



## Analysis

# Organising for socio-ecological resilience: The roles of the mountain farmer cooperative Genossenschaft Gran Alpin in Graubünden, Switzerland



Douglas K. Bardsley\*, Annette M. Bardsley

*Geography, Environment and Population, The University of Adelaide, Australia*

## ARTICLE INFO

## Article history:

Received 5 April 2013

Received in revised form 4 December 2013

Accepted 5 December 2013

Available online 29 December 2013

## Keywords:

Risk

Mountain agriculture

Cooperative

Governance

Resilience

Switzerland

## ABSTRACT

Risks are increasing for agriculture, particularly for marginal systems like the cereal production systems of the Swiss Alps. The article critically examines the outcomes of innovative governance responses to socio-ecological risk through an analysis of the roles of the cooperative organisation Genossenschaft Gran Alpin, according to the perceptions of its farmer members. Gran Alpin provides a secure premium price for cereal producers in Graubünden linked to the uniqueness of local organic mountain cropping systems, and all the values of local identity, landscape stewardship, biodiversity conservation and regional development that such systems represent. Gran Alpin is enabling an alternative approach for rural development to evolve around key elements, including: high quality breads, pastas, flours and beer; the mountains; the extreme production system; organic production and animal welfare; landscapes aesthetics in a core tourism region; and the cooperation of like-minded farmers. Resilience within the socio-ecological system is enhanced as the cooperative exploits evolving forms of collaboration, market niches, and private and public governance relationships to respond implicitly and explicitly to agro-ecological, economic and political risks.

© 2013 Elsevier B.V. All rights reserved.

## 1. Introduction

Impacts of globalisation, social, political and environmental change are combining to generate new levels of socio-ecological risk in rural areas. A number of theorists, including Beck (1992), Jasanoff (2010) and Urry (2011) suggest that broad societal transformations are now required to enable reflexive responses to that risk. There is an associated call for the development of approaches to support resilient, learning relationships between people and their environments to adapt to current and future risk (Allenby and Fink, 2005; Berkes et al., 2003; Folke et al., 2005; Kates et al., 2012; Nelson et al., 2007). To achieve those aims, socio-ecological research needs to support decision-makers design and implement appropriate transformational policy (Biermann and Gupta, 2011). By examining real-world attempts at risk governance, current and past organisational approaches effectively act as experiments to generate or sustain future resilience.

Due to the combination of highly uncertain production and marketing conditions, and relatively limited resources to adapt to change, there is a particular need for marginal rural communities to increase their systemic resilience (Aggarwal et al., 2010; Bardsley, 2003; Koohafkan et al., 2012). Resilience here refers to the ability of a system

to adapt to change or retain its essential functions irrespective of the changing conditions that it experiences (Perrings, 2006; Wilson, 2012). Early socio-ecological rural studies focused on opportunities to conceptualise and enhance local resilience in the face of rapid change within developing countries, or marginalised indigenous communities within wealthy societies (Gadgil et al., 1993; Perevolotsky, 1987; Terashima, 1983). More recently, rural systems in wealthy developed countries are being critiqued, not only from the perspective of the opportunities to increase productivity, but with the aim of supporting local resilience in the face of external change (Fielke and Bardsley, 2013; Milestad and Darnhofer, 2003; O'Hara and Stagl, 2001). As Folke et al. (2005, 446) note, "Many local communities have long recognized the necessity of coexisting with gradual and rapid change. There are groups with associated institutions that have accumulated a knowledge base of how to relate to and respond to environmental feedback, which allows the disturbance to enter at smaller scales instead of accumulating to larger scales, thereby precluding large-scale collapse." How resilience is retained or built into agroecosystems and rural communities will be elemental in maintaining sustainable and authentic cultural links to place. Yet, the forms those transformations will take, and the roles that both private and public sectors will play in the governance of change, are open for debate (Lemos and Agrawal, 2006).

Already, approaches to providing targeted state support for agriculture are contentious and are requiring decision-makers to implement innovative policy. Over the last thirty years, state support for agriculture has declined in association with the increasing dominance of neoliberal

\* Corresponding author at: Geography, Environment and Population, The University of Adelaide, South Australia 5005, Australia. Tel.: +61 8 8313 4490.

E-mail addresses: [douglas.bardsley@adelaide.edu.au](mailto:douglas.bardsley@adelaide.edu.au) (D.K. Bardsley), [annette.bardsley@adelaide.edu.au](mailto:annette.bardsley@adelaide.edu.au) (A.M. Bardsley).

policies (Anderson and Martin, 2005). In particular, agricultural commodity price support mechanisms have reduced significantly in OECD countries. In turn, strongly liberal policies are also shown to be failing people, places and systems in a range of different contexts (Bakker, 2010). Some of the strongest criticism has come from Australia and New Zealand that implemented early, comprehensive deregulatory rural policy reforms (Cloke, 1996; Dibden et al., 2009; Lawrence, 1987). While critiques of agricultural reform have also emerged in Europe, much of the focus has been on the trend away from support for productivist agriculture to rural multifunctionality, which has seen reductions in public expenditure and a lack of emphasis on innovation and economic growth (Aerni, 2009; Finger, 2010; Lanz et al., 2010; Marsden and Sonnino, 2008; Potter and Burney, 2002; Renting et al., 2009). Importantly, not all rural areas are equal in their capacities or policy needs, so rather than all agroecosystems being treated equally, the margins that export little and yet sustain large resident populations through important cultural relationships with local environments, can be specifically targeted to support unique forms of long-term resilience (Bardsley and Pech, 2012; Shucksmith and Rønningen, 2012). The roles of a small Swiss mountain cooperative, *Gennosenschaft Gran Alpin*, in supporting farming activities are examined here, to determine how effectively they have been able to support local resilience.

## 2. Swiss Agricultural Politics

Switzerland provides an interesting case study on the challenge to develop complex policy that meets the needs of rural communities within a liberalising economy (BLW, 2012; El Benni and Finger, 2011; Engel et al., 2008). Switzerland emphasises innovation for economic development, and has supported creativity of individuals and groups to create technologies for boutique and mass consumption, as well as narratives of the country itself, which it markets effectively through tourism and recreational industries (Marxt and Brunner, 2012). Less recognised, but of interest here in relation to the governance challenges ahead, is the important ongoing dialectical relationships that the Swiss state has with the farming community, such that alternative traditional and new approaches for agriculture are highly valued; openly debated, voted on and thus legitimised; and explicitly supported through state and non-state actors and market mechanisms (Aerni, 2009; Klöti et al., 2007). Those relationships have supported a culture of risk management in the Alps, and particularly after World War II, led to important discussions on the role of agricultural policy to sustain national food security (Pfister, 2009; von Ah, 1984; von Glasenapp and Thornton, 2011).

Switzerland sits outside the EU, and consequently the Common Agricultural Policy (CAP), but has established bilateral relations that have seen it develop unique agricultural policies that reflect both local and EU issues and concerns. Almost two-thirds of Switzerland is covered by lakes and mountains, with one quarter of the land area uninhabitable, so only about 1.1 million hectares are potentially useful for agriculture and of this, approximately 300,000 ha are used for arable production (BFS, 2013). Within the Alps, much of the mountain agriculture is undertaken on small farms and fields experiencing variable climatic conditions, and thus many producers struggle to compete within an increasingly liberalised marketplace. Simultaneously, Swiss farmed mountain landscapes continue to be highly valued for biodiversity and aesthetic values (Lindemann-Matthies et al., 2010). Thus, there is both a perceived need for the state to provide ongoing agricultural assistance, and as Switzerland is one of the wealthiest countries per capita, there is also capacity to provide state support.

Switzerland has significantly reformed its agricultural politics since 1993, and strongly integrated forms of rural support with environmental policy to generate cross-compliance for multiple outcomes (Mann, 2005; Zimmermann et al., 2011). Aerni (2009, 1874) notes, "Switzerland decided to fully embrace the multifunctional approach to sustainable agriculture in 1996 when the so-called 'agricultural article' was adopted in the Swiss constitution by referendum."

