



# **Crisis? What Crisis? Marginal Farming, Rural Communities and Climate Robustness: The Case of Northern Norway**

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**Abstract.** Does it make sense to talk about a crisis in agriculture in one of the world's wealthiest economies when significant quantities of public money are invested in the agricultural sector? Moreover, should one worry about the robustness of food production if it takes place at the margins of economic efficiency and where, consequently, importing food seems the simpler and cheaper option? Should agriculture in marginal areas have any role whatsoever in food production? Against the backdrop of national and international discourses on the need for increasing food production, this article analyses developments in Northern Norway in the aftermath of a year of major production crisis. The analysis uses large statistical data sets combined with qualitative information to draw a picture of agriculture in this region. We contend that marginal areas are important for maintaining agricultural production capacity but are unlikely to play a significant role in any potential increase in productivity unless new pathways are chosen for agricultural policies and production. However, the ability to maintain agricultural production systems and levels is being threatened by both economic and structural changes in agriculture and decreasing skills and knowledge of how to maintain and develop robust farming systems in these regions.

## **Introduction**

Norway's agricultural policies have, like the EUs, been characterized by substantial levels of farm support. The model of agriculture (see Almås, 2004; Rønningen et al., 2012) has been based on arguments surrounding food security, rural employment and settlement, and, increasingly during the last 20 years, the multifunctionality of agriculture (Wilson, 2001, 2008; Bjørkhaug and Richards, 2008; Marsden and Sonnino, 2008; Rønningen et al., 2012). Major agricultural exporting countries such as New Zealand, Australia and Canada see subsidies of this kind as merely hidden production subsidies (see Bills and Gross, 2005; Potter, 2006; Dibden et al., 2009). Ac-

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ording to Almås and Campbell (2012a, p. 297) a primary critique of multifunctionality as a policy platform for a more resilient agriculture is that it is too often targeted selectively toward supporting European agriculture. McMichael (2012), however, states that Europe has provided agricultural models that are not found in settler agriculture regimes of the US, Australia or New Zealand or Brazil. This implies a very different approach to agricultural support, and a different understanding of the role of agriculture and rural areas in society. In an increasingly market-oriented agri-food system, it appears doubtful that the approach that has supported Norway and the EU for so long is politically sustainable in the long term. Indeed, in Norway, the election of a new government in 2013 has seen renewed calls for dramatic reductions in the regulation of and payments to agriculture (Government Declaration, 2013).

The question of what kind of an agricultural system will emerge in their stead is one that politicians and researchers are currently grappling with. New concepts emerging in the debate include the notion of an agriculturally based bio-economy with two competing visions for the future (Levidow, et al., 2012). The first is the conventional view where life-science based technological solutions provide a common thread to address the problems facing humankind (Arancibia, 2013). This offers a vision of enhanced productivity and competitive advantage through global value chains that operate at global corporate economic levels (Kitchen and Marsden, 2009). The other, however, suggests that a sustainable bio-economy (or 'eco-economy' as per e.g. Kitchen and Marsden, 2009, 2011; Marsden, 2012) can only be achieved via the 'recalibration of micro-economic behaviour and practices that, added together, can potentially realign production–consumption chains and capture local and regional value between rural and urban spaces' (Kitchen and Marsden, 2009, p. 275).

Another emerging concept is that of neo-productivism. This postulates that a new 'productivist' era is emerging where the key driver is not government production subsidies but rather economic forces and markets driving ever increasing economies of scale, technologies and intensive forms of production (cf. Almås and Campbell, 2012b; Burton and Wilson, 2012). However, this is not thought to emerge in a geographically uniform way. Rather, as Wilson (2001) observes, the likelihood of a territorialization of agriculture is emerging – where productivist and non-productivist forms are spatially defined with productivist areas dominating the most valuable agricultural land.

These debates raise interesting issues for rural regions across Europe. In Norway, recent policy documents have emphasized the need to increase agricultural output – in part to feed predicted growth of its own population but also as a means of increasing overall food security (Ministry of Agriculture and Food, 2011). Likewise, EU discussions on the future of the CAP have outlined that market instabilities, 'often exacerbated by climate change', highlight the need for food security for European citizens (Martens and Zuleeg, 2010). However, while intensive productive agriculture is expanding in some regions, increasing reliance on the market system and change in rural communities means that less-commercially viable agriculture is under severe pressure in others (Shucksmith and Rønningen, 2011).

The post-2008 jump in the FAO food-price index emphasized both internationally and in Norway a need for increasing food production in order to meet climate change conditions, increased demand for food, and more variable food prices (Brobakk and Almås, 2011). Issues such as food security and food sovereignty have also been brought to the front in the national and international debate (McIntyre et al., 2009; Ministry of Agriculture and Food, 2011). Where and how this increased pro-

duction is to take place is a crucial issue that we cannot find addressed adequately either politically or within research. The main question put forward in this article is whether or what role farming in relatively marginal or peripheral areas ought to have in this new context for global food production. UN Special Rapporteur on the Right to Food Olivier De Schutter (2013) claims that when addressing climate change and global hunger, governments cannot focus solely on increasing food production but must also consider how to ensure sustainability and productivity on family farms. Whether Northern Norwegian family farms ought to have a role in this in the future is an underlying issue for this study.

In this article we investigate this issue in the context of Northern Norway – an area at risk from changes to the current highly subsidized and regulated agricultural regime in Norway. In 2010 agriculture in this region experienced a major crisis in production due to extreme weather conditions. We ask: Is this region equipped to meet both challenges associated with climate change and the demand for increased food production? What factors are likely to inhibit its continued production? What is required to ensure that gains in productivity in the core agricultural regions are not simply offset by losses in productivity through land abandonment outside of the central core?

### **Agriculture's Role in Norway**

Norwegian agriculture can be described as overwhelmingly peripheral and marginal in an international context. Only about 3% of Norway's land area is used for agricultural production. Employing the previously existing European Union definition of Less Favoured Area (LFA), Norway's agricultural land would have been classified almost entirely as 'less favoured' (compared with 57% of the overall utilized agricultural area in the European Union in 2007) (see e.g. Arnesen et al., 2010; Van Orshoven et al., 2012). Natural conditions are harsh, characterized by thin and stony soils, short seasons and low average temperatures. Furthermore, a substantial proportion of agricultural land is situated in mountainous and Arctic areas, thus further reducing productivity. On the other hand, top soils remain fertile due to relatively low-intensity farming practices. Recent studies also show that the grasslands in many areas are highly nutritious (Sickel et al., 2012). Further, water supplies remain sufficient. Those conditions make most areas suitable to grass-based production systems such as dairy, cattle and sheep. However, the need to house animals indoors during more than half the year in many places adds substantially to already high costs.

The 'Norwegian model of agriculture' (Almås, 2004; Rønningen et al., 2012; Almås et al., 2013) is strongly regulated, low levels of export; agricultural policy legitimacy has, as mentioned above, been closely linked to a notion of multifunctionality. Since World War II the model has been linked to five main objectives: 1. increasing food production and productivity and food security, 2. rural settlement and employment, 3. preparedness in relation to risk (with an eye to the then Soviet neighbour in the east), 4. maintaining farmers' incomes equal to that of industrial workers (introduced in the 1970s), and 5. environmental objectives (introduced in the 1970s). A number of legislative and regulatory measures concerned with subsidies, trade tariffs, border controls, veterinary issues, as well as policies designed to avoid overt farmland concentration and to restrict the use of farmland to food production (Flemsæter,

2009; Shucksmith and Rønningen, 2011) have come under considerable pressure to be reformed along free-market lines.

