a larger group into more homogeneous subgroups to facilitate co-operation. Baland and Platteau (1996) claim that even a large group can work when members share common norms or when it is confronted by a common challenge.

Although traditionally it is believed that small-group size is a necessary condition for successful collective action, there is evidence that a large group can work effectively. In fact, the NOIC's stakeholders are more than 100 farmers and cover large areas, some 14 000 hectares. The NOIC has a strong governance structure, and closely works with local governments, which helps it to manage a large number of people. The ECFP also has hundreds of participants. In this project, governmental roles are important. Both local and central governments actively approach landowners and develop action plans for soil erosion. Active participation of governments helps the group to work effectively.

Thus, while small groups can prevent free riders easier and help members to know one another, large groups still can work if institutions (e.g. rules, governance) are well established; rather it may be able to increase group capabilities through group dynamics.

- Heterogeneity of endowments, homogeneity of identities and interests

The discussion of heterogeneity is closely related to the discussion of group size because small groups tend to be homogeneous and large groups tend to be heterogeneous. In general, homogeneous groups in terms of identities and interests tend to be easier to form collective action. If group members are homogeneous and they share similar social, economic and cultural circumstances, it is easier for them to communicate and come to a mutual agreement (Dowling and Chin-Fang, 2007). Lubell *et al.* (2002) analysed hundreds of watershed partnerships in the United States and found that homogeneous partnerships in terms of their human, social and financial capital develop most rapidly. On the other hand, larger groups often mean greater differences in individual needs and interests, and financial ability. These differences can prevent collective action from working effectively (Ayer, 1997).

However, heterogeneity does not necessarily have a negative impact on collective action. Some studies indicate that heterogeneous endowments can have a positive impact on collective action because people support each other through their different abilities (e.g. Olson, 1965).

In the New Zealand cases, it seems core members of collective actions tend to be homogeneous in terms of identities and interests, but external agents can bring different views and expertise and help groups to enhance capacities through heterogeneous endowments. For example, in the Aorere Catchment case, farmers have been doing farming in the same area for a long time (homogeneous) and this fact seems to facilitate them to organise group activities, but external support from NGOs and scientists (heterogeneous endowments) help the group to obtain governmental support and implement measures based on scientific evidence. In summary, homogeneous groups in terms of identities and interests can reach mutual understanding more easily, but, heterogeneity in endowments has a possibility to improve co-operative capacity by bringing together different skills.

- Leadership

In a group activity, leadership is one of the most important factors to achieve collective objectives. The Aorere Catchment is a successful case of collective action, because it is a farmer-led initiative. Farmers themselves started to tackle issues and find solutions, which are suitable for their local situations. “One size fits all” approaches risk failing to incorporate local needs, but farmer-led approaches can reflect the community of interests when deciding on a course of action.

Leadership needs not to be taken by individuals. Organisations can take it as well. For instance, NOIC takes strong roles of supplying reliable water and improve the environment in the North Otago region. It sets environmental requirements and asks farmers to comply with them. It does monitoring and can impose sanctions for preventing free riding. Its strong initiative can make group action feasible.

- Communication

Communication is an essential factor for successful collective action because it is difficult to establish trust without it (Ostrom, 1999b). It can serve to enlighten, educate and articulate community preferences (Rudd, 2000). Communication helps individuals to reach the social optimum, i.e. Pareto optimality (Ayer, 1997). Among various communication styles, face-to-face communication is especially important (Hodge and McNally, 2000) because people can establish trust rather than just exchanging opinions by using the internet or telephone. Public institutions can also provide necessary information and facilitate communication (Ayer, 1997). Sometimes, because of a long history of mistrust amongst stakeholders, it may be difficult to establish a good relationship. In this case, an external authority can help communications by acting as a catalyst.