State agricultural support mechanisms, valuing over three billion Swiss Francs (CHF) per year, now link economic assistance to more sustainable integrated or organic production systems, including support for biodiversity conservation and landscape stewardship (Engel et al., 2008; Flury and Huber, 2008). To achieve this in a manner that is acceptable under World Trade Organization rules, great emphasis has been placed on Direct payment systems (Aerni, 2009; Bardsley and Thomas, 2004). Nevertheless, while Federal Direct payments have been provided for extensive large-scale cereal production (Finger, 2010) and animal production in mountain areas (El Benni and Finger, 2011), small-scale cropping has not been well represented. The lack of support for small-scale cereal producers became particularly acute after Household Direct payments were removed in 1999. In fact, there is an increasing concern that while the Direct payment system improved conservation of natural resources and animal welfare, it has failed to lead to sustainable agricultural development in Switzerland (Lanz et al., 2010). In particular, the approach is seen to limit the independence of farmers and constrains initiatives that will lead to local and private adaptive responses to broader exogenous political-economic forces, such as the globalisation of agricultural markets. Nevertheless, Switzerland's highly developed economy enables widespread private investment into regional, organic and biodynamic agricultural production and marketing systems (Aeberhard and Rist, 2009).

To compensate for the partial withdrawal of the state, a diverse range of alternative marketing mechanisms, community-based and scientific-support programmes have developed to provide opportunities for farmers, particularly in mountainous areas (Böni and Seidl, 2012; Couzy et al., 2012). Non-government organisations (NGOs) and other private and community actors, including *Schweizerischer Bauernverband*, *Schweizerische Arbeitsgemeinschaft für die Berggebiete*, and *Schweizer Berghilfe*, along with national cooperative supermarket chains Migros and COOP, have moved to more explicitly support mountain regions. Farmer groups, such as the Graubünden-based cereal farmer cooperative, *Genossenschaft Gran Alpin* (2013), which was established in 1987 and is the focus of this article, are also organising along spatial or sectoral lines to mitigate the negative impacts of, and exploit opportunities from, the policy changes for communities and regions.

The research described here analyses the roles of the Gran Alpin cooperative based in Tiefencastel, Graubünden for organic cereal cropping activities in the valley floors and shoulders of the eastern Swiss Alps (Fig. 1). Gran Alpin works as a farmer cooperative with a committee of farmers to coordinate decisions; two employees to manage the marketing and administrative activities; and, support from a plant breeder focussing on locally-adapted varieties (*Gennosenschaft Gran Alpin*, 2013). The Gran Alpin cooperative produces between 200 and 300 tonnes per year of organic cereals, and markets a range of products in association with strong cultural links to local bread making and independent food systems in Graubünden. In fact, Graubünden has a unique cultural history that developed with a millennial association between Raeti Celts and Roman influences (von Uslar, 1996). In more recent times, while agrodiversity eroded rapidly on the Swiss plains, until the middle of the Twentieth century mountainous areas such as Graubünden acted as refuges for local diversity (Bardsley and Thomas, 2004; Netting, 1981; von Glasenapp and Thornton, 2011). As will be discussed at length, the uniqueness of the local agroecosystem, location and cultural heritage remain vital in the forms of support that Gran Alpin has been able to provide to its farmer members. Following this introduction we provide an outline of the research method in Section 2, present the quantitative data results from a survey of Gran Alpin members in a Section 3, and discuss those results in association with qualitative data from the survey and interviews in Section 4 of this article.

## 3. Method

The research methodology was designed to undertake a review of the ongoing roles of Gran Alpin according to the perceptions of its 74

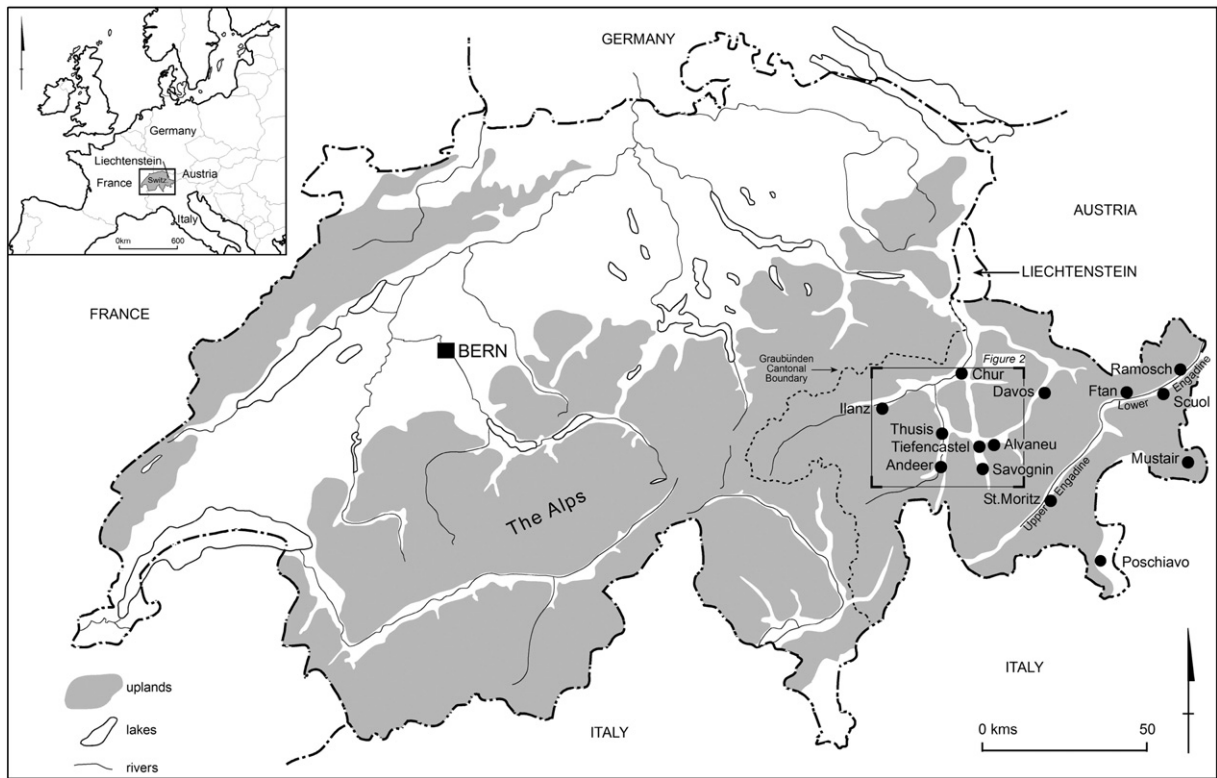


Fig. 1. Map of Switzerland indicating upland regions and research sites in Graubünden.

mountain farming members. A mixed-methodology was applied, with an initial review of academic and non-peer reviewed literature to better understand the challenges to Swiss mountain farming communities. A survey of current activities, values and risk perceptions of Gran Alpin farmers was undertaken in 2011. A draft questionnaire with binary, Likert scale and open-ended questions was developed in association with the previous and current managers of Gran Alpin to critically review the organisation's roles. The Likert scale questions rated perceptions from zero (0—least important) to four (4—most important). The mean Likert scale responses ( $\bar{x}$ ) are used as summary data in the text, and along with median values (M) and standard deviation (s) are presented with the graphed scale data in Figs. 3 and 4. In October 2011, face-to-face interviews were also carried out with key Gran Alpin stakeholders in Graubünden, including both past and current managers, the co-presidents and two other lead farmers. These key stakeholders were also asked to suggest changes to the questionnaire prior to it being mailed out to all Gran Alpin members. The questionnaire was refined and sent with a letter of endorsement from the co-presidents of Gran Alpin (both in German) to 74 Gran Alpin farmers on October 26th, 2011. A thank-you/reminder letter, also in German, was sent on November 17th, 2011. In total, 33 of 74 semi-completed or completed questionnaires were received, with a 45% response rate from locations indicated in Figs. 1 and 2. The farmers who returned the questionnaire manage an accumulative 1073 ha of farmland across the Canton of Graubünden. However, there is a concentration of responses from the Domleschg Valley and the region around Tiefencastel, where Gran Alpin is based (Fig. 2). As only half of the Gran Alpin members responded there are limits to the claims we are able to make in relation to the specific issues. Nevertheless, such response rates are not unusual in studies of this type in Switzerland and elsewhere (see Kaplowitz et al., 2004; Zingg and Siegrist, 2012), and rather the small numbers are indicative of the small cooperative, and general conclusions can still be drawn from the results.

The results are interpreted in two ways: quantitatively using a coding system based on the number of respondents who supported

different options to answer binary and Likert scale questions; and qualitatively, by reviewing farmers' written responses and the key stakeholder interviews, mostly translated from German, on the values of the Gran Alpin cooperative. In the text, the ratios of responses are used as indicators of the farmers' perceptions. The difference in the ranks was tested for significance for both the questions on the different grounds for selling through Gran Alpin and the different risks faced by farmers using the non-parametric Mann–Whitney *U* test, the Independent Samples Median Test, and the Kruskal Wallis One Way Analysis of Variance by Ranks. None of the analyses revealed significant differences between the data and normalised data distributions; perhaps because the numbers of responses were relatively small in each case. Not all of the 33 respondents answered all the questions, so where the number of respondents varies, that is indicated in the results. The quantitative and qualitative data are integrated into a discussion on the roles of the cooperative in the light of political-economic and environmental change, and systemic risk.

