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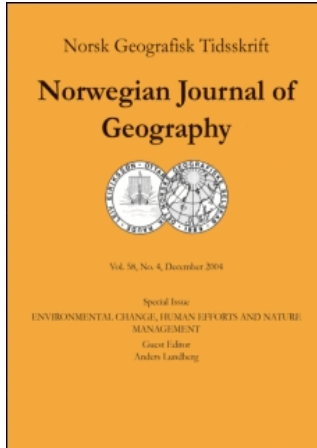
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A system perspective on innovation in the Norwegian dairy industry

EGIL PETTER STRÆTE



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Regional innovation systems (RIS) have made a considerable contribution on the one hand to a scientific understanding of how innovation occurs and on the other hand as a political tool for stimulation of regional development. The aim of the article is to illuminate this theoretical approach by discussing the role of regional innovation systems in promoting innovation in the dairy (*meieri*) industry in Norway, and further, by discussing regional consequences of the development of regional innovation systems. The main conclusion is that it is hard to find regional innovation systems within the dairy industry in Norway; the mainstream milk sector is nationally oriented. Within farm processing and a few 'countercurrent' dairy firms, however, a stronger relation to regional networks emerges. Development of regional innovation systems is a kind of endogenous development that presupposes there are local and regional resources available, which often is not the case. Hence, a one-sided commitment to regional innovation systems will result in regional disparities in economic growth. Varied strategies for innovation and for regional development can compensate for these disparities.

Keywords: *dairy, Norway, regional consequences, regional development, regional innovation system (RIS)*

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Introduction

Intensive efforts to find tools that stimulate regional development are present both in research to improve knowledge and in politics to manifest into economic value creation. Agriculture and food processing are of significance in most countries for regional development due to the territorially dispersion of farmland. In Norway, dairy farming has since the 1950s been an important element in the objective of regional development within agricultural politics from governments of various colours. Stimulation of development through innovation is a strategy to address the increasing competition within the food sector. International competition is growing in spite of import restrictions on food to Norway covering the main domestic products.

The way innovation is organized is vital in order to achieve development. In line with the tradition established by Joseph Schumpeter, *innovation* is defined as developing new products, introducing new raw materials, establishing new production processes, adopting new technology, establishing oneself in new markets, and introducing new organizational structures (Schumpeter 1934). How to define the value of what is new in an innovation is itself a matter of debate. Must it be new to the world, or new to a domestic market, or is it enough that it is new to the firm? I will assert that it is sufficient to be new to the firm (see Stræte 2006 for further discussion). At the same time, it should be emphasized that innovation is more than an invention: it should be realized or commercialized to be an innovation. Within the food sector all dimensions of innovation are present, according to the definition above, especially because of the emerging hunger for diversification in business strategies and plurality in products after decades of Fordistic organization of food processing. Local and regional variation is one of the most significant dimensions of this.

The regional innovation systems (RIS) approach has strongly influenced the understanding of how innovation occurs. This scientific approach may be helpful in analysing how innovation is organized in a specific industry, e.g. the dairy industry in Norway. Hence, the main aim of the article is to examine the *role of regional innovation systems in promoting innovation in the dairy industry*. However, it is not obvious how RIS in general influence regional development. A second aim is therefore to discuss *regional consequences of the development of RIS*. Consequences are not confined to a single sector, but to regional development in a broader sense. They can also be considered in the context of the regional reform which Norway plans to implement in the near future, and the role new regional bodies may play in innovation. The intention in this article is to contribute to an improved understanding of RIS and its potential role as a tool for promoting regional development. The dairy industry has close ties with agriculture, which is one of the most politicized industries in Norway today. Combined with the domination of the sector by the farmer-owned dairy cooperative Tine, this has provoked criticism in the public debate.

The analysis is based on several studies, both qualitative and quantitative, undertaken in the period 1995 to 2005 in Norway. These studies are discussed in Stræte (2006). The concept of RIS is subsequently discussed and clarified in the article, and then discussed in the context of innovation in the dairy industry, followed by reflections on regional consequences which may arise from the development of RIS.

The approach of regional innovation systems (RIS)

Through several studies and publications, the concept of innovation systems primarily in a national perspective was

launched in the mid-1980s, in particular by Freeman (1987), Lundvall (1992) and Nelson (1993). The point of departure was that research was increasingly focused on how innovations spread, and on relationships between innovation and social and institutional political factors (Fagerberg 2002). A characteristic of the innovation system approach is that it was and is a criticism of a linear and almost mechanical understanding of innovation. The relationships associated with innovation are more complex and characterized by interactivity between the actors, especially between firms, knowledge communities and government authorities. This interactivity and the need for proximity have stimulated the growth of the RIS approach, i.e. space and territory are especially in focus.