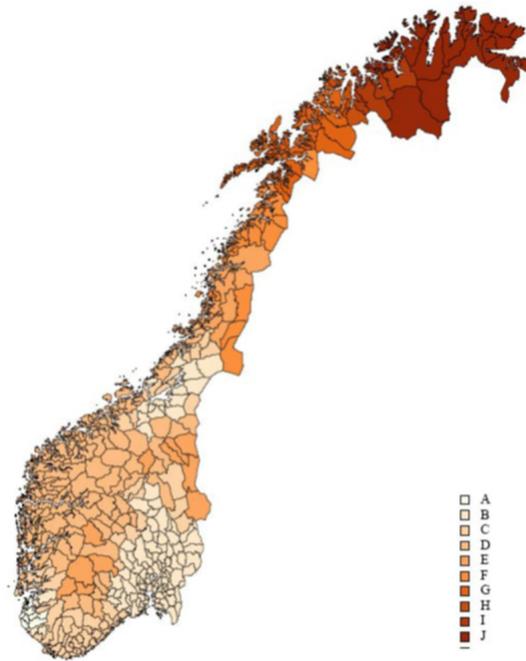
A national identity, which formed at a time of owner-occupied farms and dispersed rural settlements sustained largely by pluriactive farming as the norm, forms the background for and upholding of the Norwegian model of agriculture. However, this model stands against the universal logic of the agricultural threadmill of modernization (Cochrane, 1958), which suggests rationalization and structural change is required. Norwegian agriculture is highly politicized, through a system of subsidies and a cooperative arrangement of annual negotiations between the state authorities and the two farmers' organizations over major goals, price levels and technicalities. Almås (2004) describes this as a 'societal contract', in which the state provides a certain income to farmers in order to maintain 'viable agriculture' all over Norway and, in turn, farmers fulfill the five main objectives for Norwegian agriculture outlined above. These values have been important also for the diversification strategies encouraged by the authorities, towards tourism, green care and other types of new rural business developments.

Norway turned down EU membership in two referendums, and rural and agricultural issues are relevant in understanding these outcomes. In the 1980s, Norway began orientating its policies towards EU developments and responding to WTO negotiations on the liberalization of global agricultural trade, overproduction, and loss of environmental and landscape values. Multifunctionality objectives were geared towards cultural landscape preservation and the viability of rural communities. Area and cultural landscape payments partly replaced previous production-related subsidies and, parallel to CAP reforms, agri-environmental schemes were introduced (see Daugstad et al., 2006).

Dairy production has clearly been the most important type of agricultural production in Norway's remote regions, and has been extensively supported by family farm policies, which can be partly attributed to it being a labour-intensive sector. The dairy sector has been based on the creation and the widespread use of the Norwegian Red Cattle (NRF), a modern breed combining good dairy and meat production characteristics. The breed has been a symbol of good resource utilization, based on extensive grazing systems, of which home-produced rough fodder was the basis (Veie and Værdal, 2013). The ratio between home-produced grass and grain and imported feed concentrates is a central issue in considering the sustainability of these farming systems. Developments within dairy are thus crucial to understanding and analysing agricultural and land-use development (see e.g. Muirhead and Almås, 2012).

At the core of Norwegian agricultural policy mechanisms has been a policy of a geographical canalization of production based on 'relative comparative advantages'. This contends that 'good' areas should concentrate upon grain production while the uplands, the coast and Northern Norway ought to do what they are best suited to: grass-based dairy and beef production. Rich outfield pastures were important feed resources, but a certain share of nationally produced grain for feed was also an important element in this delicate balance of production and zoning of differentiated payments. At the political level, Norway uses the geographical and physical criteria as the basis for defining its agricultural land into zones. Based on this, differentiated support levels are available for various crops within different regions.

Various challenges to agricultural production are reflected in the zoning of agricultural policy measures into geographical regions; for example, in terms of moun-



**Figure 1.** Zones for regional payments for milk.

*Source:* Ministry of Agriculture and Food, 2013a, p. 157.

tains, valleys, coastal regions and Northern Norway (see Figure 1). The darker fields receive more subsidies for being disadvantaged due to natural conditions. However, some have called for more regionally targeted support policies to meet local challenges, such as those of mountain and Arctic agriculture (e.g. Rønningen et al., 2011; Shucksmith and Rønningen, 2011), an issue that has been addressed more recently within policy papers and projects (Ministry of Agriculture and Food, 2011, 2013b).

### **Crisis in Troms Agriculture**

The year 2010 was extremely cold for agricultural production in parts of Northern Norway, in particular the county of Troms. A bad winter and a disastrously wet and cold summer caused widespread crop failure, with up to 100% crop losses on some farms. The severe economic losses associated with the weather conditions meant that an unusually high number of farmers in the region left farming. This revealed two major issues. First, agricultural policy measures and compensations are inadequate both in general and in relation to crop damages. Second, agricultural production systems in the region lack economic robustness.

A regional analysis carried out in 2011 identified a number of major challenges to Troms agriculture. These include a lack of profitability of farming, barriers to financing necessary investment, recruitment challenges, low levels of (formal) agronomic and business competence, and high sheep losses as a result of carnivore predation. On the other hand, the potential for high-quality food production in the region can be considered a competitive advantage (Rønningen et al., 2011).

Climate change is relevant as 'crisis years' associated with climatic events are expected to occur more frequently in the future. In several Norwegian regions since 2010, summers have been characterized by unusual and extreme weather conditions, such as floods or draughts, resulting in high crop losses and economic losses. In general, greater variations in yields are to be expected in the future (Vagstad, 2013), including higher yields due to potentially warmer climate (Hakala et al., 2005). In this article, we discuss whether there is a place for peripheral, marginal agriculture against the backdrop of climate change and a globally heightened focus on increasing food production.

One question relevant to understanding the situation in Norway is to what extent it is possible to talk about a crisis in agriculture in a country with a prosperous, politically stable economy and a relatively equal distribution of wealth. Should food production be a priority in a country that, in many respects, cannot compete in terms of economically efficient food production and where, therefore, the import of food seems to be the obvious way to ensure food security?

The 2009 White Paper 'Climate Change: Agriculture as Part of the Solution' (Ministry of Agriculture and Food, 2009) responded to FAO estimates that the world needs to double its food production by the middle of this century by arguing that it would require Norway to continue 'to manage land well' in order to secure domestic demand – especially considering the predicted increase in population by about one million by 2030.

This article analyses the developments within the northernmost agricultural region in the world, Northern Norway, and within the context of national and international discourses on the need for increasing food production. Analyses are based on national and regional statistics of agriculture in Troms county and a regional analysis of quantitative as well as qualitative data (cf. Rønningen et al., 2011). To start with an observation: stakeholders were surprised at how critical the situation has become in Northern Norway. Later feedback on these analyses (Rønningen et al., 2011) indicated strongly that the Troms situation could be extrapolated to represent agriculture in many rural areas in Norway. This feeds into a discussion regarding food security and food sovereignty at the level of the nation state, and what role national and regional food production should have in a context of climate change and increased demand for food. A reminder of the fragility of food production is the fact that several areas in Norway, including Troms, until 2013 have been facing radiation effects of the Chernobyl disaster in April 1986, having to let sheep and reindeer graze in the lowlands for several weeks to lower becquerel levels before slaughter, adding to uncertainty and costs.