#### 4. Results

The quantitative results from the questionnaire are summarised here, but are supported by direct quotes from farmers translated from the original German in the discussion section below. Of the 33 Gran Alpin respondents, 24 are aged between 45 and 60 years, seven from 30 to 45, and two are over 61 years of age. Agricultural production generated seventy percent or more of total family income for all but four of the 33 respondents. However, only 11 of the 33 obtain all of their household income from agriculture, with numerous households also working in the ski industry during winter or other occupations. This suggests that while agriculture remains vital for many Gran Alpin members, they are also diversifying their income sources. Respondents noted that the most important economic activities for their farming businesses were animal production, along with the forms of state assistance provided through Direct payments and the *Vernetzungprojekte* (connection project): a state program

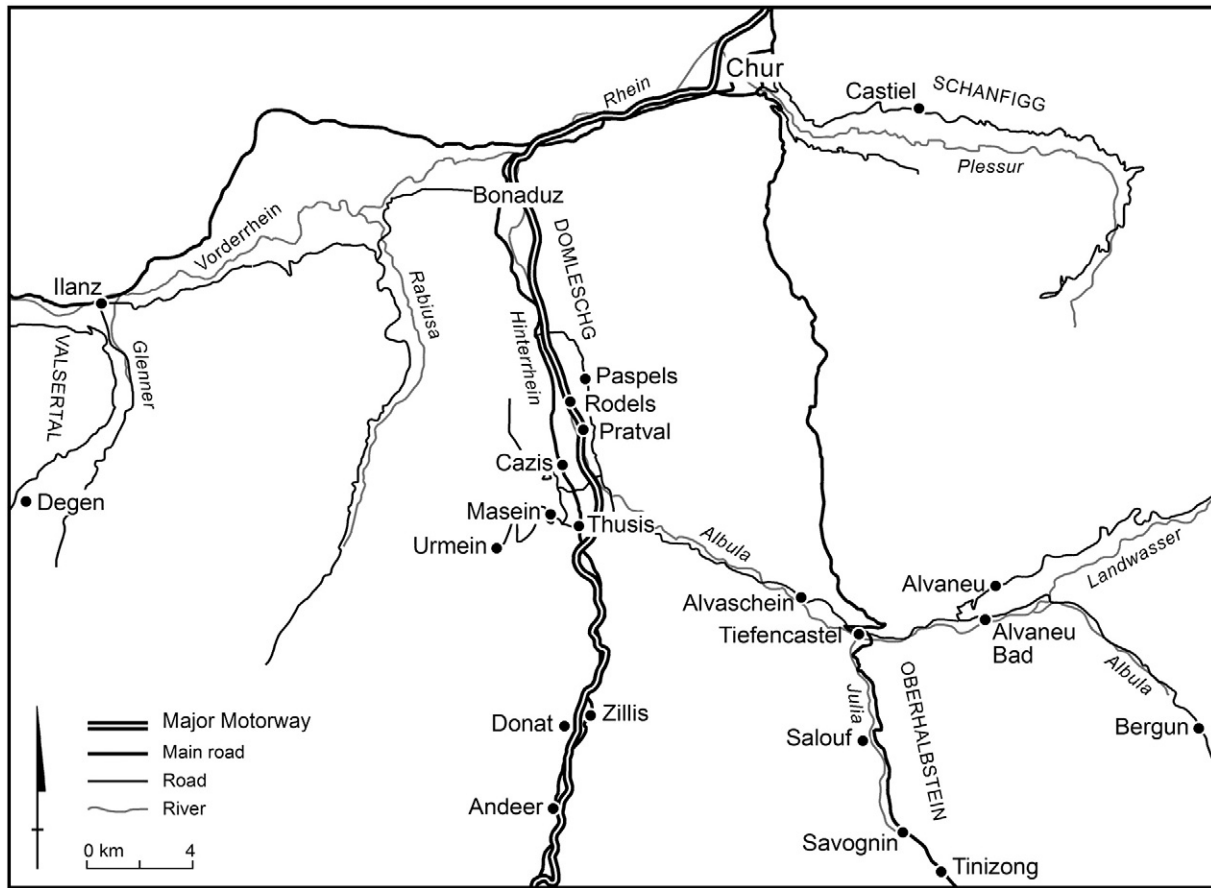


Fig. 2. Locations of respondents' farms within the core area of central Graubünden.

aimed at supporting farmers to conserve biodiversity on their farms (Amt für Natur und Umwelt, 2009). 15 of the 33 respondents noted that local varieties and species of crops and livestock remain an important or very important element of their farming activities. Thus, agriculture remains significant in relation to production, ecological and cultural values amongst respondents.

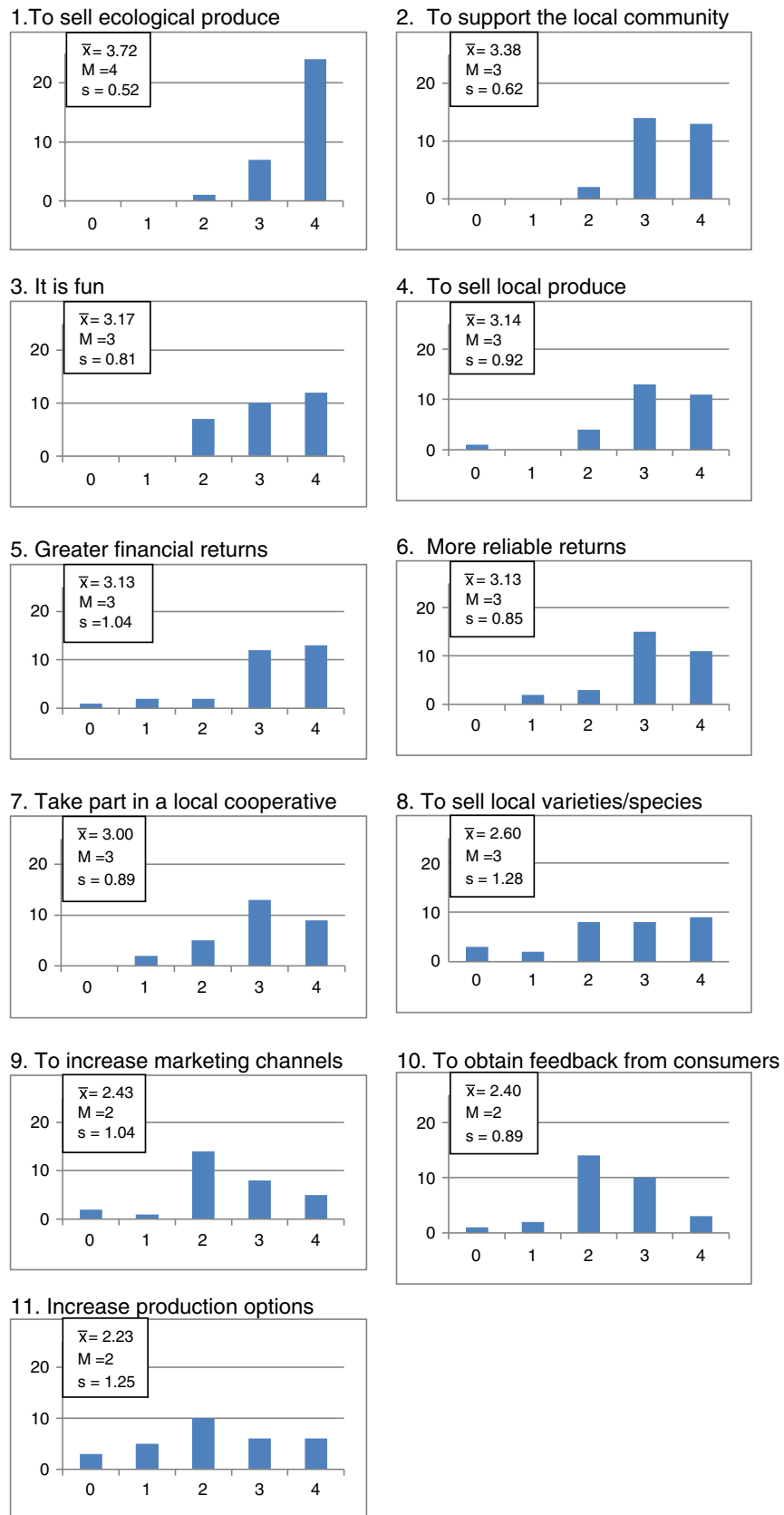
Nineteen of the 33 farmers stipulate that their major activity is cattle husbandry, with nine of those raising calves with their mothers (*Mutterkuhhaltung*) to exploit marketing advantages. Eleven farmers identified milk production as their major production activity, and of the three others, one raised donkeys, one horses and one produced vegetables. The mean farm area of respondents is 32.5 ha, with further access to summer pastures (alps) at higher altitudes. Typically the farms range over a large altitude with most having some high fields (mean of 1682 metres above sea level (m.a.s.l.), but extending up to 2300 m.a.s.l.) and comparatively low fields (mean of 998 m.a.s.l., but extending down to 600 m.a.s.l.), closer to the place of residence. That said, nineteen of the 33 farmers have their lowest fields at or above 1000 m.a.s.l., and although most cereal production is on the lower fields, some rare fields of barley (*Hordeum vulgare*) are grown up to 1600 m.a.s.l. Respondents stated that, on average, cereal production creates only 7.4% of farm income, with only ten respondents receiving more than 10% of their income from cereal cropping. The length of farmer involvement with Gran Alpin varied considerably from 21 years to 1 year, but most ( $n = 25$  of the 31 respondents) had only joined in the last twelve years, with a mean of 8.7 years of involvement.