In other words, a regional innovation system is an environment in a region in which systematic contact and communication between innovative actors represent the norm – supported by actors in the infrastructure (Asheim & Isaksen 1997; Braczyk et al. 1998; Cooke & Morgan 1998; Lundvall 2002; Asheim & Coenen 2005; Asheim & Gertler 2005; Iammarino 2005). An innovation system connected to the development and production of products includes both actors linked directly to the production system or value chain and actors linked to the support network in the infrastructure. Infrastructure is here defined broadly as including physical infrastructure such as transport systems, waste disposal, power and water supply, etc., as well as financial support, competence and knowledge functions related to banks, consultants, research, education, etc. (Fig. 1). The theoretical approach of RIS is most concerned with knowledge communities.

Institutions regulate or influence the relationships. Here, *institutions* are understood as stabilized social relationships, which are continuously reproduced, in the form of rules, norms, conventions, and so forth. The more integrated and dense an innovation system is, the more the organizations are embedded in a common institutional environment. An important element in a regional perspective is the proximity and trust that can be built into relationships when those involved are close to each other. In spite of the growth of global trade and markets, local influence is still important for firms (Maskell 1998). In innovation systems, relations are developed through activities such as research and development, education, training, developing new product markets, incubator activities, and funding (Edquist 2005, 190).

There are various types of innovation systems associated with various sectors, technologies and regions (Asheim &

Isaksen 1997). Various RIS represent a kind of hierarchy based on how developed or integrated the system is:

- The first requirement, a regional industrial cluster, means that the firms are in contact with each other, at least through commerce.
- A second requirement is that the firms cooperate in innovation, whether in specific projects or in organizations established precisely for the objective of stimulating innovation.
- A third requirement is that this network of firms is linked to knowledge organizations – it is only *then* that an RIS exists in the strictest sense of the concept.

Comparing RIS to related concepts such as agglomerations and clusters, they have in common the territorial concentration of specific industry that is linked together through relations in a mixed milieu of competition and cooperation or in value supply chains. To be regarded as RIS, these agglomerations must also do systematic work on innovation where both firms and knowledge organizations are involved (Isaksen & Onsager 2004). Examples of well-known regional innovation systems are industrial districts in Italy, Baden-Württemberg in Germany, and Silicon Valley in California.

A normal understanding of a region is to regard it as a more or less delimited territorial area which has something in common and which on that basis can be distinguished from other regions. This *something* in common may be industrial structure, landscape, culture, language, identity, etc. – but it is often associated with governmental administrative regions. In Norway, this is currently highly relevant in connection with the debate on the possible introduction of a new regional administrative level. However, it is just as relevant to look at whether there is a coherence and inward orientation in the relationships in the region – which introduces the concept of *functional region*. For example, this may be related to regularity in relationships between firms, business organizations, meeting forums, or a common labour market. It may not conflict with the boundaries of administrative regions, but may often cross them.

An important criterion for delimiting a region for my purpose is that it has a significant degree of inward orientation among the actors in connection with innovation processes.

Organization of innovation in the dairy industry

Turning to the dairy industry in Norway, I maintain that here RIS have little significance for innovation. I address the production structure first and then the infrastructure. There are a few exceptions, which are discussed below.

To define the concept of a sector, Statistics Norway's standard industrial classification, which is based on international standards, can be consulted. The basis here is to group industrial activities according to the type of goods produced, the raw materials used in production and the application involved. The dairy industry includes the

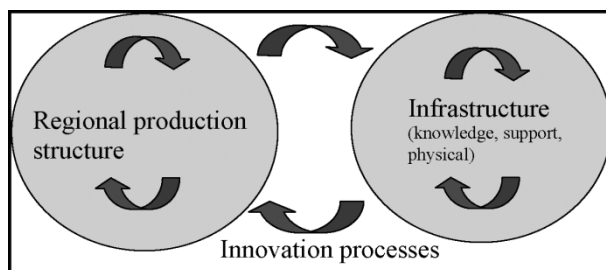


Fig. 1. Main elements and dynamics in regional innovation systems (RIS).

manufacture of dairy products and ice cream. Here, the discussion is limited to the Norwegian dairy industry (Fig. 2).

The dairy industry comprises industrial enterprises which receive milk either directly from farms or indirectly from another dairy – fluid or processed – and refine or continue the processing of the milk into a semi-finished or finished product. This means that the dairy industry includes the dairy cooperative Tine, as well as Synnøve Finden, Q-meieriene (The Q Dairies), and a few other dairies, as well as c.140 processing facilities on farms (farm processors).

This dairy industry is found in the processing part of the value chain in Fig. 2, and is a part of the larger milk sector. ‘Ingredient’ indicates industries where milk is a significant ingredient but in combination with other raw materials. Market regulation is relatively comprehensive in the dairy industry compared to other industries. However, neither the ingredient industry nor market regulations as such are crucial in this RIS approach, and these are not explored further here.