In the New Zealand cases, the Aorere Catchment tries to have better communication not only among farmers, but also with marine farmers and other stakeholders by having group meetings, issuing community papers and sharing information including the results of the scientific tests on water quality of the Catchment. Although, in the beginning, marine farmers who suffered from water deterioration accused the

farmers, they gradually understood each other through interactive communication, and finally celebrated their achievements together by holding a party.

4.4.3. Institutional arrangements

Some institutional arrangement is necessary for successful collective action. The literature review and the New Zealand case studies find that: 1) locally devised management rules; and 2) monitoring and sanctions are key factors for successful collective action.

- Locally devised management rules

Allowing groups to develop their own solutions and implementation rules is very important for successful collective action because the “one size fits all” approach may fail to engage farmers in collective action (Ostrom 1990; Mille *et al.*, 2010). For example, Ayer (1997) argues that farmer-led organisations could better incorporate incentives into rules that encourage necessary maintenance for managing resources. However, top-down rules may not be able to take local situations into consideration and thus fail to work. Wade (1988) argues that central governments need to be tolerant towards locally-based authorities and give them sufficient power to adjust rules to local conditions. Baland and Platteau (1996) state that any rule set at a high level should be properly explained to community groups and that there should be room for adaptation. In fact, in the Aorere Catchment case, farmers develop an individual farm planning system to address specific water quality issues, because each farm is different and needs specific treatments. Flexible and locally adjusted approaches are more effective to manage non-point pollution, rather than “one size fits all” approaches.

Rules to manage resources and organise collective action also need to be fair, consensual and easily enforced by participants. Wade (1988), and Baland and Platteau (1996) argue that simple rules are easier to remember and enforce. This is particularly needed for collective action which involves multiple players. Complicated rules are usually difficult to understand, and, intentionally or unintentionally, increase the number of rule breakers, which could lead to mistrust among members. Rules also need to fit local conditions and, if necessary, local people should be able to modify them so that there is a better fit to the specific characteristics of local settings, and thereby making them easier to enforce by the local population (Ostrom, 1990).

- Monitoring and sanctions

In order to prevent free riding and rule-breaking, monitoring is important for collective action. Baland and Platteau (1996) argue that groups should be granted clear and secure rights over local-level resources and clear responsibilities that include monitoring so as to make collective action more successful. Although monitoring can be done by a central authority, according to Baland and Platteau (1996) self-monitoring organised by the users themselves is likely to be significantly less costly than a centralised system of monitoring. Ostrom (1990) found that in successful management of CPRs by collective action, monitoring is undertaken not by external agencies but by the participants themselves. Pennigton and Rydin (2000) also point out that local issues are easier to monitor than global issues because the

organisers have much smaller groups, such that any free-riding behaviour on the activities of the organisation can be more easily monitored. In fact, in order to prevent farmers from free-riding, NOIC audits one third of farmers every year and undertakes weekly unscheduled compliance checks. This strong monitoring system helps large-scale collective action to work.

However, if monitoring activities necessitate the use of costly technologies and equipment to be effective, governments may be better in providing financial and technical support to decentralised monitoring (Baland and Platteau, 1996). In addition, if it is necessary to monitor broad areas which go beyond the limits of the group (e.g. non-point pollution), both monitoring by groups and governments may be necessary.

Once collective action emerges, some degree of coercion becomes a necessary condition to sustain it. Wade (1988) points out the importance of measures for rule-breaking. More specifically, Ostrom (1990) raises the importance of graduated sanctions depending on the seriousness and context of the offence. People can learn how to co-operate even if they make mistakes. Although it is necessary to exclude someone who commits a significant violation of the rules, severe sanctions for a first offence may hinder trust and co-operation from being established, rather than promoting them. To make sanctions effective, ease of detection of rule-breakers is also important (Wade, 1988). In the NOIC case, to enhance the compliance with the environmental agreements between farmers and NOIC, NOIC stops supplying water to farmers if they do not satisfy requirements. This kind of measure may be necessary for collective action.