When asked how important Gran Alpin is for their businesses, only four of the respondents stated that it was very important, but the vast majority see the organisation as quite important ( $n = 13$  of 30 respondents) or important ( $n = 11$  of 30 respondents), with only two respondents stating that it is unimportant. 15 of the 30

respondents noted that Gran Alpin provided unique opportunities for themselves and their farming businesses. Although cereal cropping is less important than animal husbandry for respondents, on average Gran Alpin markets 95.5% of members' cereals, with only 5 of 33 respondents not selling their entire crop through the organisation. When asked why they market their grain through Gran Alpin the most popular three mean responses on the Likert scale ranging from no importance (0) to very important (4) (Fig. 3), was, in descending order, "To sell ecological produce" ( $\bar{x} = 3.7$ ), "To support the local community" ( $\bar{x} = 3.4$ ) and "To have fun" ( $\bar{x} = 3.17$ ). The three least important reasons for marketing grain through Gran Alpin were all commercial reasons: in ascending order, "Increase production options" ( $\bar{x} = 2.23$ ), "To obtain direct feedback from the consumer" ( $\bar{x} = 2.4$ ) and "To increase marketing channels" ( $\bar{x} = 2.43$ ). Although these results do not reveal significant differences, they nevertheless are indicative of the relative values of Gran Alpin's activities for farmers.

A key element of the questionnaire asked producers to outline their perceptions of the risks they face from environmental change, through to issues of demographic, socio-economic, and political change. While only just over half of the farmers who answered this question ( $n = 16$  of 31 respondents) recognised that their farming business had experienced significant risks over the last 20 years, the detail is particularly interesting from the perspective of understanding the complexity of mountain farming (Fig. 4). Although not showing significant differences, the most highly ranked risk amongst farmers were climatic factors ( $\bar{x} = 2.79$ ), followed by changing input costs ( $\bar{x} = 2.77$ ) and bureaucratic procedures ( $\bar{x} = 2.74$ ). However, when farmers were asked to identify very important risks, most of the 31 respondents highlighted bureaucratic procedures ( $n = 6$ ), changing input costs ( $n = 5$ ), overproduction ( $n = 4$ ) and people leaving the district ( $n = 4$ ). By far the majority noted that climate change has influenced





**Fig. 3.** Ranked farmers responses to the question: "What is the most important reason for your choice to market your produce with Gran Alpin? Based on averaged Likert scale data and presented in order from most important to least important reason. (X axis: 0–4/least important–most important, Y axis: count of number of responses; Key:  $\bar{x}$  = mean, M = median, s = standard deviation).

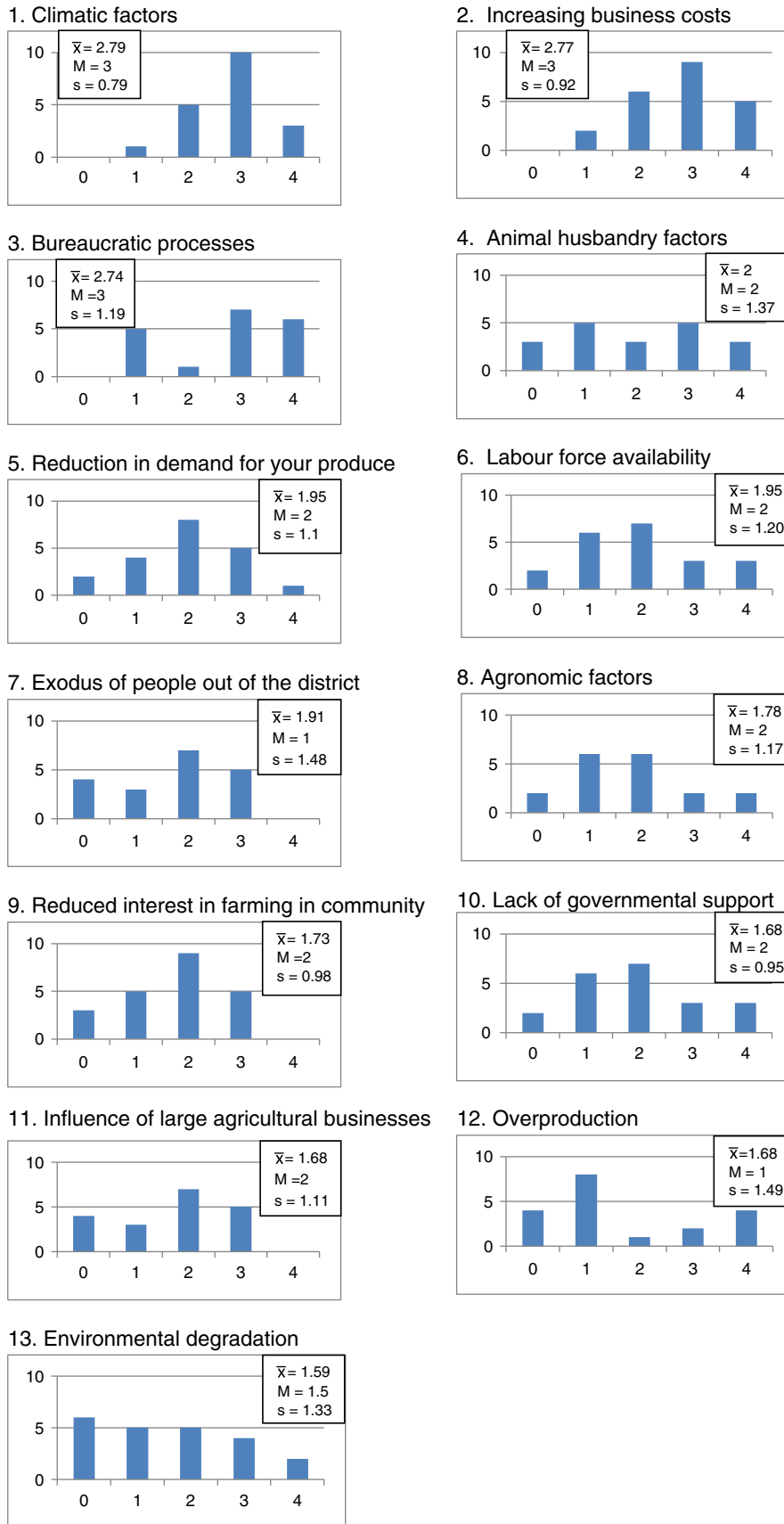


Fig. 4. Ranked farmers responses to the question: “In the last 20 years, have there been any major risks to your farming business?” Based on averaged Likert scale data and presented in order from most important to least important reason. (X axis: 0–4/least important–most important, Y axis: count of number of responses Key:  $\bar{x}$  = mean, M = median, s = standard deviation).

their activities ( $n = 27$  of 32 respondents). Interestingly, while most of those farmers ( $n = 20$ ) stated that climate change is having negative impacts, as will be elaborated upon in the discussion, seven farmers stated that the changes have reduced production risks. Most respondents ( $n = 23$  of 32 respondents) stated that farmer numbers in their community had declined over the last decade, while only nine mentioned there had been little change and none stated that their community had experienced increased farmer numbers.