Production in the dairy industry is distributed throughout the country since the dairies are based on fresh milk as a raw material from agriculture – which is widely dispersed geographically. The structure of the dairies has changed radically since 1945, from almost 600 dairy plants to some 60 in 2006. During this period, the dairy cooperative, Tine, has centralized its organizational structure, with the formation of groups of companies since 2002 as the peak period. There are still five regional subsidiaries, but their primary responsibility is to ensure effective logistics and production as well as to keep in touch with members. Their involvement and initiative regarding innovation are rather marginal. The central part of Tine, which includes its own research and development and marketing functions, in specified organizational divisions, takes care of this work. Tine does a great deal of work in innovation. In relation to innovation system theory, Tine is the most important actor in a *national* innovation system, with little regional contact. In an apt comment, Selstad (1997, 197) describes the cooperative plants as ‘isolated high-tech enclaves in the countryside – cathedrals in the rocks’. This comment underpins the strong centralized management of innovation in the dairy cooperative.

The industrial milk sector in Norway is not regionalized, but vertically integrated, corresponding to a productivist line. This means that none of the variants of regional innovation system mentioned above is representative of the milk sector. The dairy companies often have little in common with other firms in the local environment, and this makes it difficult to create synergy effects horizontally. Dairies do not assign functions to local or regional suppliers to any great extent. In other words, regional systems or networks are weak.

However, several other participants in the production structure should be mentioned. First, Tine has met competition from Synnøve Finden, Q-Meieriene, Nestlé, and Kavli. All of them, except Q-Meieriene, have plants manufacturing dairy products based on milk purchased from Tine. All of these competitors of Tine, however, have few plants and

their production is standard, so that the need and pressure for innovation in this field is limited. In 2000, Q-Meieriene AS was merged from the former Gausdalsmeieriet and Jæren Gårdsmeieri, and its main shareholder is Kavli. Synnøve Finden ASA is a company owned by several other companies and individuals.

The conclusion is that the production structure is nationally oriented to a great extent, suggesting that we are dealing with a national innovation system. This is also in line with an analysis undertaken by Knudsen et al. (1999) of the Norwegian agricultural sector. In particular, they investigated whether there were opportunities for regional innovation milieus here. Their conclusion was that the agricultural sector, including milk and dairy, comprised a national innovation system. They rejected the regional system model. They did indicate that there was scope for local and regional development in the field, but that it would then be necessary to use other models, such as local mobilization, to analyse these activities.

Onsager (1999) conducted an analysis of the food industry in Rogaland in South-West Norway and assessed whether a regional innovation system existed there. He concluded that important parts of the food environment formed a regional innovation system in Rogaland, but this was linked to and partly integrated in the national innovation system in various ways. This thus applied to the entire food sector, not dairy or milk alone.

What, then, is the situation of another component in regional innovation systems – the *infrastructure*? This primarily means organizations such as research institutes, universities, technology centres, and government agencies which may have important competence to support regional innovation. Are these found at a regional level? Conclusions from Knudsen et al. (1999), as well as from Hauknes (2001) are clear. They maintained that the Norwegian agricultural sector had a wealth of such actors and organizations, but they were primarily located in Ås, Stavanger and Trondheim (Fig. 3), and were nationally oriented, i.e. there are few indications of regional systems.

The next step is to consider the extent to which there are relationships between production structure and a regional infrastructure. Again, Knudsen and colleagues asserted that there were no such regional relationships in the food sector. This conclusion is supported in a study from 2001 showing that managers of dairy firms considered the relationships to local actors to be of minor importance (Stræte & Rye 2002).

In other words, it is not easy to find regional innovation systems within the dairy industry in Norway. However, there are factors that may modify this to some extent.

There are two other types of commercial actors: on-farm processing facilities and a few dairy firms, both within and outside Tine, which to some extent have charted their own course *against the current* of the more streamlined product range offered by Tine and Synnøve Finden. A great deal has taken place in this area since Knudsen et al. (1999) conducted their analysis some 80 years ago. In the survey from 2001, we found 8–10 such ‘countercurrent firms’ (Stræte & Rye 2002). The number has probably increased in subsequent years.