## **Data**

The analysis in this article is based on several different data sources: public documents, reports, the agricultural register, surveys, recordings from meetings and interviews. With regard to secondary statistical data, we use statistical information and reports gathered by Statistics Norway, such as data sets on structural distribution (Statistics Norway, 2009, 2010, 2012). Furthermore, we use reports on applications for production subsidies (the Norwegian direct payment database) and data on milk quotas, all of which are publicly available on the Norwegian Agricultural Authority web pages (<<http://www.slf.dep.no>>). Data gathered from the county

governor of Troms and TINE Nord (TINE dairy cooperative's office in Northern Norway) are also publically available.

We also base the analysis on recordings from a stakeholder meeting in which representatives from relevant organizations, institutions and other stakeholders of Troms's agriculture participated (Rønningen et al., 2011). Eleven prepared presentations addressed relevant issues related to the current situation for Troms's agriculture, followed by stakeholder discussions on the situation of Troms's agriculture. The attending delegates also answered a semi-structured questionnaire on challenges and opportunities for Troms's agriculture. Some interviews were carried out to follow up on topics that emerged at the meeting.

In terms of primary data, we analyse survey data from Norwegian farmers collected every second year since 2002–2012 (trend data). The six samples have been merged into one file that consists of 9,899 individual Norwegian farmers' replies that are identified by county. In Troms county 238 farmers are represented, accounting for 2.4% of farmers in the area. This is close to real figures of active farms (that is, farms with a certain minimum of agricultural output, making them eligible for production subsidies) as noted in the agricultural register. In 2010 Troms farmers accounted for 2.47% of Norwegian farm units (Statistics Norway, 2010).

The trend-data survey provides a general base of knowledge on the socio-cultural factors in Norwegian agriculture.<sup>1</sup> The sample consists of the main operators of active farms (see above). Simple comparative statistical methods such as cross tabulation and compared means are used to show similarities and differences between the Norwegian sample and the Troms county subsample. We are looking at the farms' production bases (main production types), farmer demographics (age and gender) and education, and motivation for farming and future plans. The purpose of these analyses is to create a basis for discussing future robustness in marginal agricultural areas of Norway. Further analysis in the article presents the similarities and differences in terms of production characteristics and motivational aspects between farmers in Norway as a whole and farmers in the Troms region.

## Analysis

### *Is the Norwegian Model Being Challenged as a Result of Structural Change?*

There have been significant structural changes in Norwegian agriculture (Bjørkhaug, 2012; Forbord et al., 2014). In 1949, 213 000 farms were defined as 'active', whereas only 44 770 farms remained in this category in 2012. The most obvious change is one towards fewer and bigger farms. Nevertheless, with an average farm size of 10–20 hectares of productive farmland, farms sizes have remained comparatively small compared to international standards and most farms depend on a pluriactive model with additional income from other resource-based activities or off-farm employment (Almås, 2004; Bjørkhaug, 2008)

Between 2008 and 2011, the number of eligible farms in Troms county that applied for support for agricultural activities dropped by 11% (1,065 applications in 2011). While the reduction of farm units in Norway averaged 3% in the 2000s, it increased to 5% in Troms in the period from 2010 to 2011.

According to the county governor of Troms (2011), agriculture in Troms accounted for 1,783 full-time employment positions in 2008 (calculated in terms of working hours, not employees). This represents around 2% of the total employment in the

county and reflects the relatively small importance of agricultural employment in Norway as a whole. However, when industries that are horizontally and vertically associated with agricultural production are included, the contribution to employment and settlement becomes much more significant.

Only 1.5% – compared to an average Norwegian 3% – of the Troms land area is farmland. While the area of productive agricultural land remained stable in Norway irrespective of changes in farm numbers, this began to change in the previous decade. Since 2005 the average reduction in agricultural land in Norway has been 2.65%. However, in the Troms region this figure was substantially higher at 5.66%.

Norway is witnessing increasing levels of land leasing (Forbord et al., 2014). When a farm closes down production the land is normally let out. The national average of rented land is 40%, while Troms farmers have among the highest proportion of rented land per unit, 58% (Statistics Norway, 2011a). Families often stay on agricultural properties, utilizing houses and farm resources while leasing out productive land and ending conventional farming. While 44770 Norwegian farms are active, 121 080 of the 185 000 registered agricultural properties are inhabited (Statistics Norway, 2011b). For Troms the proportion of uninhabited agricultural properties is also higher than the overall average of Norway (36% against 21%). This means that the Troms countryside is witnessing increasing numbers of empty farms with ‘no lights in the windows’, while the remaining farms utilize the available land within a reasonable distance from the home farm. The general pattern in Norway is low frequency of farm sales. This is caused by a combination of price regulation on farm property sales and, more importantly, families’ reluctance to sell their properties outside of the family. Owners are inclined to keep farms as holiday homes and to uphold traditions and home feelings as farms may have been in the family for generations – sometimes hundreds of years (see e.g. Flemsæter, 2009). A relatively lower price on agricultural properties in Northern Norway might also explain some of the reluctance to sell properties (Statistics Norway, 2011c).

Several potential issues arise from this structural change. One is the potentially higher costs of farming due to added management costs on leased land, lack of land maintenance, transport costs due to more dispersed farm businesses, a greater dispersion of the population and, associated with this, potential skill shortages. In short, is a threshold in terms of the minimum number and size of farms required to maintain sustainable rural agricultural communities?

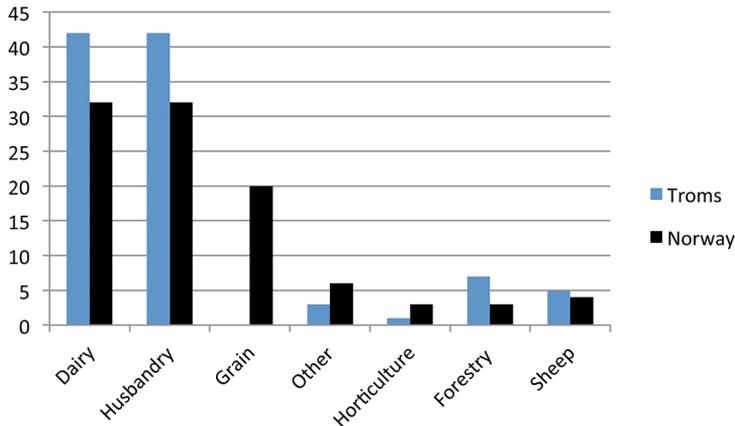
### **Agricultural and Socio-cultural Status of Troms Farms**

Further analysis in the article presents the similarities and differences in terms of production characteristics and motivational aspects between farmers in Norway as a whole and farmers in the Troms region.

#### *Types of Agricultural Production*

Dairy and animal husbandry are the dominant forms of agricultural production in the Troms region (Figure 2). These are mostly grass-based and utilize local grass and grazing resources. The rich outfield grazing resources are important.