Of the 32 farmers who responded to the question whether risk insurance was important for their farming business, 27 stated that it was reasonably important, important or very important, and only 5 stated that it was of little or no importance. When asked to comment on whether Gran Alpin had reduced the risks to their farming businesses, and in what form that risk mitigation had taken, the responses were mixed. No farmer stated that without Gran Alpin they would not be farming, but a large minority ( $n = 10$  of 31 respondents) suggested that without the cooperative they would not be producing cereals. About half of those respondents ( $n = 15$ ) indicated that Gran Alpin was important to reduce risks to their farming businesses. Although not statistically significant, a majority noted on the Likert scale that the key risks that were reduced were linked to contemporary challenges to cultural values and their identity ( $\bar{x} = 2.52$ ) and the marketing of their products ( $\bar{x} = 2.48$ ). In fact, most ( $n = 20$  of 27 respondents) indicated that Gran Alpin was important or very important to reduce risks linked to values and identity. While in general the levels of importance of Gran Alpin's risk reduction roles for production ( $\bar{x} = 1.54$ ), businesses ( $\bar{x} = 1.5$ ) or to the region ( $\bar{x} = 1.48$ ) were relatively minor, in each case some farmers highlighted key specific risk mitigation roles. The complex elements of risk management, and other issues raised by the open-ended questions and interviews are expanded upon in the discussion.

## 5. Discussion

### 5.1. The Challenges of Mountain Farming

The Swiss state is spending considerable political and economic effort to support farmers in marginal agro-ecological regions of the Alps and the Jura, and yet, as Fig. 4 indicates, many farmers are concerned about the rising bureaucratic and input costs on their businesses. Several farmers mentioned that they were receiving up to three-quarters of their income from Direct payments from the state. This result corresponds to findings of El Benni and Finger (2011, 5) who note that, "Since 1995 farmers in mountain regions lose money by agricultural production (i.e. costs exceed revenues from agricultural production). Since 2001 approximately 25% of the direct payment support is needed by mountain farmers to compensate these market losses." Farmer 30 (Castiel) summarised the situation, "Swiss people think that they are paying for their milk at the shop, but they are really paying for it through their taxes." The investment by the Swiss people into mountain agriculture could be justified as a response to the liberalisation of the agricultural economy that has increased risks for managers of small farms (Bardsley and Thomas, 2004). However, as also indicated in this survey, even with considerable investment many people are leaving mountain agriculture as the constraints of farming to the needs of the state increase and small-scale holdings are unable to successfully exploit the new political-economy (Flury et al., 2013). As people leave, this can provide opportunities for some remaining farmers to expand their operations, but it was also noted that, "There are fewer people and more work for those who remain" (Farmer 3, Scuol). Farmer 4 (Ftan) similarly stated "Unfortunately, in our community, the work that needs to be done for the good of all is becoming harder to do, because there are fewer people."

A number of other contemporary risks were highlighted by Gran Alpin members, as indicated in Fig. 4. Climate change is creating farming risks, and respondents' comments suggest that most are linked to

longer, drier droughts; more extreme precipitation events; and the increasing climatic variability. The specific implications of climate change for agriculture in Graubünden are likely to be highly complex, because micro-climatic conditions associated with altitude, slope, aspect and snowpack are strongly influential, and sensitivity factors, such as access to irrigation, vary significantly. Climate change modelling by Kotlarski et al. (2011) suggests that rates of warming at higher altitudes in the Alps could exceed regional trends and local hydrological regimes are likely to be modified in ways that are difficult to forecast but could lead to increasing resource conflict (Beniston, 2010). Farmer 2 (Thusis) noted that "Extreme climatic conditions are being experienced more frequently, such as more extreme droughts." Farmer 32 (Paspels) noted "There are ever longer dry spells, so more farmers want to irrigate but the streams don't carry sufficient water." While climate change could enhance cereal yields in low-lying parts of Switzerland (see Finger and Schmid, 2008), farmers articulated the interactive complexity between changes to local climatic conditions and mountain farming. Farmer 33 (Alvaneu Dorf) outlined how he is experiencing increasing variations in yields as inter-annual climatic variability has increased. Farmer 31 (Urmein) noted that:

Climate change is having a positive impact on my production. Winter cereals can be cultivated now as the winters are shorter. The animals can go up to the alp earlier in the season. As the cattle are away longer from the farm, larger surfaces can be used for crop cultivation. The crops can be harvested so early that I can plant a pasture afterwards and I can still make hay from it—I could never do that before. The crops grow well in spring, when we don't have big thunderstorms, and then when we do have big thunderstorms there is cover on the fields because the pasture covers the soil. Further up the valley they have more problems with thunderstorms, the other way they have problems with lack of rain, but right here it has improved things.

In fact, several of the mountain farmers have noticed that a longer growing season is improving their yields and reducing climatic risk. Farmer 29 (Masein) noted improvements to their local climate since they have been "Experiencing more regular precipitation and fewer snow fall events in summer." Similarly, Farmer 21 (Zillis) noted that "In our valley, the warming brings less risk of frost in Spring and Autumn."

### 5.2. The Multiple Roles of Gran Alpin

The great practical value of Gran Alpin for mountain farmers is linked to the capacity to sell regional, organic cereal products through an established organisation for greater and more reliable returns for farmers (Fig. 3). As Farmer 3 (Scuol) noted, "I found that the direct marketing of cereals was very difficult and time consuming," but that it became easier with the larger cooperative organisation, which was well-established in the marketplace. Farmer 9 (Degen) highlights the important point that "Considering the small quantity I produce, cereal cultivation would be impossible without participating with others in marketing the product." Gran Alpin has established links to Swiss supermarkets, originally Migros and more recently COOP under the *Pro Montagna* label, as well as wider marketing organisations such as *Alpinavera* (2013). In fact, in 2011 Gran Alpin was awarded the *Prix Montagna* supported by *Schweizerische Arbeitsgemeinschaft für die Berggebiete* und *die Schweizer Berghilfe*, for best project to add value, generate employment and diversify the local economy in the Swiss mountains (Hofmann, 2011).

As well as returning a regular premium to producers for their organic grain above what they would obtain on the open market, Gran Alpin generates efficiencies for farmers without losing the strong links to where the cereals are produced, in which way, by whom and what the broader culture and landscape represent. "It makes a lot of sense to

create a high quality food product from organic production in the mountain region” (Farmer 1 Alvaschein). Unique Gran Alpin flour, bread and pasta types are marketed directly or through other organisations. For example, the COOP supermarket highlights a unique type of bread each month that often draws from local alpine producers, with the “Capricorn” bread made only from Gran Alpin grain (Attinger, 2010). Gran Alpin also produces the only malting barley in Switzerland, and by working with a local brewer, it is marketing a beer under its own label. Many farmers noted that the link to organic production was vital for them to join the cooperative, which also helps to guide varietal choice, pest management and harvesting, including sharing machinery. Farmer 19 (Rodels) noted that “With Gran Alpin we are producing sustainable organic cereals that can be sold at a good price in accordance with my ideological principles. It is really great that it is even possible.” Farmer 12 (Cazis) similarly exclaimed, “Organic production for a niche market is something that is close to our hearts. Gran Alpin provides the opportunity to exploit this niche in an optimal way.”

While almost all mountain farmers stated that farm insurance is an important component of their risk mitigation, especially to alleviate risks of animal death or injury, insurance for hail, snow or wild animal damage for cereals is more limited in comparison to production on the plains. Along with a private company, Gran Alpin undertakes some specific activities that respond to the risk of producing cereals in the mountains. “In the case of a missed harvest, at least the cost of the seed, and in some cases even more, can be covered by Gran Alpin’s risk fund” (Farmer 31 Urmein). Importantly, Gran Alpin also reflects the risks of production by providing differential payments. Higher returns are provided for products from farms where conditions are generally less favourable than for other cooperative members. As Farmer 32 (Paspels) noted, “We get paid CHF1.08/kg, while others get CHF1.20/kg because we are lower down the valley, and the farmers higher up get more.”