The Norwegian Value Chain of Milk

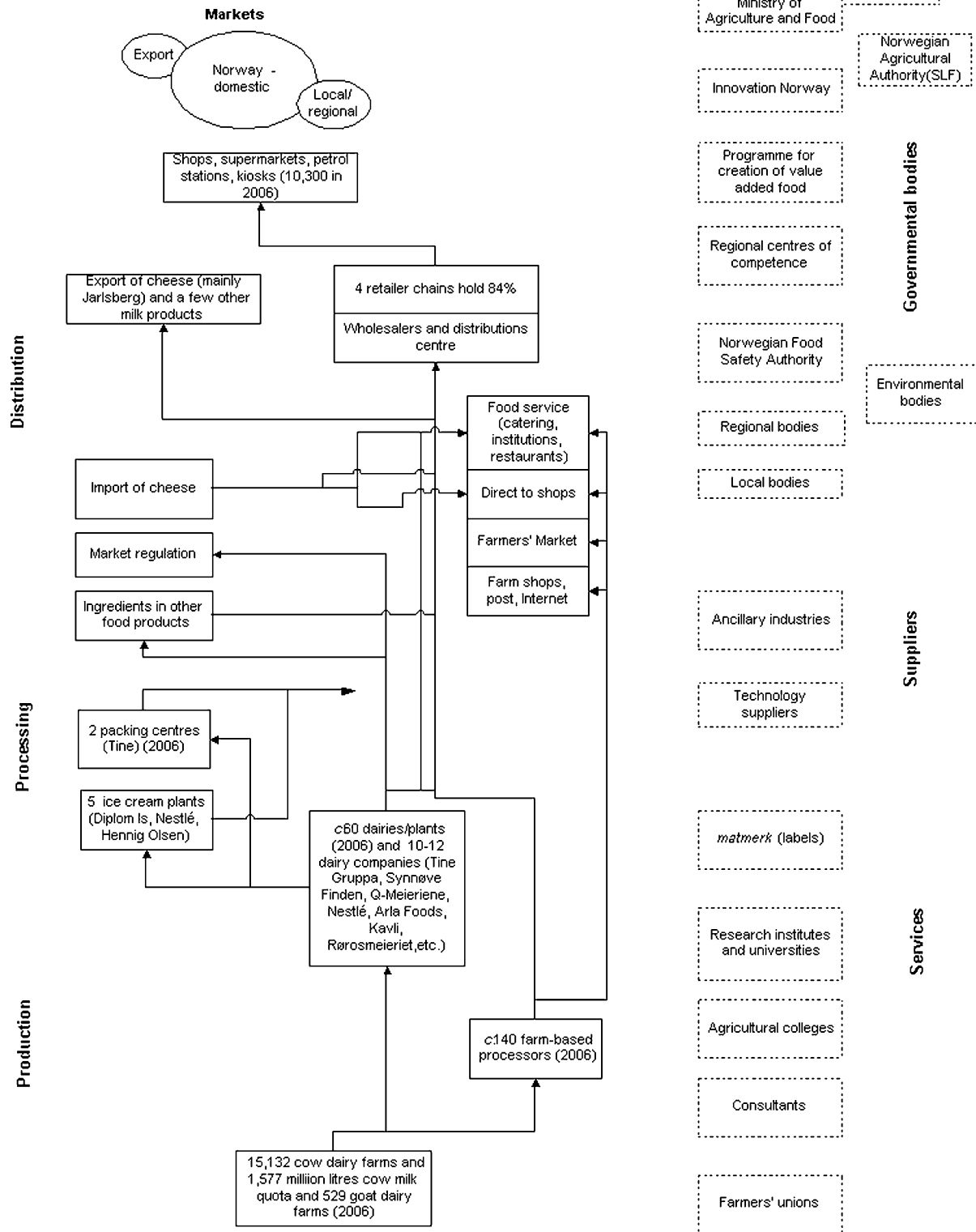


Fig. 2. The innovation system of the Norwegian milk sector.