4.4.4. External environment

External forces and authorities also affect group activities. Some collective action comes naturally, while others need government intervention (Ayer, 1997). If collective action is not naturally formed, external support may be necessary. Indeed, the literature review and the New Zealand case studies reveal the importance of external support, both financial and non-financial support. It is also important to have good cooperation between local and central governments for promoting collective action.

- Private benefits and financial support

Collective action brings benefits to the entire group, but the benefits from collective action are not equally distributed; rather smaller-scale individuals in the group may benefit the most because of the big contribution from larger-scale individuals to the entire group (Kennedy, 1999). The private benefit of farmers participating in collective action is an important factor when farmers decide to act co-operatively or not (e.g. Ayer, 1997; Hodge and McNally, 2000; Lubell *et al.*, 2002; McCarthy, 2004). In some cases, financial support from agencies can increase the benefits from collective action and facilitate its development.

The importance of financial support from external authorities has been pointed out in several studies. Lubell *et al.* (2002) analysed the emergence of over 900 institutions managing watersheds in the United States and found that collective action is more likely to be formed when the potential benefits outweigh the transaction costs of

developing and maintaining new institutions. They argue that institutional support, including monetary support, is important in order to overcome transaction costs. Hodge and McNally (2000) analysed wetland restoration activities in Wales and raised the importance of schemes for encouraging collective action including financial support. Hodge and Reader (2007) argue that grants supporting the relevant activities of individual participants can encourage the development of “social entrepreneurs” who are willing and able to stimulate action in their local areas, and that this support can also allow local leaders to initiate collective action. Financial assistance seems particularly important at the initial stage of an activity because it has higher transaction costs compared with individual activities (Mills *et al.*, 2010). Pollard *et al.* (1998) analyse ten partnerships for tackling non-point pollution in Scotland and state that partnerships require pump-priming resources, either as staff time or as financial support to initiate and manage projects. They claim that once partnerships are established, they can attract funding by themselves.

External financial support comes from both governments and non-governmental organisations. Governmental financial supports have two patterns: general agri-environmental policies and policy measures specifically for promoting collective action. General agri-environmental policies (e.g. payments for relocation of livestock facilities away from stream banks and equipment modification for improved pesticide application) can sometimes indirectly support collective actions by providing funds which can be used for both individual and collective activities. However, they do not necessarily promote collective actions, because individuals can also apply for programmes. Farmers do not necessarily have motivations to act collectively. If it is better to tackle agri-environmental problems collectively, not individually, it would be better to implement policies which specifically target collective action. For example, SFF only targets collective action and promotes it at the national level in New Zealand. Some support is provided by local governments. In the NOIC case, Otago Regional Council develops water run-off policies with NOIC and Waitaki District Council invests NZD10 million in the NOIC infrastructures. Local governments can provide assistance which is adjusted for local situations.

Non-governmental bodies also provide financial support. In the Aorere Catchment case, non-governmental stakeholders such as NZ Landcare Trust and Dairy NZ provide finance to support farmers’ activities, in addition to governmental financial support. In SFF projects, a significant amount of cash and in-kind support are made by non-governmental actors.

- Non-financial support

Non-financial support is also important for collective action. For example, advice from local authorities can help to identify potential parties which are appropriate in local circumstances (Hodge and McNally, 2000; Mills *et al.*, 2010). Some studies require governments to take more pro-active approaches. For example, Baland and Platteau (1996) argue that governments should provide a framework of basic rights, rules and objectives for collective action to serve as a guideline for managing CPRs voluntarily. In addition, sanctions are also part of non-financial means by which governments can reinforce collective action (Ayer, 1997). It is also important to note that sanctions imposed by the groups themselves may work better than ones that are imposed by governments.