Apart from explicit risk management activities, Gran Alpin acts to mitigate risks by diversifying the local socio-ecosystem. Farmers are already involved in a range of production and marketing activities, including direct marketing of dairy products and the raising of premium calves with their mother cows. Gran Alpin has needed to make cereal production attractive within the context of these dominant animal husbandry activities. It does this by not only defending the roles of mountain agrarianism, but championing mountain cereal production across Switzerland, and making it an enjoyable process. The fact that most farmers valued involvement with Gran Alpin for reasons associated with lifestyle, community or ecological goals (Fig. 3), suggests that it is achieving its aim. Several respondents noted the attraction of the farming challenge of organic mountain cereal production, in comparison to “growing grass, drying it and feeding it to the cows” (Farmers 30, Castiel). Farmer 23 (Tinizong) stated, “It has to be fun. You have to see that what you are doing is having a positive effect.” Being in the cooperative also leads to “The exchange of ideas with other producers and facilitates relationships with the customers” (Farmer 8, Andeer). Farmer 7 (Domleschg) outlines the broader commercial value of such a network, outlining that “We run a farm shop and sell a lot of Gran Alpin products. From a financial perspective, we source more from Gran Alpin than we actually deliver to them.”

Although a minority of Gran Alpin members cultivate local agricultural biodiversity, several highlighted that local crop varieties and animal breeds are the cornerstone of their farming activities. Where it is seen as important, farmers note that they like the idea of retaining biodiversity, and growing “Varieties that are appropriate for their local agroecosystems” (Farmer 15 Poschiavo) or for on-farm consumption (Farmer 1 Alvaschein). Gran Alpin has enabled some farmers to grow old species or varietal types of rye (*Secale cereale*), wheat (*Triticum aestivum*), buckwheat (*Fagopyrum esculentum*) and spelt (*Triticum spelta*), which have become neglected, and yet are suitable for the high-radiation levels, long winters and short growing seasons of the high valleys. For example, as Farmer 31 (Urmein) noted, Gran Alpin “Provides a premium of CHF1500 per hectare for old varieties or for

buckwheat”. The plant breeder at Gran Alpin is also developing unique varieties from germplasm of local cultivars that are adapted to mountain conditions (Schilperoord, 2013), and several farmers indicated that they also worked with *Pro Specie Rara*, a Swiss NGO committed to agrobiodiversity conservation.

Agricultural diversity is not just retained at the level of individual crops, but in the form of the retention of the entire mountain agrarian system. To supplement for the lack of Federal Direct payments for small-scale cropping, the Office for Agriculture within the Cantonal Government of Graubünden has provided a Direct payment of CHF800 per hectare for cereal production—an amount per hectare only slightly less than Federal payments for animal husbandry. Yet, as a third of farmers stated, without Gran Alpin many producers would no longer be considering growing cereals. Farmer 9 (Degen) stated bluntly “Cereal production is not the main source of income on the farm. Should the price drop below a certain level, I would cease production.” As farmers have become involved in the *Vernetzungsprojekte*, the temporary Cantonal cereal production payments have ceased, but the Canton continues to finance extension and machinery, and represent the cooperative’s views nationally. The results here align with earlier work by Schenk et al. (2007), who noted that bureaucratic factors are a major challenge for Swiss farmers (Fig. 4). However, in this case, by providing the opportunity to be involved in more comprehensive support programs, the Cantonal Direct cereal production payments and the Federal *Vernetzungsprojekte* provide mountain cereal farmers with the choice of more or less state involvement in their activities. Gran Alpin assists that process by facilitating discussions on the future roles of Swiss mountain farming.

Most farmers are only obtaining a small percentage of their total income from cereal production. However, their cropping activities interact with their animal husbandry to diversify farm business income, which reduces their vulnerability to price fluctuations in milk and meat products. The use of cereals in field rotations also reduces production risks in other ways, including providing additional feed and straw for animal husbandry and withdrawing excess nitrogen from animal production systems to ensure compliance with ecological Direct payment regulations. Gran Alpin helps to entrench rural networks, which in turn generate values from personal relationships through to the facilitation of the exchange of machinery and ideas, to the creation of links to supporters within and external to Graubünden to lobby for greater policy recognition. Farmer 31 (Urmein) stated “I have gained enormously from Gran Alpin because I know almost all the farmers across the region and their types of activities. It is a fantastic network.” More broadly, Farmer 33 (Alvaneu Dorf) noted that, “Gran Alpin promotes a diverse agricultural sector and the production of natural foods. Gran Alpin strengthens cultural values to maintain identity.” In fact, a sense of cultural identity is vital to sustain the willingness to farm in the marginal mountain region.

### 5.3. A Future for the Mountain Cooperative

Much time, effort and finance is expended to establish and manage an organisation such as Gran Alpin. The values of the cooperative may at times seem modest, especially in relation to impacts on production levels or economic returns. However, such a conclusion would not be based on an understanding of the challenges to mountain farming in Switzerland and the associated need for explicit recognition of the Right to Farm. In a recent review of agriculture in the Alps, Flury et al. (2013, 121) note, “Regardless of the form of structural change which has occurred in the past, maintenance and support of mountain agriculture can only be sustainable where a private or public service is provided for which there is a demand.” Gran Alpin is providing people who are not necessarily earning a high income within a very wealthy country with a clear definition of their roles, and championing that definition as valuable beyond conventional agricultural products or practices. In such a manner, Gran Alpin is acting as the bridging organisation to



support and legitimise adaptation to rapid change (Folke et al., 2005). By focussing on utilising and marketing regional varieties, species, products and production processes, which are of high quality and linked to stewardship of environment, culture and place, the cooperative is acting to sustain mountain agrarianism within an increasingly liberalised political-economy.

Gran Alpin is recognising that it must continue to evolve its role to support mountain farming. Two farmers noted that while Gran Alpin had successfully exploited an important marketing niche all the opportunities were now saturated, and in the future the organisation would need to focus on conservation and advocate to increase state recognition of the roles of cereal farming in the Alps. Paralleling findings by Aerni (2009), the respondents here perceived few opportunities for significant gains in crop productivity. In fact, there is evidence that cereal productivity gains in Switzerland as a whole have been limited since the introduction of Direct payments, which led to a parallel price decrease “By about 50% in the period from 1991 till 2005 for all cereals” (Finger, 2010, 180). However, farmers articulated the important point that a lack of productivity growth does not infer a lack of innovation. Clearly, Gran Alpin is not only creating something new, but also by recognising the multiple values of mountain farming, it is innovating within an alternative, post-productivist paradigm. Perhaps partly in a response to the systemic complexity, the Swiss state has been debating changes to the Direct payment policy from 2014, which may see a refocussing away from animal husbandry and nature conservation, and onto the retention of cultural landscapes and the production of crops and fodder for sustainable agricultural development and food security (BLW, 2012; Lanz et al., 2010; Zimmermann et al., 2011).

Without Gran Alpin there would be few farmers able to exploit either the earlier Cantonal support for agrarian activities or any new levels of Federal assistance. As the state has moved away from productivism to support a multifunctional agricultural sector, it has been important for Gran Alpin to maintain local knowledge of how to produce cereals successfully in the eastern Swiss Alps. Without the organisational, production and technical support, it would be difficult for farmers in the high valleys to exploit any new policy niche associated with cereals. This raises another key point, which has been identified elsewhere (Antrop, 2005; Bardsley and Wiseman, 2012; Cardinale et al., 2012; Holling, 2001), that it is essential for marginal socio-ecosystems to not reduce their systemic complexity as they adapt to change. If local diversity is lost, socio-ecosystems will struggle to adapt rapidly to new situations, risks and opportunities as they arise with rapid changes in political-economic, social or ecological circumstances. In fact, the entire culture of risk that still remains in the Swiss Alps could be undermined if traditional approaches to managing environmental variation and change are devalued or lost.

While several farmers were concerned about the erosion of the cooperative as a community of like-minded farmers with similar philosophies of production and stewardship, the *Genossenschaft* has evolved into a more formal organisation that is taking on new roles, including an institutional expression of the traditional alpine risk management culture. The cooperative now undertakes multiple roles that have matured from their original forms to engage within economic and political spheres in association with a range of public and private actors to support broader elements of resilience (see Plummer et al., 2012). For example, Gran Alpin has worked with the Cantonal Government to provide targeted assistance for cereal producers. It works with the research institutes FiBL (*Forschungsinstitut für biologischen Landbau*) and Agroscope Reckenholz-Tänikon, and with the farming school Plantahof in Landquart. Gran Alpin are also supported by the Swiss organic organisation Biosuisse and the Canton of Graubünden, in the latter case to develop locally-adapted cereal varieties.