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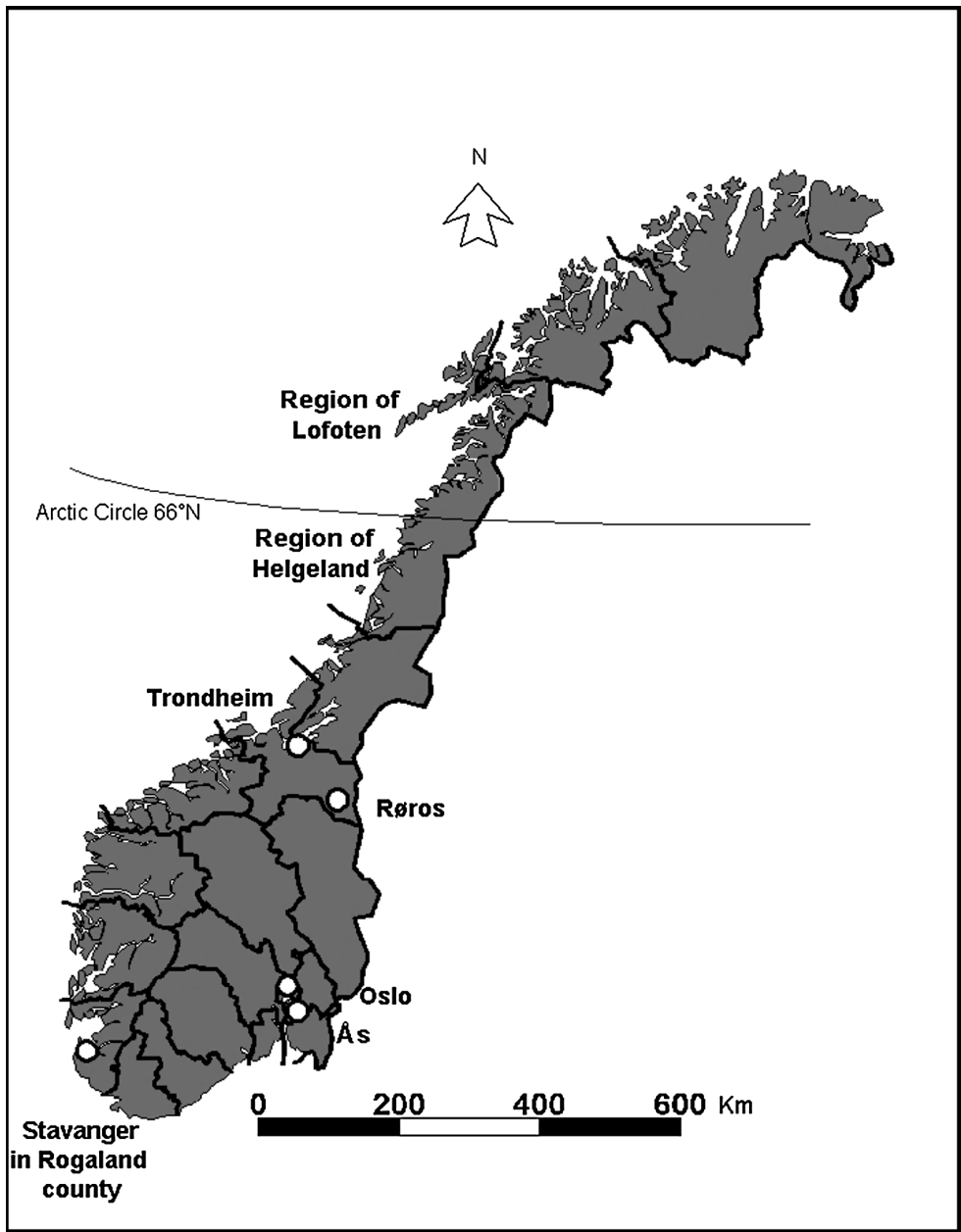


Fig. 3. Norway: Location map.

The on-farm processors are much more strongly embedded in a regional network, including their fellow farmers. The establishment of the Farmers' Market, where consumers can buy food directly from producers, is an example of regional cooperation. According to our study of dairy managers from 2001, the level of participation by the 'countercurrent firms' in a regional network was, however, highly variable. Nevertheless, with respect to regional innovation systems, the door is ajar. This is a field which is currently changing rapidly. In addition, it may be too strict to limit RIS to dairies; the entire food sector should be included. Hence, the significance of RIS will increase.

An important condition for the development of RIS is the assets that may be specific to a regional perspective. For a food

enterprise, these are definitely assets related to *proximity* to raw materials and *geographical origin*. This, in turn, is related especially to the parts of food processing relating to what can be termed local and regional food. This is a field in which, relatively speaking, a radical change has taken place in Norway during the past 10 years. I define *regional food* as food products which can be associated with a particular region based on qualities communicated to the consumer through measures such as branding, design or narratives. These qualities can be linked to the geographical origin and history or to distinctive characteristics of the product. *Tjukkmelk* (a kind of curdled whole milk) from Rørosmeieriet is a typical regional product.

The development of local and regional food is related to the *quality 'turn'* in the food sector (Goodman 2003). This creates

tensions and dynamics within the sector and provides scope for regional variation and initiative. Within this development I will argue that traces of RIS can be observed. However, it is too early to say whether they will develop so that they fit into a relatively narrow definition of RIS. Governmental bodies such as the Ministry of Agriculture and Food, including their representatives at county level, and the state-owned organization Innovation Norway, which promotes industrial development, have been important forces in the development of local and regional food. The programme 'Creation of value added in food' (*Verdiskapingsprogrammet for matproduksjon*) was launched in 2001 and has stimulated business activity in local food (Bråtå et al. 2006). An important element in this programme as well as other programmes from Innovation Norway is to promote cooperation between actors. The Norwegian Food Branding Foundation, Matmerk, is also a governmental initiative but is independent and owned by several different organizations representing interests along the value supply chain. This foundation stimulates the development of specialized foods through their labels. In addition, it offers a service to firms, along with other private advisers. The organization Norwegian Rural Tourism and Food from the Farm (Norsk Bygdeturisme og Gardsmat (NBG)), with more than 520 members, is also important as an arena and network creator among food processors.