Farmers do not always have enough scientific knowledge on how to manage resources. If they lack specific expertise, external experts such as professors, researchers and governments can provide them with technical assistance. In fact, in the Aorere Catchment case, external researchers undertook scientific research on water quality in the catchment. In the case of the ECFP, governments take more proactive approaches. The Ministry for Primary Industries of New Zealand (MPI) and a local government, the Gisborne District Council (GDC), approach landowners together and develop plans to treat erosion, including free technical advice. Science and advice could empower farmers in these cases.

- Cooperation between local and central governments

Cooperation between local and central governments is important to promote collective action. Collective action usually deals with local issues, and local governments have better knowledge on local situations. They can provide expertise and technical assistance which are adjusted for each local situation. Central governments may not be able to provide this kind of assistance due to a lack of knowledge on local issues.

On the other hand, central governments generally can provide larger amount of resources. Sometimes, geographical boundaries that collective action targets extend beyond township/county boundaries. If collective action tries to cover broad areas or need a large amount of resources, central governments need to provide support. Thus, both support from local governments regarding detailed local issues and support from central governments which requires larger resources are necessary. For example, in the ECFP case, the collective action is underpinned by the Ministry for Primary Industries, because the necessary resources including financial ones are beyond the capacity of the GDC. However, the GDC also supports erosion control by establishing rules to target eroding and erosion prone areas. The GDC is responsible for the regional plan which requires effective tree cover relying on cost-effective treatment options. The ECFP by the MPI supports landowners to satisfy this requirement by providing grants. This shows a good working relationship between the MPI's ECFP management and the GDC has been important to the success of this collective action (MAF, 2011).

5. Policy implications

Collective actions are of three types: 1) collective action without government support, 2) collective action with voluntary support from governments and 3) top-down, compulsory, collective action (Table 1). In this paper, the second type of bottom-up collective action with support from governments is examined.

The study shows that collective action is useful for managing CPRs, providing public goods and club goods, and reducing negative externalities. It is especially effective in managing broad geographical areas which extend beyond an individual farmland. Collective action has several benefits: it has scale merits and reduces some costs compared with individual actions; it increases capacities by sharing information and brings larger benefits; and it can tackle local issues which, sometimes, central approaches may not be able to deal with.

However, there are several barriers to promoting collective action. The main challenges are free rider problems and transaction costs. Individuals have incentives to free ride on collective actions because one who cannot be excluded from the benefits of a collective good has little incentive to make a voluntary contribution to the provision of that good. Collective action also involves additional transaction costs when compared with individual activities, especially at the initial stage and its implementation. Some of these difficulties can be, to some extent, mitigated by incorporating mechanisms such as an assistance of governments and NGOs.

It goes without saying that groups must first to the extent possible make their best efforts to overcome these difficulties by themselves. For example, they can create their own local rules for preventing free ridings and reducing transaction costs. However, they may still need governmental support for coping with some challenges. Generally speaking, farmers lack specific scientific knowledge, technical information and finance. Governments can provide assistance in these areas. Five main policy implications emerge from this analysis.

Farmers should take initiatives and governments can support them

- Bottom-up collective action can identify local issues and provide solutions for dealing with community of interest. However, Davies *et al.* (2004) pointed out, it may be difficult for farmers to take voluntary collective action because a majority of farmers may be reactive rather than proactive. Moreover, farmers often need external support such as scientific knowledge, technical information and financial assistance in order to take collective action. Thus, external help from public agencies or other interested bodies may be necessary to promote collective action. Bottom-up collective action does not necessarily mean an action without governmental or external support.

Some policies should specifically promote collective action

- Collective action is key to improving the agricultural environment. It can be very effective to deal with agri-environmental externalities which are beyond individual farm level. However, current government policies do not necessarily promote collective action. As some studies argue (OECD, 1998; Hodge and McNally, 2000), some policies (e.g. policies for dealing with externalities which extend beyond an individual farmland) should explicitly encourage collective action.