While Gran Alpin's marketing roles remain key to the value of the organisation, in effect, the mountain farmers are cooperating to enable their worldviews to be reflected more broadly in the economic and

political spheres. While it has not achieved all its goals and it might be possible to argue that the Swiss present a unique case due to their wealth, tourism, marketing abilities etcetera, the broad findings presented here align with other research in different contexts in other developed countries (Fielke and Bardsley, 2013; Lereboullet et al., 2013; Magnani and Struffi, 2009; Ortiz-Miranda et al., 2010). In fact, a growing body of research on farmer cooperatives is suggesting that by cooperating in their organisation, production and marketing, small-scale farmers can create institutions that support agency and provide efficiencies within difficult political and economic situations in a global era. There is a message here that extends beyond the Alps, to suggest that private actors, cooperatives and the state can work in complex unison to develop appropriate policy and practice for retaining flexibility, while enhancing resilience, in a rapidly changing agricultural marketplace.

## 6. Conclusion

The capacity to define and effectively govern vital socio-ecosystems will become increasingly important as societies encounter new levels of risk. While there are constraining elements created by the Swiss state in their agricultural political response to global pressures, innovation and financial wealth, which have been at the heart of Swiss economic success, are being utilised to target support for agro-ecosystems and rural communities that are considered of high value. The members of Gran Alpin have cooperated to adapt their systems to continue to benefit from state and community support, while also exploiting the liberalised marketplace through mechanisms that respond to consumer perceptions of their unique, local, high quality, ecologically and socially advantageous products. In effect, resilience is supported while individual producers are provided with the flexibility to utilise the organisation in a number of ways that are accommodating of their particular situations and aspirations. In doing so, Gran Alpin is assisting to mould a position of agri-cultural opposition to a more extreme liberal form of agricultural production and exchange, within which they would struggle to compete. The cooperative does not solve all the challenges of increasing production costs and the constraints of Swiss policies, but it has acted as an important stewarding organisation to support local farmers and their associated cereal production systems through a period of dramatic change. Gran Alpin is assisting farmers to retain both an interest in agriculture and the desire to keep farming, which in the case of wealthy Switzerland is a significant challenge, especially in marginal areas.

The governance of risk requires new policy directions. To transform societies to become truly reflexive to risk and allow for ecological and economic sustainability to more fully align, Western democracies are justifiably unwilling for the state to presume a strong role if it involves a significant reduction in individual and collective freedoms. Neither is it clear, however, that neoliberal policies and practices are going to propel a new level of long-term sustainability. A third governance path is being built around a more comprehensive role for the state to support better private outcomes through a range of complex financial and regulatory mechanisms. Gran Alpin is helping to facilitate such a process amongst small scale cereal producers in Graubünden by acting at a range of levels: community, market, policy advocate and risk management. It is helping to guide new ways of doing that are not generating huge financial wealth for local farmers, but are sustaining livelihoods, cultures and production systems in a unique place. Particularly interesting in the context of the emerging risks to small-scale agriculture associated with climatic change and rising costs is that the cooperative can step in to mitigate risk, by acting explicitly to provide forms of insurance, to reduce technical or agronomic input costs, or take on some burdensome bureaucratic elements. Risk is also reduced implicitly as the cooperative provides security and scale in the marketplace, and advocates politically for a neglected production system, and in fact, an under-valued way of life, to be better represented within Swiss society.

## Acknowledgements

The authors wish to thank Maria Egenolf Mathieu and Peer Schilperoord, the current and previous managers of Gran Alpin respectively, for their ongoing assistance. Thanks also to the many farmers for their work and their willingness to voice opinions, particularly co-presidents Christian Bühler and Thomas Müller. Thanks also to Chris Crothers for producing the maps. Finally, we would like to acknowledge the friendly hospitality of Professor Etienne Piguet and the University of Neuchâtel while we were in Switzerland.