Troms farmers have lower quotas than national average, fewer dairy cows (18.1 versus 22.1), lower suckler cows stocks (10.7 versus 14). Average farm unit size for sheep is above national average (81 versus 63.2) while goat numbers are about the



**Figure 2.** Main agricultural productions (Troms and Norway).

national average (95.6 versus 92.6) (Statistics Norway, 2011d). Troms farmers keep 2% of Norway's dairy cows, 5% of ewes and 26% of milking goats, which represents a decline in both cow and goat production (see Kleiven, 2011).

Figures from SLF (2010) show that the proportion of dairy farms has also declined while the proportion of other types of animal husbandry systems have increased. There is also a widespread change in farming systems in order to reduce labour input, for example, a move from dairying to suckler cow and breeding systems. Another typical route is to switch from dairy to sheep farming, and to gain additional income from off-farm employment. This development has meant that while the proportion of animal farming systems overall remains relatively stable, the proportion of dairy units in the Troms region has dropped by about 4%. However, if compared to an average drop of 21% nationwide, this strongly indicates that Troms farmers still are occupied with 'conventional' or 'traditional' farming systems, also reflecting fewer possibilities for pluriactive strategies.

According to TINE Nord et al. (2011), 40% of the Troms dairy producers will have closed down their operations by 2015 and production will, in the same period, have decreased by 25%. While annual production used to be around 34 million tons (up to 2007), this is expected to drop to around 25 million tons by 2015, representing a 25% decline (TINE Nord et al., 2011). This development is likely to be problematic not just for the dairy farmers but for dairy processing businesses in Northern Norway. The trend is very disturbing with respect to sustainability and cannot be explained by the 2010 crop disaster only. Even though quota prices in Troms have remained very low, in 2010 not all available quotas were sold (TINE Nord et al., 2011). The estimated future decline of producers by about 40% between now and 2015 means that the remaining producers cannot maintain the current production volume in the future.

#### *Farmer Demographics and Properties*

Farmers in Troms do not differ significantly from the Norwegian average on gender composition or age. The average age of farmers is around 50. In the combined dataset from 2002 and 2012, there are slightly more women in the Troms sample (17%) than in the nationwide sample (12%). Trend-data analysis further shows that farmers

in Northern Norway have less formal education than average Norwegian farmers. Only four out of 10 have formal agricultural training. The overall lower educational level within Troms agriculture suggests challenges in terms of meeting increasingly specialized production systems, stricter demands of animal welfare regulations and climate changes. A TINE report shows that the two northernmost counties of Norway – Troms and Finnmark – have lower enrolment in quality systems among dairy farmers, and have lower slaughter weights and higher infection levels than average, while few deliver elite-quality milk (TINE Nord, 2010).

Although there may have been a number of factors leading to the peak situation in 2010, these findings still indicate a correlation between education level and production and quality. Previous studies have shown a relatively passive attitude to introducing formal competence requirements within agriculture. Forbord and Bjørkhaug (2009) found that among central actors (Ministry of Agriculture and Food, the Farmers Union and the Smallholders' Association) the dominant belief was that best competence is acquired through experience, i.e. through socialization on the farm, and later through practice (also see Ellingsen et al., 2004).

Agricultural competence was also an issue that arose during stakeholder meetings. A need for professional advice and temporary staff/holiday assistance was called for across municipalities and farming communities. Lack of formal competence was also noticed within the farming community. There is a strong culture of acknowledging (only) tacit and on-farm learned skills. With changing needs of agronomic, economic and technological skills, socialization on farm might not be sufficient for a future sustainable Norwegian farming. These concerns are also related to future recruitment to Troms agriculture.

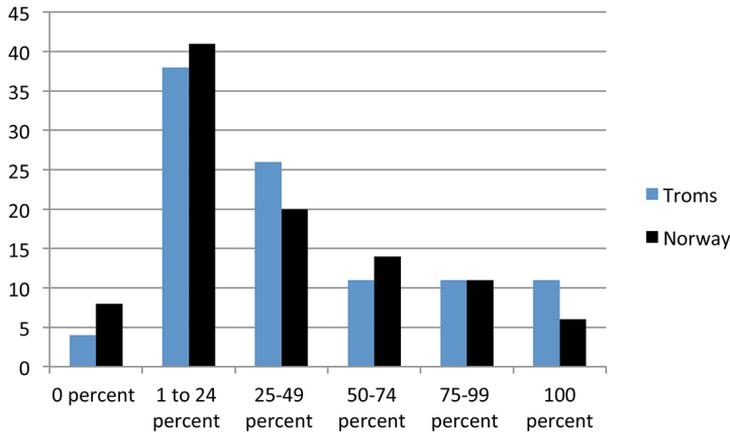
### *Strong Farmer Identity*

In the 2002–2012 data set, 67% of the farmers state that their main affiliation of employment is being a farmer, compared to the Norwegian average of 57%. Furthermore, three out of four Troms farmers have a preference for full-time farming, more than the national average of 60%, and fewer have a preference for part-time strategies (8% of Troms farmers prefer part-time compared to 30% nationally) while 12% have a preference for only off-farm work (compared to 6% in the Norwegian sample).

Farm households in Norway increasingly depend on off-farm income for survival (Bjørkhaug, 2012). In the Troms data set we find that slightly more farm households depend on farming as a substantial part of their household income. Twenty-two per cent of farming households receive more than 75% of their household income from farming (national average is 17%), while for the average Norwegian farm household (including Troms) off-farm income counts for half of household income in 70% of households (Figure 3).

### *Individual Farming Motivation*

While evaluating several motivations for farming, the trend-data survey (2002–2012) shows that the top 'motivations' to farm of Troms farmers are an interest in agriculture and interest in a rural lifestyle, and that they express this more strongly than the average Norwegian farmer. Being self-employed is third on the motivation list.



**Figure 3.** Share of household income from farming (2002–2012 trend-data combined).

Another interesting feature is that fewer Troms farmers state duty or need as motivation for taking over farms than the national average. Lack of other job opportunities was the least important motivation factor for farming. This is true for the average Norwegian farmer and also the Troms farmers.

Another feature is the low level of participation in joint farming enterprises (*samdrift*) in Troms; 3% of the dairy farms are joint farms, while the national average is 14% (SLF, 2011). Joint farming has been seen as a strategy for future expansion, helping small farms to make more efficient investments and sharing labour in a socially acceptable way (Stræte and Almås, 2007).

### *Planning for the Future of Troms Agriculture*

Motivation to take over a farm can be linked both to region and type of production. Former analyses of farmers (Bjørkhaug and Wiborg, 2010) and of individuals entitled to farms (Andgard et al., 2009) have shown that taking over a farm is less attractive in Northern Norway than in the rest of the country. Further, dairy farms and other farms with animal husbandry have been found to be less attractive than crop-based productions. Uncertainty regarding economy, lack of agricultural competence and interests in other professions are major factors. Access to a job market outside of farming, for both farmer and partner, is another critical factor, as is access to a social and professional community. With a declining population in the rural areas, the latter two criteria are increasingly not met, and represent a crucial issue in terms of structural development towards fewer and larger farms in already sparsely populated regions.