Together these programmes and organizations create arenas in which indications of RIS in some regions can be observed. The period from the mid-1990s and approaching 2005 saw pioneering work, with the establishment of many new firms and founding of new organizations – the infrastructural set-up. However, it remains to be seen whether this development will create RIS in a strict sense.

It may be appropriate to stimulate development of alternative innovation systems if promotion of regional food is desired. The background for this is that special production, such as local and regional food, can be 'swallowed into the regime of standards' – it can be more difficult to preserve the local and regional profile (Stræte & Marsden 2006). It may be an advantage for such alternative systems to be regional, i.e. they can become RIS.

A study at the end of the 1990s, led by Isaksen from the STEP Group (Isaksen 1999) and a number of Norwegian researchers in the field indicated the most important regional resources for use in innovation activities in firms. Several of these resources are significant to the development of an alternative system related to food. For example:

- *An active subcontractor system.* In the food sector, microbusinesses or the on-farm processors in particular have a great need for cooperation and coordination, instead of each finding their way on their own. For example, it is a great challenge for these firms to develop adequate systems for distribution.
- *Opportunities for unique combinations of various types of knowledge.* In local food, examples include combining artisanship and traditional knowledge with new scientifically founded knowledge about food. Combinations also arise between sectors, for example, between food and tourism, and institutional households. Here, a great potential remains unexploited.

- *Development of collaborative spirit and entrepreneurial attitudes.* In some regions a great deal has been achieved and is still taking place. From being frowned upon as disloyal to the agricultural cooperatives, these small new food enterprises have become 'the heroes' of the food sector. The public sector has led the way in a political project, which should be regarded as successful so far, with reference to the aforementioned programme for creation of added value in food.
- *The support network from the public sector, business organization and knowledge communities.* Much activity has taken place at regional level in recent years.
- *The presence of important customers and users.* For farm processors, direct sales are very useful (for example, the Farmers' Market).

To sum up, the question is: Do RIS have a role to play in promoting innovation in the dairy industry?

My conclusion is that for the conventional dairy industry, which is definitely the most important in both volume and economic terms today, RIS have little or no significance for innovation, at least if the strictest definition of RIS is to be emphasized. This part of the dairy industry is integrated in a national innovation system.

In summary, the reasons that such regional systems have not been developed in Norway are:

- The centralization of the production structure in the dairy cooperative that is embedded in productivist organization models.
- The dominance of the retailer chains, with centralized purchasing schemes and distribution systems, which have made it difficult for smaller local and regional firms to make headway.
- The political system of governance to which the dairy industry has been, and remains, subject, i.e. import restrictions and market regulation, with a national orientation.
- The development of national research communities (especially the Norwegian University of Life Sciences (UMB) and the Norwegian Food Research Institute (Matforsk)).
- Restrictive regional innovation support to groups of companies or similar combinations such as Tine. It is difficult for a local dairy firm with a good idea to obtain regional support from Innovation Norway, for example, when it belongs to a group of companies (this is restricted due to EEA regulations). To win acceptance for the idea internally in Tine can also be difficult. There are many competitors for the same prize, as well as the strategies of the group to be taken into account.

Nevertheless, the area in which RIS could obtain most significance is in the development of local and regional food, within the quality 'turn' in the food sector. Here, RIS can play a critical role in the differentiation of the Norwegian food sector.

It should also be pointed out that some risks are involved in this. For example, a strong national commitment to the development of regional systems may contribute to increasing uniformity, leading to a latent conflict with the potential advantage of stronger regional development, i.e. emphasizing

distinctive characteristics of the region. National actors in particular may be overenthusiastic here.

Regional consequences of the development of RIS

What can development of RIS lead to more generally, if the perspective is broadened slightly? An attempt will be made here to answer the question: *What regional consequences can be expected from a development of regional innovation systems?* Here, I use the same understanding of regional innovation systems and region that has already been outlined, except that I now consider such systems from a more general point of view. Some examples will be provided.

I have chosen to emphasize the perspective of regional development. This is a difficult and imprecise concept often used normatively about regional change, which may well be linked to history, culture, migration, business activity, etc. There are many interesting perspectives here, but important objectives and indicators in relation to the core of innovation system thinking comprise the creation of economic value, economic growth and employment. The policy for the development of regional innovation systems thus represents a strategy which may form part of what has been and remains an important political objective in Norway, namely to preserve the key features of the settlement pattern. I understand regional consequences here as the effect of a policy for regional development on, for example, employment, normally regarded as a prerequisite for settlement.