Initial support, especially financial support, is important

- Collective action involves new transaction costs, especially at the beginning. The transaction costs may hinder collective action from emerging. Therefore, as all three New Zealand cases show, initial support from governments is important.
- Among them, financial support is crucial because farmers have not yet established their institutions and their financial basis is weak. However, once the collective action is on track, it is necessary for it to be financially independent as much as possible.

Technical assistance can empower farmers

- For managing natural resources, specific scientific knowledge is important. However, farmers may not have sufficient knowledge on it. They may not know appropriate management practices for providing public goods and reducing negative externalities. Thus, governments and other external bodies can provide them with technical assistance and empower them.
- Governments can contribute to: providing accurate information on natural resource systems, recording key information on natural resource systems, providing low-cost conflict resolution system, designing mechanisms for local individuals to be able to discourse and debate so that they can learn from one another, disseminating information on successful cases, and creating institutional mechanisms that local participants can use for organising themselves (Ostrom, 2004).

Cooperation between local and central governments is a key

- Local governments play important roles. Some flexibility is necessary to adjust programmes to local conditions, and consistent with existing institutions. Governments need to strengthen local management and allow more local decision-making without imposing external rules (Meinzen-Dick and Di Gregorio, 2004, McCarthy, 2004).
- On the other hand, central governments can provide support on a larger scale, which is difficult to be done by local governments. Understanding characteristics of problems and choosing the best actor to provide support is essential. If central governments implement policies to promote collective action, they need to take into consideration issues of collaboration with local governments.

Collective action is useful for achieving agri-environmental targets. It can manage CPRs, provide public goods and club goods, and reduce negative externalities in a cost-effective way. Blandford (2010) argues collective action can be a viable alternative to both regulation-oriented policies and market-oriented policies. In order to enhance altruism and cooperative actions of farmers, community engagement and public commitments are useful as policy tools (Defra, 2010). This study provides some first indications of policies for promoting collective action. However, each situation requires different types of actions. It is necessary to adjust the general factors identified in this study with a view to developing the best approach for each case. Last but not least, although this paper examines only three New Zealand cases, it is necessary to examine more cases from a range of various countries to draw firmer conclusions and more general policy implications. This will be done in the ongoing OECD study.

References

Agrawal, A. (2001), "Common Property Institutions and Sustainable Governance of Resources", *World Development*, Vol. 29, No. 10, pp. 1694-1672.

- Ahn, T. K. and E. Ostrom (2002), "Social Capital and the Second-generation Theories of Collective Action: An Analytical Approach to the Forms of Social Capital", Paper prepared for delivery at the 2002 Annual Meeting of the American Political Science Association, Boston, Massachusetts, August 29-September 1, 2002.
- Ayer, H. (1997), "Grass Roots Collective Action: Agricultural Opportunities", *Journal of Agricultural and Resource Economics*, Vol. 22, No. 1, pp.1-11.
- Baland, J. M. and J. P. Platteau (1996), *Halting Degradation of Natural Resources: Is there a Role for Rural Communities?*, FAO (Food and Agriculture Organization of the United Nations), Rome.
- Blandford, D. (2010), Presidential Address: The Visible or Invisible hand? The Balance between Markets and Regulation in Agricultural Policy, *Journal of Agricultural Economics*, 61(3), pp. 459–479.
- Cooper, T., K. Hart and D. Baldock (2009), *The Provision of Public Goods through Agriculture in the European Union*, report prepared for DG Agriculture and Rural Development, Contract No 30-CE-023309/00-28, Institute for European Environmental Policy, London.
- Damianos, D. and N. Giannakopoulos (2002), "Farmers' Participation in Agri-environmental Schemes in Greece", *British Food Journal*, Vol. 104, No. 3/4/5, pp. 261-273.
- Davies, B., K. Blackstock, K. Brown and P. Shannon (2004), *Challenges in Creating Local Agri-environmental Cooperation Action amongst Farmers and Other Stakeholders*, The Macaulay Institute, Aberdeen.
- Department for Environment, Food and Rural Affairs of the United Kingdom (Defra) (2008), *Bringing Theoretical and Applied Evidence Together from Across Defra and Highlighting Policy Relevance and Implications for Future Research*, November 2008, Defra Agricultural Change and Environment Observatory Discussion Paper.
- Dowling, J. M. and Y. Chin-Fang (2007), *Modern Developments in Behavioral Economics: Social Science Perspectives on Choice and Decision*, World Scientific Pub Co Inc.
- Dunbar R. I. M. (1992), "Neocortex Size as a Constraint on Group Size in Primates", *Journal of Human Evolution*, Vol. 22, No.6, pp. 469-493.
- Hardin, G. (1968), "The Tragedy of the Commons", *Science*, Vol. 162, pp. 1243-1248.
- Hodge, I. and S. McNally (2000), "Wetland Restoration, Collective Action and the Role of Water Management Institutions", *Ecological Economics*, Vol. 35, pp. 107-118.
- Hodge, I. and M. Reader (2007), *Maximising the Provision of Public Goods from Future Agri-environment Schemes*, Final Report for Scottish Natural Heritage, Rural Business Unit, Department of Land Economy, University of Cambridge.