New mandatory requirements for open dairy solutions by 2024 for older barns (built or renewed earlier than 1995) and 2034 for newer barns (Mattilsynet, 2013) means that a large number of farmers are now facing the decision of whether to make substantial investments in new buildings and technology or to quit. With the current pace of units closing down in the county, there will be a great need for investment in the remaining units if even part of the decline in production is to be halted.

Public funding is available for investment support through the Rural Development Fund as a share of investment costs; however, the need is far greater than currently available funds and loans would allow (Gjengedal, 2011). An interesting aspect is that loans for investments in farming in Troms are mainly provided by Innovation Norway (a public body) and not through private banks.

Trend data (2002–2012) further showed that 37% of Troms farmers would recommend family succession (against 55% nationally), while 27% would not (against 16% nationally). The rest do not know. Figures 4 and 5 show farmers’ plans in a five-year and twenty-year perspective.

In the short term (five-year perspective) more Troms farmers than the Norwegian average are determined in regard to either increasing or downscaling production. Fifty-six per cent of farmers plan to increase production. Also more Troms farmers see closing down as an option, which suggests a polarization process is going on.

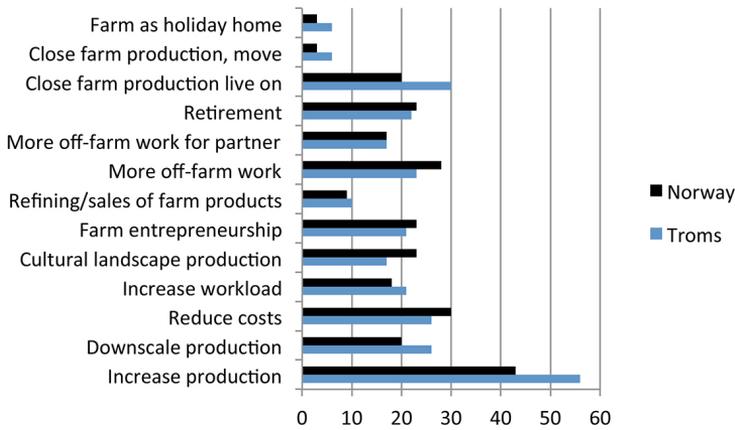


Figure 4. Plans in five years (2002–2012 trend data combined – percentages).

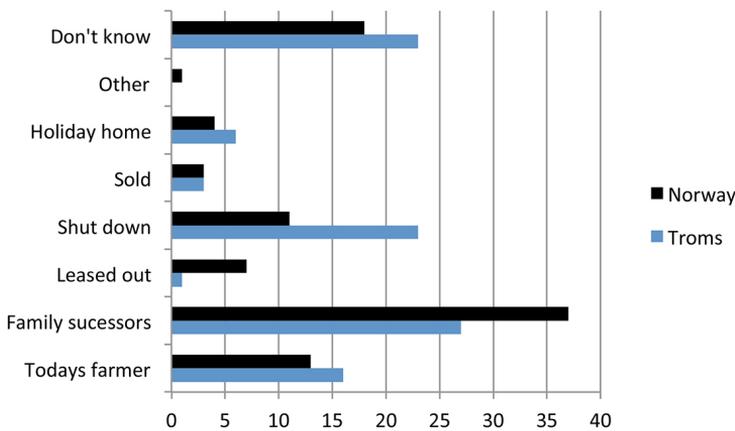


Figure 5. Plans for the farm in 20 years (2002–2012 trend data combined – percentages).

In the longer term, nearly one out of four farms plan to close down production. A little less than half of farmers (43%) believe the farm will still be in business (managed either by today's farmer or family successor) in 20 years (against 50% nationally), 23% believe the farm will shut down in 20 years (against 11% nationally); however, few will sell the farm property within 20 years (3%), meaning that others will not continue agricultural production on these units except possibly by leasing the land.

The stakeholder meeting revealed some interesting controversies and dilemmas in the current policy framework for Norwegian agriculture as well as how policy and diverging interests are dealt with by farmers' own institutions. Norwegian farmers' organizations meet with the government for yearly negotiations on agricultural subsidies. The need for a united and coherent voice on a national basis does make it difficult to negotiate for special regional or production needs – and also particular needs and compensation in time of crisis, as they might affect the total national agricultural budget. A harmonic strategy of equality, implying the same production should lead to the same income levels everywhere, has been a tradition in negotiations between state and farmers. This makes market-oriented or regionally based strategies, such as developing 'Arctic', 'fjord' or 'mountain' agriculture, a difficult policy strategy. However, we do find new political strategies for Arctic agriculture in national policy documents since 2010 crisis of Troms agriculture (Ministry of Agriculture and Food, 2011). Thus, research and development might focus on, for example, Arctic qualities in grass and vegetables, meat, and marketing potential for Northern Norway agriculture.

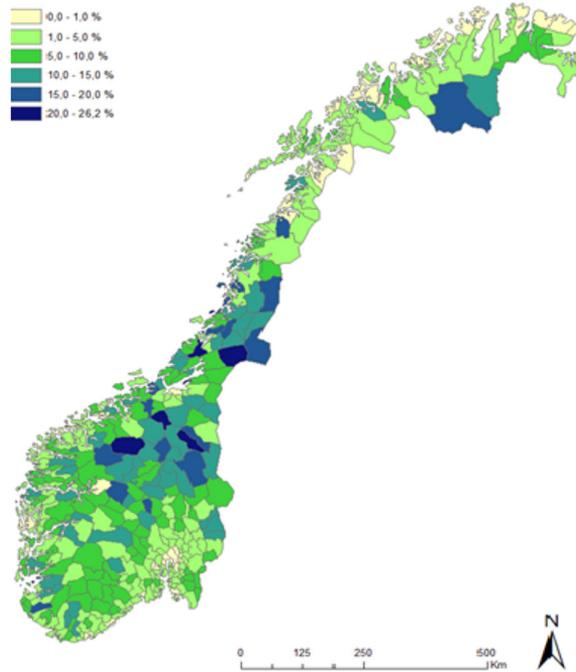
The Troms stakeholders also pointed to higher production costs in the north, such as transport costs for feed and fertilizers, technological investments, and also higher costs of farm investments due to low competition on professional competence. With this, increased access to private (local banks) and public (Innovation Norway funds) loans was called for.

The issue of carnivores was also raised. This is an issue of increasing concern not related to the crisis as such. Major parts of Troms farmers' and Sami grazing areas for sheep, cattle and reindeer are located in areas that have seen a strong increase in carnivore numbers, and high lamb and reindeer calf losses undermines motivation, breeding programmes and future planning. The monetary compensation does not compensate for the psychological strain or the economic losses linked to losing breeding animals.

The crisis was thought to have mobilized partnerships as well as local support for agriculture outside the agricultural community. It also enforced and enabled collaboration between farming communities and local and regional government bodies. Strengthened local or regional alliances were pointed out as a positive externality of crisis. Whether this is a short term or also a long term effect remains to be seen.