I find it useful to link RIS as a strategy to regional development strategies. Somewhat simplified, one can say that in Norway there has been a commitment partly to distribution strategies (top-down) and partly to endogenous development (bottom-up). At the same time, initiatives have varied from being scattered – a wide-ranging commitment – to being concentrated (Bukve 1994; Almås 1995; Amdam et al. 1995; Hansen & Selstad 1999). Looking at this in context, there are four main strategies, as presented by Amdam, Isaksen and Olsen (Amdam et al. 1995) in their book about regional policy and development of rural districts (Fig. 4):

- (1) Acquisition involves a dispersed initiative with, for example, investments and government workplaces on the part of the authorities to areas which succeed in presenting a convincing case that they need them.
- (2) Growth centre strategy involves a concentrated effort which may well be in a regional centre, which can then function as a driver for the whole region.
- (3) Local resource mobilization involves stimulating and following up all types of ideas and initiatives from the local community. There are several variants of this, but the idea is to let a thousand flowers blossom.
- (4) The small enterprise and network strategy is an initiative to develop concentrations of firms in the same or related sectors, or rather to develop the relationships between them.

There is also a certain chronological sequence in the degree to which the strategies have prevailed in the Norwegian post-

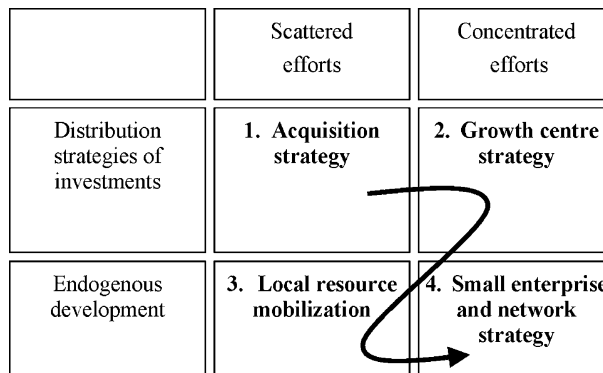


Fig. 4. Regional development strategies (Amdam et al. 1995).

war period, even though elements of all of them also exist today. The arrow indicates the chronology.

Against this background, RIS are an example of such small enterprise and network strategies. In other words, preparation or stimulation to promote the development of regional innovation systems is an expression of a concentrated initiative in regions, based on endogenous development.

As mentioned in the discussion of concepts, the public sector, together with the university and research sector, play an important role in the effort to stimulate increased innovation in the business sector. The public sector's role is especially important in work to stimulate the development of regional innovation systems. One might ask whether it is possible at all to create a strategic development of innovation systems. For example, Nilsson & Uhlin (2002) argue that control of systems is not possible because they are too complex and because individual actors are the drivers in these systems. However, there are certain *functions* in innovation systems which can be stimulated through government initiatives, such as relevant education and research.

With regard to regional consequences, I restrict my discussion to two dimensions in Fig. 4. The first is endogenous or internally generated development, where dynamics in the region promote growth in which the actors and resources of the region play a vital role. The second is regional distribution, meaning how economic activity and indicators are distributed among the regions and within the regions as far as development is concerned. This is quite simply related to the regions which succeed and the regions which do not.

First, endogenous development is discussed. A key principle for stimulating the development of regional innovation systems is to develop what already exists in the region. Most importantly, there should be a regional industrial cluster on which to build. Research shows that there are not many of these in Norway. Onsager (2004) has, however, estimated that such regional clusters make up 15–20% of the person-years in Norwegian industry. However, I would like to consider this from a slightly broader perspective, and rather regard the strategies as development in the direction of RIS. This means I include most of the efforts to develop RIS.

I apply the broad understanding of innovation systems here, emphasizing knowledge, knowledge transfers and learning in order to stimulate innovation, including a strong emphasis on informal institutions. In such contexts, a

distinction is often made between explicit knowledge, which can be expressed in formal language, and tacit knowledge which cannot be expressed in this way, but is embedded in routines and skills. Tacit knowledge is thus local to a much greater extent. While both forms are important in innovation efforts – it is not possible to discuss one form without the other – there are differences between sectors with respect to their knowledge bases. Asheim & Gertler (2005) use the concepts of *synthetic* and *analytic* knowledge to describe such variation in *knowledge bases*. Synthetic knowledge bases are primarily related to sectors in which innovation takes place through the usage or novel combination of existing knowledge – a synthesis. An example is traditional manufacturing industry, such as the shipbuilding industry. Analytic knowledge bases prevail in sectors where scientific knowledge is highly important and where innovation is based on developing new knowledge – new analyses. Biotechnology and electronics are examples of such activities. Innovation processes within these sectors tend to be more structured.

What does this imply for the regional consequences of developing RIS?

To achieve the best possible results in a region, the stimulation for development should take account of the knowledge base and the distinctive features that apply to the sector and related sectors to be simulated.