- Kennedy, L. (1999), “Cooperating for Survival: Tannery Pollution and Joint Action in the Palar Valley (India)”, *World Development*, Vol. 27, No. 9, pp. 1673-1691.
- Ledyard, J. (1995), “Public Goods: Some Experimental Results”, in J. Kagel and A. Roth (eds.), *Handbook of Experimental Economics*, Princeton University Press, Princeton, NJ.
- Lubell, M., M. Schneider, J. T. Scholz and M. Mete (2002), “Watershed Partnerships and the Emergence of Collective Action Institutions”, *American Journal of Political Science*, Vol. 46, No. 1, pp. 148-163.
- McCarthy, N. (2004), “Local-Level Public Goods and Collective Action”, in R. Meinzen-Dick and M. Di Gregorio (eds.), *Collective Action and Property Rights for Sustainable Development*, 2020 Vision for Food, Agriculture and the Environment, Focus 11, IFPRI (International Food Policy Research Institute), Washington, D.C.
- Meinzen-Dick, R. and M. Di Gregorio (eds.) (2004), *Collective Action and Property Rights for Sustainable Development*, 2020 Vision for Food, Agriculture and the Environment, Focus 11, IFPRI, Washington, D.C.
- Ménard, C. (2004), “The Economics of Hybrid Organizations”, *Journal of Institutional and Theoretical Economics*, Vol. 160, pp. 345–376.
- Mills, J., D. Gibbon, J. Ingram, M. Reed, C. Short and J. Dwyer (2010), “Collective Action for Effective Environmental Management and Social Learning in Wales”, paper presented at the Workshop 1.1 Innovation and Change Facilitation for Rural Development, 9th European IFSA, Building Sustainable Futures, Vienna Austria, 4-7th July 2010.
- Ministry of Agriculture and Forestry of New Zealand (MAF) (2007), “East Coast Forestry Project Grant Guidelines”, Ministry of Agriculture and Forestry, Wellington.
- MAF (2010), “Ten Years of Grassroots Action 2010”, Ministry of Agriculture and Forestry, Wellington.
- MAF (2011), “Review of MAF Afforestation Schemes: Permanent Forest Sink Initiative, Afforestation Grant Scheme, East Coast Forestry Project, Sustainable Land management (Hill Country Erosion) Programme”, MAF Information Paper No: 2011/07, Ministry of Agriculture and Forestry, Wellington.
- NZ Landcare Trust (2009), “Aorere Our River Our Future”, <http://www.landcare.org.nz/files/file/155/aorere-booklet-sm.pdf> , accessed 7 June, 2012, NZ Landcare Trust, Hamilton, New Zealand.
- OECD (1998), *Co-operative Approaches to Sustainable Agriculture*, OECD, Paris.
- OECD (1999), *Cultivating Rural Amenities: An Economic Development Perspective*, OECD, Paris.
- OECD (2012a), *Water Quality and Agriculture: Meeting the Policy Challenge*, OCED studies on Water, OECD, Paris.