### *Agriculture's Role in Employment and Settlement*

As shown above, a large share of Troms farmers have shut down recently and many plan to shut down production in the near future. Patterns of decreasing land use are also emerging, which implies that remaining farmers are not able to utilize farmland on closed production units. Policies have stressed agriculture's important role for rural viability until now, and an objective is to develop Norwegian rural areas based on agriculture and the resources found in rural areas. Figure 6 illustrates that agri-



**Figure 6.** Agriculture's role in employment (2008).

culture is less important for employment within the best agricultural municipalities (lighter areas) (e.g. the counties surrounding the Oslo fjord) than in more marginal agricultural areas (darker areas), typically mountains, fjord areas and Northern Norway.

Structural development within agriculture has had significant influence on employment and settlement in the municipalities of Troms. Within the county, a centralization towards the more densely populated areas is taking place. There is a correlation between the closing down of active farms and declining population numbers in municipalities where the primary sector constitutes a major employer. In other words, the more important<sup>2</sup> agriculture is for employment and settlement, the worse the effects of farm closure.

### **Crisis? What crisis?**

Farmers in rural areas of Norway enjoy a general high standard of living and modern lifestyles. Although farm income is low, most Norwegian farm households supplement it with off-farm income or diversification, which means that average farm household income is relatively good but working hours are long.

Climate change might even be positive for parts of agriculture Norway and Northern Norway to some extent. For some a wetter, wilder climate with greater variations is forecasted, but also potentials for higher yields, and crops may be produced at higher altitudes and further north than previously, as average temperature increases. Yet, so far this does not seem to reduce what in agriculture internally is experienced as negative structural and economic conditions.

The crisis in 2010 revealed a lack of robustness of the farms, but also of the system of compensation. On paper, the Norwegian agricultural sector has a system that to some extent should take some of the economic burden of a failing season. However, design and format does not reflect the actual regional differences and challenges such as cost of long transport for supplementary feed, etc. Also, each farm holding needs to pay a certain minimum fee per property to release compensation for loss. When some farmers operate up to 10 leased farms this cost becomes significant (Gryteland, 2013).

Without better adjusted agricultural policies and measures, including investment and climate funds, the strong restructuring within agriculture in Troms will continue in its present form. This means that sustainable full-time farming will be impossible for most farmers, and many will have to diversify into a more differentiated agriculture in terms of modern pluriactivity if agriculture is to have an impact for employment and settlement in the future in Troms. However, long distances and peripherality are major handicaps in this respect, and these, in addition to a reluctance to diversify among Troms farmers, were probably some main factors contributing to low levels of pluriactivity.

'Viable agriculture all over the country' is still defined as a major objective for Norway's agricultural policies. Statistical analysis in this article shows that there is considerable restructuring going on in terms of the closing down of farm units, high share of land lease, and also land abandonment. The developments in Northern Norway are of utmost concern in terms of keeping up a sufficient level of food production, which in turn maintains the whole infrastructure of dairies, slaughterhouses, attached food and delivery industries, viable rural areas as well as cultural landscapes and biodiversity. Lost production and income due to the bad weather in crisis year 2010 has reinforced the situation, and may also be seen as a reminder of what may be expected in terms of climate change's influence on farming. While the situation in Troms to some extent has been seen as extreme, the analysis above illustrates the key developments that are occurring in many parts of rural Norway.

The European model of agriculture, and multifunctionality, provides, according to McMichael (2012), arguments for food sovereignty, self-sufficiency, and family farming that are also applicable to the developing world. They have the capacity to become part of a loose alliance of new (and recovered) approaches to agriculture around the world. Almås and Campbell (2012a) strongly endorse McMichael's argument that European multifunctional policy is important because it can align potentially with other ways of undertaking agriculture in other parts of the world. The year 2014 is the international year of family farming. From being seen as obstacles to modernization and development, there is an increasing acknowledgment, also within FAO, that these systems are the only ones so far that can ensure that large parts of the population in the developing world have an acceptable standard of nourishment, and that this ought to be secured (FAO, 2013). A multifunctional approach might be one model to follow.

Is agriculture in peripheral, marginal areas in the North relevant in a global context of climate change and focus on increasing food production? One criticism against the Norwegian multifunctional model is the moral question of whether a country like Norway can 'afford to have environmentally-oriented agricultural policies that potentially restrict supply at the same time as being concerned about the limited supplies of food' (Rønningen et al., 2012, p. 92). Another factor is the trade leakage of foodstuff from neighbouring Sweden, and declining consumer and voter

support of the model. While all surveys show high support and legitimacy of Norwegian agriculture (Norsk Monitor, 2011), the willingness to support Norwegian production must also be shown through real consumer behaviour.

The objectives of supporting (agri)cultural landscapes and viable agriculture all over the country are still evident in the recent White Paper on agriculture, but the direction of political signals under the previous 'red-green' coalition government shows that the neo-productivist path has strengthened (Rønningen et al., 2012). The new 'blue-blue' coalition has challenged the present agricultural system and might indicate that changes are in the making (Government Declaration, 2013). The strength of the post-World War II Norwegian agricultural model is yet to be tested and future directions to be outlined. However, fragility in the system did come to the fore with one year of 'bad weather'. From a food security perspective, it may be a risky strategy for Norway to let the extensive family farming systems go. Troms farmers, however, want to be full-time farmers, but based on analyses in this article, this might be economically unsustainable.

The future of Arctic and other marginal agricultural systems are to be negotiated among motivated producers, consumers and sufficient institutional and political support. Keeping up a critical mass of agricultural production to sustain production for a multitude of functions and industries might be less expensive than re-stabilizing a neglected agricultural system when food requirements or environmental values change. A renewal of multifunctional goals of agriculture might also be necessary in Norway.

## Notes

1. For trend-data details, see Rye and Storstad, 2002, 2004; Vik and Rye, 2006; Vik, 2008; Logstein, 2010, 2012.
2. Calculations are based on Statistic Norway work and demography register data and SLF statistics on production register data.

## References

- ALMÅS, R. (2004) *Norwegian Agricultural History*. Trondheim: Tapir Academic Publishers.
- ALMÅS, R. and CAMPBELL, H. (2012a) Reframing policy regimes and the future resilience of global agriculture, in: R. ALMÅS and H. CAMPBELL (eds) *Rethinking Agricultural Regimes: Food Security, Climate Change and the Future Resilience of Global Agriculture*. Bingley: Emerald Group Publishing, pp. 285–300.
- ALMÅS, R. and CAMPBELL, H. (eds) (2012b) *Rethinking Agricultural Regimes: Food Security, Climate Change and the Future Resilience of Global Agriculture*. Bingley: Emerald Group Publishing.
- ALMÅS, R., BJØRKHAUG, H., CAMPBELL, H. and SMEDSHAUG, C.A. (2013) *Fram mot ein berekraftig og klimatilpassa norsk landbruksmodell*. Trondheim: Akademika forlag.
- ANDGARD, A., ELDBY, H., HILLESTAD, M.E. and KLEM, L. (2009) *Rekruttering til landbruket. Odelsbarns holdninger til overtakelse av gard*, Rapport nr.2 /2009. Oslo: Landbrukets Utredningskontor.
- ARANCIBIA, F. (2013) Challenging the bioeconomy: the dynamics of collective action in Argentina, *Technology in Society*, 35, pp. 79–92
- ARNESEN, T., OVERVÅG, K., GLØRSEN, E., SCHURMAN, C. and RIISE, Ø. (2010) *Fjellområder og fjellkommuner i Sør-Norge. Definisjon, avgrensning og karakterisering*, R-2010/08. Lillehammer: Østlandsforskning.
- BILLS, N. and GROSS, D. (2005) Sustaining multifunctional agricultural landscapes: comparing stakeholder perspectives in New York (US) and England (UK), *Land Use Policy*, 22, pp. 313–321.
- BJØRKHAUG, H. (2008) *Agricultural Restructuring and Family Farming in Norway: Strategies for Sustainable Practices*, R 5-08. Trondheim: Centre for Rural Reseach
- BJØRKHAUG, H. (2012) Exploring the sociology of agriculture: family farmers in Norway – future or past food producers? in: D. ERASGA (ed.) *Sociological Landscape: Theories, Realities and Trends*. Rijeka: InTech, pp 283–303.