Regions such as Røros and the islands of Lofoten (Fig. 3) have completely different prerequisites and needs relating to the development of a regional innovation system than, for example, Rogaland. All these regions have tendencies toward the development of regional systems within the food sector. Røros and the Lofoten Islands have a synthetic knowledge base where traditional and new knowledge of food is combined to highlight distinctive geographical features. More knowledge is needed about the way food is profiled, distributed and marketed in these regions, while Rogaland has a solid conventional food industry working in close cooperation with knowledge communities from several geographical levels. The knowledge communities serve the whole value chain. They also have more analytic knowledge in their knowledge base. An example of an innovation from Rogaland in the Norwegian market was the establishment of Fjordkjøkken, which produces ready-to-eat meals for Fjordland. This took place on the basis of close cooperation between both business and knowledge communities – both synthetic and analytic knowledge was needed.

In connection with a strong emphasis on endogenous development, there may be a risk of being too inward-looking without receiving necessary impulses from outside. A lock-in may then occur, where the industrial cluster becomes locked into established work procedures, technology and solution patterns. Here, development of RIS may help them to avoid such lock-ins.

The second important dimension to consider as a background to regional consequences is *regional distribution*. In social democratic Norway, the tendency is for the regional disparities to arouse most attention. This distribution is partly related to the distribution of resources, for example, the distribution of funds for business development, and partly to results, for example the trend in employment and settlement.

Two issues can be highlighted here. First, what happens in the regions which do not have a basis for developing RIS? For example, regions without typical business clusters or with sectors in which innovation does not play such a vital role?

It seems evident that a stronger commitment to the development of RIS in isolation will contribute to a less equitable regional distribution. One can imagine that the principle described in the Gospel according to St. Matthew applies: *'For whosoever hath, to him shall be given, and he shall have more abundance: but whosoever hath not, from him shall be taken away even that he hath'* (Matteus 25 29, <http://www.bibelen.no/>). Alternatively, it would fit Gunnar Myrdal's more scientifically based law about cumulative causation, as described by Lindkvist (2002).

To illustrate this, two important agricultural regions in Norway can be considered: Jæren, 25 km south of Stavanger, and Helgeland (Fig. 3), both with substantial milk production. Let us assume a strong commitment to innovation in these two regions. Jæren – which has a strong infrastructure with strong knowledge communities – would be far better positioned than Helgeland to take advantage of such a commitment. Jæren would have a greater ability to utilize the resources to which it could obtain access, and would also be in a better position to compete for access to the resources. The result in the form of increased employment can be imagined. It would be difficult for Helgeland to emerge from this as a winner. New winners and new losers would be the result.

From an egalitarian point of view – which is here understood as equitable treatment in that each region should achieve a form of development based on its own premises – there is thus a need for a varied regional development policy. Although this is not the topic under discussion, one should not discount the possibility that several variants of the four main strategies mentioned above are needed.

The other aspect I would like to highlight is the dilemmas which various government policies face as a result of the development of RIS.

One dilemma is decentralization or fragmentation versus concentration of scientific communities. RIS in their strictest form require the development of regional knowledge communities, such as regional university colleges. This is a familiar debate, which includes arguments related to the need for such communities to be of a certain size in order to be effective. In other words, there are conflicting interests, especially when resources for research are limited.

Another dilemma is related to the national profile of agricultural policy and regional equalization as a goal in contrast with regionalized development. Clearly, regionalization will weaken the equalization profile which is the objective of the national policy. A distinctive feature of Norwegian agricultural policy is the strong emphasis placed on regional balance in production. The motivation stated for this is the objective of contributing to rural development and disperse settlement. Regionalization may function as a lever facilitating a break with the national perspective and regulation of the milk sector. A specific example is: Will milk producers accept different prices for milk based on the way it is used in the dairy to which they supply it? This is not the case today; a national equalization scheme is in effect. This is a political dilemma, where the role of research is only to clarify the issues.

Conclusions

The main conclusions are, first, that RIS have little significance for innovation within the conventional dairy industry in Norway but in the development of local and regional food, within the quality 'turn' in the food sector, there are indications that RIS may become significant. Here, RIS can play a critical role in the differentiation of the Norwegian food sector. Second, development of RIS has consequences in the form of a change in the distribution of value added at different geographical levels, which in turn may increase regional differences.

Within the theory of innovation and innovation systems, there appears to be little attention to such consequences of distribution. The need for innovation is not regarded as implying potential problems. Commitment to innovation, however, should also involve critical analyses of innovation, including RIS. This includes questions such as: What are the aggregated effects of the changes? Which interests are being served? Which actors have power? How are decisions about the allocation of resources made?

To summarize the discussion in this article, first, a regional point of departure is necessary to make it possible to draw on local or regional resources in the process of innovation. Second, RIS may be a highly relevant strategy when an industrial cluster exists – one must have something to build on. Commitment to such development without an industrial cluster will probably be wasted. Third, RIS also have strong needs for relationships beyond the region, or they face the risk of lock-in. Fourth, a one-sided commitment to RIS will result in regional disparities in growth. Varied strategies for innovation and for regional development can compensate for these disparities. However, this is a political question.

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