## References

- Aeberhard, A., Rist, S., 2009. Transdisciplinary co-production of knowledge in the development of organic agriculture in Switzerland. *Ecol. Econ.* 68, 1171–1181.
- Aerni, P., 2009. What is sustainable agriculture? Empirical evidence of diverging views in Switzerland and New Zealand. *Ecol. Econ.* 68, 1872–1882.
- Aggarwal, P.K., Baethegan, W.E., Cooper, P., Gommers, R., Lee, B., Meinke, H., Rathore, L.S., Sivakumar, M.V.K., 2010. Managing climatic risks to combat land degradation and enhance food security: key information needs. *Procedia Environ. Sci.* 1, 305–312.
- Allenby, B., Fink, J., 2005. Toward inherently secure and resilient societies. *Science* 12, 1034–1036.
- Alpinavera, 2013. Alpinavera Aktuell. <http://www.alpinavera.ch/sites/content/aktuell.html> (Accessed March 15, 2013).
- Amt für NaturUmwelt, 2009. Kantonale Richtlinien Öko-Qualitätsverordnung: Mindestanforderungen an ökologische Ausgleichsflächen mit Qualität. <http://www.gr.ch/DE/institutionen/verwaltung/ekud/anu/projekte/natur/naturschutz/Seiten/Vernetzungsprojekte.aspx> (Accessed February 25, 2013).
- Anderson, K., Martin, W., 2005. Agricultural trade reform and the Doha development agenda. *World Econ.* 28, 1301–1327.
- Antrop, M., 2005. Why landscapes of the past are important for the future. *Landsc. Urban Plan.* 70, 21–34.
- Attinger, G., 2010. Berggetreide: Das neue Gold Graubündens? *Bündner Bauer.* 34, 28–29.
- Bakker, K., 2010. The limits of 'neoliberal natures': debating green neoliberalism. *Prog. Hum. Geogr.* 34, 715–735.
- Bardsley, D., 2003. Risk alleviation via in situ agrobiodiversity conservation: drawing from experiences in Switzerland, Turkey and Nepal. *Agric. Ecosyst. Environ.* 99, 149–157.
- Bardsley, D.K., Pech, P., 2012. Defining spaces of resilience within the neoliberal paradigm: could French land use classifications guide support for risk management within an Australian regional context? *Hum. Ecol.* 40, 129–143.
- Bardsley, D., Thomas, I., 2004. In situ agrobiodiversity conservation in the Swiss inner alpine zone. *Geojournal* 60, 99–109.
- Bardsley, D.K., Wiseman, N.D., 2012. Climate change vulnerability and social development for remote indigenous communities of South Australia. *Glob. Environ. Chang.* 22, 713–723.
- Beck, U., 1992. *Risk Society: Towards a New Modernity*. Sage Publications, London.
- Beniston, M., 2010. Impacts of climatic change on water and associated economic activities in the Swiss Alps. *J. Hydrol.* 412–413, 291–296.
- Berkes, F., Colding, J., Folke, C., 2003. *Navigating Social–Ecological Systems: Building Resilience for Complexity and Change*. Cambridge University Press, Cambridge, UK.
- BFS (Bundesamt für Statistik), 2013. Land- und Forstwirtschaft. <http://www.bfs.admin.ch/bfs/portal/de/index/themen/07.html> (Accessed March 16, 2013).
- Biermann, F., Gupta, A., 2011. Accountability and legitimacy in earth system governance: a research framework. *Ecol. Econ.* 70, 1856–1864.
- BLW (Bundesamt für Landwirtschaft), 2012. *Agrarbericht 2012*. BLW, Bern.
- Böni, R., Seidl, I., 2012. Alpine products and services-supply situation in selected Swiss regions. *Agrarforschung Schweiz.* 3, 123–131.
- Cardinale, B.J., Duffy, J.E., Gonzalez, A., Hooper, D.U., Perrings, C., Venail, P., Narwani, A., Mace, G.M., Tilman, D., Wardle, D.A., Kinzig, A.P., Daily, G.C., Loreau, M., Grace, J.B., Larigauderie, A., Srivastava, D., Naeem, S., 2012. Biodiversity loss and its impact on humanity. *Nature* 486, 59–67.
- Cloke, P., 1996. Looking through European eyes? A re-evaluation of agricultural deregulation in New Zealand. *Sociol. Rural.* 36, 307–330.
- Couzy, C., Dockès, A.-C., Guillaumin, A., 2012. Innovation systems and processes in the field of agricultural direct marketing: a cross-national analysis between France, Italy, the Netherlands and Switzerland. New trends for innovation in the Mediterranean animal production, 129 278–281.
- Dibden, J., Potter, C., Cocklin, C., 2009. Contesting the neoliberal project for agriculture: productivist and multifunctional trajectories in the European Union and Australia. *J. Rural. Stud.* 25, 299–308.
- El Benni, N., Finger, R., 2011. The effect of agricultural policy reforms on income inequality in Swiss agriculture: an analysis for valley, hill and mountain regions. EAAE 2011 Congress paper. ETH Zurich, Zurich.
- Engel, S., Pagiola, S., Wunder, S., 2008. Designing payments for environmental services in theory and practice: an overview of the issues. *Ecol. Econ.* 65, 663–674.
- Fielke, S.J., Bardsley, D.K., 2013. South Australian farmers' markets: tools for enhancing the multifunctionality of Australian agriculture. *Geojournal* 78, 759–776.
- Finger, R., 2010. Evidence of slowing yield growth: the example of Swiss cereal yields. *Food Policy* 35, 175–182.
- Finger, R., Schmid, S., 2008. Modeling agricultural production risk and the adaptation to climate change. *Agric. Finance Rev.* 68, 25–41.
- Flury, C., Huber, R., 2008. Evaluation of jointness in Swiss agriculture. OECD, Multifunctionality in Agriculture: Evaluating the Degree of Jointness, Policy Implications. OECD, Paris, pp. 241–251.
- Flury, C., Huber, R., Tasser, E., 2013. Future of mountain agriculture in the Alps. In: Mann, S. (Ed.), *The Future of Mountain Agriculture*. Springer-Verlag, Berlin, pp. 105–126.
- Folke, C., Hahn, T., Olsson, P., Norberg, J., 2005. Adaptive governance of social–ecological systems. *Annu. Rev. Environ. Resour.* 30, 441–473.
- Gadgil, M., Berkes, F., Folke, C., 1993. Indigenous knowledge for biodiversity conservation. *Ambio* 22, 151–156.
- Gennosenschaft Gran Alpin, 2013. Willkommen bei Gran Alpin. <http://www.granalpin.ch> (Accessed March 20, 2013).
- Hofmann, F., 2011. Gran Alpin holt sich Prix Montagne. *Die Südostschweiz.*, 246, p. 1 (Friday 9 September 2011).
- Holling, C.S., 2001. Understanding the complexity of economic, ecological, and social systems. *Ecosystems* 4, 390–405.
- Janoff, S., 2010. A new climate for society. *Theory Cult. Soc.* 27, 233–253.
- Kaplowitz, M., Hadlock, T., Levine, R., 2004. A comparison of web and mail survey response rates. *Public Opin. Q.* 68, 94–101.
- Kates, R.W., Travis, W.R., Wilbanks, T.J., 2012. Transformational adaptation when incremental adaptations to climate change are insufficient. *PNAS* 109, 7156–7161.
- Klöti, U., Knoepfel, P., Kriesi, H., Linder, W., Papadopoulos, Y., Sciarini, P., 2007. *Handbook of Swiss Politics*. NZZ Libro, Zurich.
- Koohafkan, P., Altieri, M.A., Gimenez, E.H., 2012. Green agriculture: foundations for biodiverse, resilient and productive agricultural systems. *Int. J. Agric. Sustain.* 10, 61–75.
- Kotlarski, S., Bosshard, T., Lüthi, D., Pall, P., Schär, C., 2011. Elevation gradients of European climate change in the regional climate model COSMO-CLM. *Clim. Chang.* 112, 1–27.
- Lanz, S., Barth, L., Hofer, C., Vogel, S., 2010. Développement du système des paiements directs. *Recherche Agronomique Suisse.* 1, 10–17.
- Lawrence, G., 1987. *Capitalism and the Countryside: The Rural Crisis in Australia*. Pluto Press, Sydney.
- Lemos, M.C., Agrawal, A., 2006. Environmental governance. *Annu. Rev. Environ. Resour.* 31, 297–325.
- Lereboullet, A.-L., Beltrando, G., Bardsley, D.K., 2013. Socio-ecological adaptation to climate change: a comparative case study from the Mediterranean wine industry in France and Australia. *Agric. Ecosyst. Environ.* 164, 273–285.
- Lindemann-Matthies, P., Junge, X., Matthies, D., 2010. The influence of plant diversity on people's perception and aesthetic appreciation of grassland vegetation. *Biol. Conserv.* 143, 195–202.
- Magnani, N., Struffi, L., 2009. Translation sociology and social capital in rural development initiatives. A case study from the Italian Alps. *J. Rural. Stud.* 25, 231–238.
- Mann, S., 2005. Farm size growth and participation in agri-environmental schemes: a configurational frequency analysis of the Swiss case. *J. Agric. Econ.* 56, 373–384.
- Marsden, T., Sonnino, R., 2008. Rural development and the regional state: denying multifunctional agriculture in the UK. *J. Rural. Stud.* 24, 422–431.
- Marx, T., Brunner, C., 2012. Analyzing and improving the national innovation system of highly developed countries: the case of Switzerland. *Technol. Forecast. Soc. Chang.* <http://dx.doi.org/10.1016/j.techfore.2012.07.008>.
- Milestad, R., Darnhofer, I., 2003. Building farm resilience: the prospects and challenges of organic farming. *J. Sustain. Agric.* 22, 81–97.
- Nelson, D.R., Adger, W.N., Brown, K., 2007. Adaptation to environmental change: contributions of a resilience framework. *Annu. Rev. Environ. Resour.* 32, 395–419.
- Netting, R., 1981. *Balancing on an Alp: Ecological Change and Continuity in a Swiss Mountain Community*. Cambridge University Press, New York.
- O'Hara, S.U., Stagl, S., 2001. Global food markets and their local alternatives: a socio-ecological economic perspective. *Popul. Environ.* 22, 533–554.
- Ortiz-Miranda, D., Moreno-Perez, O.M., Moragues-Faus, A.M., 2010. Innovative strategies of agricultural cooperatives in the framework of the new rural development paradigms: the case of the Region of Valencia (Spain). *Environ. Plan. A* 42, 661–677.
- Perevolotsky, A., 1987. Territoriality and resource sharing among the Bedouin of southern Sinai: a socio-ecological interpretation. *J. Arid Environ.* 13, 153–161.
- Perrings, C., 2006. Resilience and sustainable development. *Environ. Dev. Econ.* 11, 417–427.
- Pfister, C., 2009. The “disaster gap” of the 20th century and the loss of traditional disaster memory. *GAIA Ecol. Perspect. Sci. Soc.* 3, 239–246.
- Plummer, R., Crona, B., Armitage, D., Olsson, P., Tengö, M., Yudina, O., 2012. Adaptive management: a systematic review and analysis. *Ecol. Soc.* 17 (3), 11.
- Potter, C., Burney, J., 2002. Agricultural multifunctionality in the WTO: legitimate nontrade concern or disguised protectionism? *J. Rural. Stud.* 1, 35–47.
- Renting, H., Rossing, W.A.H., Groot, J.C.J., Van der Ploeg, J.D., Laurent, C., Perraud, D., Stobelaar, D.J., Van Ittersum, M.K., 2009. Exploring multifunctional agriculture: a review of conceptual approaches and prospects for an integrative transitional framework. *J. Environ. Manag.* 90, S112–S123.
- Schenk, A., Hunziker, M., Kienast, F., 2007. Factors influencing the acceptance of nature conservation measures: a qualitative study in Switzerland. *J. Environ. Manag.* 83, 66–79.
- Schilperoord, P., 2013. Berggetreide. <http://www.berggetreide.ch> (Accessed March 26, 2013).
- Shucksmith, M., Rønningen, K., 2012. The Uplands after neoliberalism? The role of the small farm in rural sustainability. *J. Rural. Stud.* 27, 275–287.
- Terashima, H., 1983. Mota and other hunting activities of the Mbuti archers: a socio-ecological study of subsistence technology. *Afr. Stud. Monogr.* 3, 71–85.
- Urry, J., 2011. *Climate Change and Society*. Polity Press, Cambridge, UK.

- von Ah, J., 1984. Food security and ecology in conflict? Minimum data needs for pragmatic problem solving in Switzerland. *Mt. Res. Dev.* 4, 1–4.
- von Glasenapp, M., Thornton, T.F., 2011. Traditional ecological knowledge of Swiss alpine farmers and their resilience to socioecological change. *Hum. Ecol.* 39, 769–781.
- von Uslar, R., 1996. Zu Rättern und Kelten in den mittleren Alpen. *Berichte der Römisch-Germanischen Kommission.* 77, 155–213.
- Wilson, G.A., 2012. Community resilience, globalization, and transitional pathways of decision-making. *Geoforum* 43, 1218–1231.
- Zimmermann, A., Möhring, A., Mack, G., Mann, S., Ferjani, A., Gennaio, M.P., 2011. Die Auswirkungen eines weiterentwickelten Direktzahlungssystems. ART Bericht 744, Forschungsanstalt Agroscope Reckenholz-Tänikon, Switzerland.
- Zingg, A., Siegrist, M., 2012. Lay people's and experts' risk perception and acceptance of vaccination and culling strategies to fight animal epidemics. *J. Risk Res.* 15, 53–66.