- BJØRKHAUG, H. and RICHARDS, C.A. (2008) Multifunctional agriculture in policy and practice? A comparative analysis of Norway and Australia, *Journal of Rural Studies*, 24, pp. 98–111.
- BJØRKHAUG, H. and WIBORG, A. (2010) *Challenges for Succession in Family Farming*, NF notat 1007/2010. Bodø: Nordlandforskning.
- BROBAKK, J. and ALMÁS, R. (2011) Increasing food and energy prices in 2008: what were the causes and who was to blame?, *International Journal of Sociology of Agriculture and Food*, 18(3), pp. 236–259.
- BURTON, R. and WILSON, G. (2012) The rejuvenation of productivist agriculture: the case for 'cooperative neoproductivism', in: R. ALMÁS and H. CAMPBELL (eds) *Rethinking Agricultural Regimes: Food Security, Climate Change and the Future Resilience of Global Agriculture*. Bingley: Emerald Group Publishing, pp. 51–72.
- COCHRANE, W. (1958) *Farm Prices: Myths and Reality*. Minneapolis: University of Minnesota Press.
- DAUGSTAD, K., RØNNINGEN, K. and SKAR, B. (2006) 'Agriculture as an upholder of cultural heritage? Conceptualisations and value judgements: a Norwegian perspective in international context, *Journal of Rural Studies*, 22, pp. 67–81.
- DE SCHUTTER, O. (2013) *Agroecology*. Published online <<http://www.srfood.org/en/agroecology>>, accessed 3 September 2013.
- DIBDEN, J., POTTER, C. and COCKLIN, C. (2009) Contesting the neoliberal project for agriculture: productivist and multifunctional trajectories in the European Union and Australia, *Journal of Rural Studies*, 25, pp. 299–308.
- ELLINGSEN, W., FOLKENBORG, K. and JAKOBSEN, S.E. (2004) *Kompetansekrav i norsk landbruk. Behov, innhold og organisering*, Fafo-rapport 463. Oslo: Fafo.
- FAO (FOOD AND AGRICULTURE ORGANIZATION) (2013) *The International Year of Family Farming*. Published online <<http://www.fao.org/family-farming-2014/en/>>, accessed 1 September 2013.
- FLEMSÆTER, F. (2009) From home to second home: emotional dilemmas on Norwegian Smallholdings, *Scandinavian Journal of Hospitality and Tourism*, 9(4), pp. 406–423.
- FORBORD, M. and BJØRKHAUG, H. (2009) Rekruttering til landbruket: Hva mener organisasjonene og forvaltningen?, in: A. BARSTAD and K. SKREDE (eds) *Levekår i landbruket 1995–2004. Livsformer og rammebetingelser i endring*. Oslo: Statistisk sentralbyrå.
- FORBORD, M., BJØRKHAUG, H. and BURTON, R. (2014) Drivers of change in Norwegian agricultural land control and the emergence of rental farming, *Journal of Rural Studies*, 33, pp. 9–14.
- GJENGEDAL, G. (2011) *Økonomi og investeringer i landbruksbygg i Troms*. Presented at Seminar Tromslandbruket. Tromsø, 11 April.
- GOVERNMENT DECLARATION (2013) *Politisk plattform for en regjering utgått av Høyre og Fremskrittspartiet*. Oslo: Statsministerens kontor.
- GRYTELAND, Ø. (2013) Erstatningsordningene må dekke tapene, *Bondebladet*, 12 April.
- HAKALA, K., LAURILA, H. and MELA, T. (2005) Increase in atmospheric CO<sub>2</sub> and ambient temperatures in the North, *Journal of Crop Improvement*, 13(1–2), pp. 239–255.
- KITCHEN, L. and MARSDEN, T. (2009) Creating sustainable rural development through stimulating the eco-economy: beyond the eco-economic paradox?, *Sociologia Ruralis*, 49(3), pp. 273–293.
- KITCHEN, L. and MARSDEN, T. (2011) Constructing sustainable communities: a theoretical exploration of the bioeconomy and eco-economy paradigms, *Local Environment*, 16(8), pp. 753–769.
- KLEIVEN, A. (2011) *Regionale utfordringer innenfor eksisterende virkemiddelapparat*. Presented at Seminar Tromslandbruket. Tromsø, 11 April.
- LEVIDOW, L., BIRCH, K. and PAPAIOANNOU, T. (2012) EU agri-innovation policy: two contending visions of the bio-economy, *Critical Policy Studies*, 6(1), pp. 40–65.
- LOGSTEIN, B. (2010) *Trender i norsk landbruk 2010*, Frekevensrapport R4-10. Trondheim: Centre for Rural Research.
- LOGSTEIN, B. (2012) *Trender i norsk landbruk 2012*, Frekevensrapport R7-12. Trondheim: Centre for Rural Research.
- MARSDEN, T.K. (2012) Towards a real sustainable agri-food security and food policy: beyond the ecological fallacies?, *Political Quarterly*, 83(1), pp. 139–145.
- MARSDEN, T. and SONNINO, R. (2008) Rural development and the regional state: denying multifunctional agriculture in the UK, *Journal of Rural Studies*, 24, pp. 422–431.
- MARTENS, H. and ZULEEG, F. (2010), Introduction: Europe 2020: delivering well-being for future Europeans, *Challenge Europe*, 20, pp. 8–11.
- MATTILSYNET (2013) *Endring av forskrift om hold av storfe – nye krav om frister for løsdrift og mosjon*. Published online <[http://www.mattilsynet.no/dyr\\_og\\_dyrehold/produksjonsdyr/storfe/endring\\_av\\_forskrift\\_om\\_hold\\_av\\_storfe\\_\\_nye\\_krav\\_om\\_frister\\_for\\_losdrift\\_og\\_mosjon.10673](http://www.mattilsynet.no/dyr_og_dyrehold/produksjonsdyr/storfe/endring_av_forskrift_om_hold_av_storfe__nye_krav_om_frister_for_losdrift_og_mosjon.10673)>, access 24 October 2013.