- OECD (2012b), *Farmer Behaviour, Agricultural Management and Climate Change*, OECD, Paris.
- Olson, M. (1965), *The Logic of Collective Action: Public Goods and the Theory of Groups*, Harvard University Press, Cambridge.
- Ostrom, E. (1990), *Governing the Commons: The Evolution of Institutions for Collective Action*, Cambridge University Press, New York.
- Ostrom, E. (1999a), "Coping with Tragedies of the Commons", *Annual Review of Political Science*, Vol. 2, pp. 493–535.
- Ostrom, E. (1999b), "Self-Governance and Forest Resources", CIFOR Occasional Paper No.20, Center for international Forestry Research, Indonesia.
- Ostrom, E. (2004), "Understanding Collective Action" in R. Meinzen-Dick and M. Di Gregorio (eds.), *Collective Action and Property Rights for Sustainable Development, 2020 Vision for Food, Agriculture and the Environment*, Focus 11, IFPRI (International Food Policy Research Institute), Washington, D.C.
- Ostrom, E. (2010), "Analyzing collective Action", *Agricultural Economics*, Vol. 41, Issue Supplements1, pp. 155-166.
- Pennigton, M. and Y. Rydin (2000), "Researching Social Capital in Local Environmental Policy Contexts", *Policy & Politics*, Vol. 28, No. 2, pp.33-49.
- Pollard, P., E. Leighton and T. Seymour (1998), "Partnership Approaches to Diffuse Pollution Management", in Petchey, M., B. J. Darcy and C. A. Frost (eds.), *Diffuse Pollution and Agriculture*, Proceedings of the Second Diffuse Pollution and Agriculture Conference in Edinburgh, The Scottish Agricultural College, Aberdeen.
- Polman, N., L. Slangen and G. van Huylenbroeck (2010), "Collective Approaches to Agri-environmental Management", in Oskam, A., G. Meester and H. Silvis (eds.), *EU policy for Agriculture, Food and Rural Areas*, Wageningen Academic Publishers.
- Pretty, J. (2003), "Social Capital and the Collective Management of Resources", *Science*, Vol. 302, pp. 1912-1914.
- Rudd, M. A. (2000), "Live Long and Prosper: Collective Action, Social Capital and Social Vision," *Ecological Economics*, Vol. 34, No. 234, pp.131-144.
- Samuelson, P. A. (1954), "The Pure Theory of Public Expenditure", *Review of Economics and Statistics*, Vol. 36, pp. 387-389.
- Samuelson, P. A. (1955), "Diagrammatic Exposition of a Theory of Public Expenditure", *Review of Economics and Statistics*, Vol. 37, pp. 350-356.
- Scott, J. and G. Marshall (2009), *A dictionary of sociology*, Oxford University Press, Oxford.
- Shobayashi, M., Y. Kinoshita and M. Takeda (2011), "Promoting Collective Actions in Implementing Agri-environmental Policies: A Conceptual Discussion", Presentation at the OECD Workshop on the Evaluation of Agri-environmental Policies, 20-22 June, Braunschweig.

- Singleton, S. and M. Taylor (1992), "Common Property, Collective Action and Community", *Journal of Theoretical Politics*, Vol. 4, No.3, pp.309-324.
- Vojtech, V. (2010), *Policy Measures Addressing Agri-environmental Issues*, OECD Food, Agriculture and Fisheries Working Papers, No.24, OECD Publishing, Paris.
- Wade, R. (1988), *Village Republics: Economic Conditions for Collective Action in South India*, ICS Press, Oakland.
- World Bank (2009), *World Development Report 2010: Development and Climate Change*, World Bank.