- MCINTYRE, B.D., HERREN, H.R., WAKHUNGU, J. and WATSON, R.T. (eds) (2009) *International Assessment of Agricultural Knowledge, Science and Technology for Development: Global Report*. Washington, DC: IAASTD.
- McMICHAEL, P. (2012) Food regime crisis and revaluing the agrarian question, in: R. ALMÁS and H. CAMPBELL (eds) *Rethinking Agricultural Regimes: Food Security, Climate Change and the Future Resilience of Global Agriculture*. Bingley: Emerald Group Publishing, pp. 99–122.
- MINISTRY OF AGRICULTURE AND FOOD (2009) *Klimautfordringene: landbruket en del av løsningen*, White Paper 39, 2009. Oslo: Ministry of Agriculture and Food.
- MINISTRY OF AGRICULTURE AND FOOD (2011) *Landbruks- og matpolitikken. Velkommen til bords*, White Paper 9, 2011–2012. Oslo: Ministry of Agriculture and Food.
- MINISTRY OF AGRICULTURE AND FOOD (2013a) *Jordbruksforhandlingene 2013*. Oslo: Ministry of Agriculture and Food
- MINISTRY OF AGRICULTURE AND FOOD (2013b) *Tydeligere distriktsprofil. Rapport fra arbeidsgruppe*. Oslo: Ministry of Agriculture and Food.
- MUIRHEAD, B. and ALMÁS, R. (2012) The evolution of western agricultural policy since 1945, in: R. ALMÁS and H. CAMPBELL (eds) *Rethinking Global Agricultural Regimes: Food Security, Climate Change and the Future Resilience of Global Agriculture*. Bingley: Emerald Group Publishing, pp. 23–49.
- NORSK MONITOR (2011) *Verdiundersøkelsen*. Oslo: Synnovate.
- POTTER, C. (2006) Competing narratives for the future of European agriculture: the agri-environmental consequences of neoliberalization in the context of the Doha round, *Geographical Journal*, 172(3), pp. 190–196.
- RØNNINGEN, K., BJØRKHAUG, H., HOLM, F.E. and VIK, J. (2011) *Tromslandbruket. Regional analyse*, R 6/11. Trondheim: Centre for Rural Research
- RØNNINGEN, K., RENWICK, A. and BURTON, R. (2012) Western European approaches to and interpretations of multifunctional agriculture – and some implications of a possible neo-productivist turn, in: R. ALMÁS and H. CAMPBELL (eds) *Rethinking Agricultural Regimes: Food Security, Climate Change and the Future Resilience of Global Agriculture*. Bingley: Emerald Group Publishing, pp. 73–98.
- RYE, J.F. and STORSTAD, O. (2002) *Trender i norsk landbruk 2002*, Frekvensrapport R. 8/02. Trondheim: Norsk senter for bygdeforskning.
- RYE, J.F. and STORSTAD, O. (2004) *Trender i norsk landbruk 2004*, Frekvensrapport R. 4/04. Trondheim: Norsk senter for bygdeforskning.
- SHUCKSMITH, M. and RØNNINGEN, K. (2011) The uplands after neoliberalism? The role of the small farm in rural sustainability, *Journal of Rural Studies*, 27(3), pp. 275–287.
- SICKEL, H., BILGER, W. and OHLSON, M. (2012) High levels of  $\alpha$ -tocopherol in Norwegian alpine grazing plants, *Journal of Agricultural and Food Chemistry*, 60, pp. 7573–7580.
- SLF (STATENS LANDBRUKSFORVALTING) (2010) *Statistikk og utvikling*. Published online <<https://www.slf.dep.no/no/statistikk>>.
- SLF (STATENS LANDBRUKSFORVALTING) (2011) *Kvoter 2011, fylkesfordeling*, Rapport nr. 202 KU. Oslo: SLF.
- STATISTICS NORWAY (2009) *Landbruket i Norge 2009*. Published online <[http://www.ssb.no/emner/10/04/sa\\_landbruk/sa116/jordbruk.pdf](http://www.ssb.no/emner/10/04/sa_landbruk/sa116/jordbruk.pdf)>.
- STATISTICS NORWAY (2010) *Jordbruksbedrifter med leige av jordbruksareal og leigd jordbruksareal, etter fylke*. Oslo: Statistics Norway.
- STATISTICS NORWAY (2011a) *50 års landbrukshistorie i tekst og tall*. Published online <<https://www.ssb.no/jord-skog-jakt-og-fiskeri/artikler-og-publikasjoner/50-aars-landbrukshistorie-i-tekst-og-tall>>
- STATISTICS NORWAY (2011b) *Landbruksseidommer, innbyggere og bosatte, etter kommunenes folketall og type landbruksseidom. 2010*. Published online <<https://www.ssb.no/a/kortnavn/laeiby/tab-2011-06-20-03.html>>.
- STATISTICS NORWAY (2011c) *Landbruksseidommer1 omsatt i fritt salg, etter kjøpesum. 2010*. Published online <<http://www.ssb.no/laeiti/tab-2011-10-27-02.html>>.
- STATISTICS NORWAY (2011d) *Dyretal per jordbruksbedrift med vedkomande husdyr, etter fylke og bruksstorleik*. Published online <<http://www.ssb.no/stjord/tab-2011-12-19-05.html>>.
- STATISTICS NORWAY (2012) *Strukturen i jordbruket, 2012, førebelse tal*. Oslo: Statistics Norway
- STRÆTE, E.P. and ALMÁS, R. (eds) (2007) *Samdrift i melkeproduksjonen: En samvirkestrategi for økt velferd og fleksibel drift*, Rapport 3/07. Trondheim: Norsk senter for bygdeforskning.
- TINE NORD (2010) *FAGLIG RAPPORT KU 2010*. Harstad: TINE Nord.
- TINE NORD, FYLKESMANNEN I TROMS and INNOVASJON NORGE (2011) *Rapport Analyse – Melk i Troms*. Harstad: TINE Nord.
- VAGSTAD, N. (2013) Miljø, klimatilpassing og bærekraft i norsk matproduksjon. Nasjonale perspektiver med globalt bakteppe, in: R. ALMÁS, H. BJØRKHAUG, H. CAMPBELL and C.A. SMEDSHAUG (eds) *Fram mot ein berekraftig og klimatilpassa norsk landbruksmodell*. Trondheim: Akademika Publisher, pp. 181–202.

- VAN ORSHOVEN, J., TERRES, J.-M. and TÓTH, T. (eds) (2012) *Updated Common Bio-physical Criteria to Define Natural Constraints for Agriculture in Europe: Definition and Scientific Justification for the Common Biophysical Criteria*. Luxembourg: Publications Office of the European Union.
- VEIE, J.O. and VÆRDAL, K.I. (2013) Bærekraftig og klimavennlig melkeproduksjon i Trøndelag, in: R. ALMÅS, H. BJØRKHAUG, H. CAMPBELL and C.A. SMEDSHAUG (eds) *Fram mot ein berekraftig og klimatilpassa norsk landbruksmodell*. Trondheim: Akademika Publisher, pp. 229–252.
- VIK, J. (2008) *Trender i norsk landbruk 2008*, Frekevensrapport. Trondheim: Norsk senter for bygdeforskning.
- VIK, J. and RYE, J.H. (2006) *Trender i norsk landbruk 2006*, Frekevensrapport. Trondheim: Centre for Rural Research
- WILSON, G.A. (2001) From productivism to post-productivism... and back again? Exploring the (un) changed natural and mental landscapes of European agriculture, *Transactions of the Institute of British Geographers*, 26, pp. 77–102.
- WILSON, G.A. (2008) From 'weak' to 'strong' multifunctionality: conceptualising farm-level multifunctional transitional pathways, *Journal of Rural Studies*, 24, pp. 367–383.