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What is AKIS?

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AKIS is short for the Agricultural Knowledge and Innovation System. It can be seen as an analytical construct, a tool for illustrating actors and networks in a specific context. In the next EU agricultural policy, 2023-2028, member states are encouraged to use the AKIS concept in order to improve knowledge flow and strengthen links between research and practice. This fact sheet presents the historical basis of AKIS, an overview of AKIS in Europe and Sweden, and concludes with some reflections regarding the concept.

History of AKIS

In 1980, U.J. Nagel introduced the concept of the agricultural knowledge system, AKS, as a paradigm for the study of information linkages between three main actors: universities, disseminators and users. He proposes six functions of an AKS:

1. Needs identification
2. Generation of knowledge
3. Operationalisation of knowledge
4. Dissemination of knowledge
5. Utilisation of knowledge
6. Evaluation of experiences

Nagel emphasises needs identification and efficient knowledge flow, and holds that, ideally, the system should work towards the user, as this provides its major legitimation. While his model is predominantly linear - researchers produce innovative knowledge, spread by extension service, used by farmers - this should ideally work as a continuous circular flow with feedback between each function.

The assignment of specific functions to specific actors is criticised by Röling (1990) who holds that all major actors should engage in all major functions. He finds Nagel's model too "one-way", notes that the word "feedback" denotes reaction rather than action, and laments the lack of appropriate vocabulary to describe the "upstream" flow emanating from users. Röling agrees with Nagel on the importance of the user, stating: "A hallmark of successful AKIS is that users have considerable control over technology development and transfer" (Röling 1990:37). He adds information to Nagel's model, hence 'Agricultural Knowledge and Information System', AKIS. He stresses that a system working optimally and synergistically should be able to achieve more than would be achieved by its individual parts; the total impact of an AKIS should be more than the sum of its constituents.

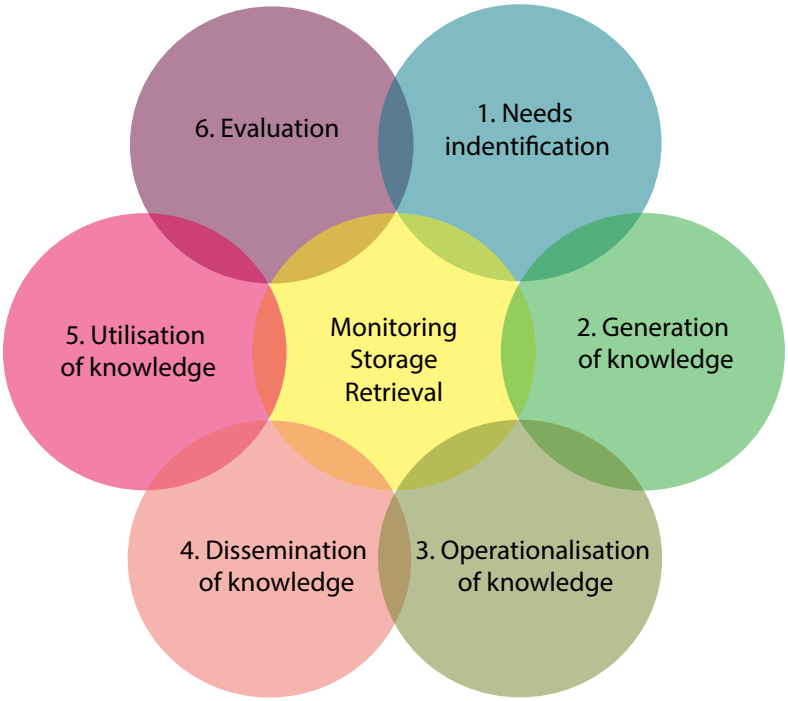

Figure 1: Functions within an AKIS, adapted from Bachmann (2000:25).

In the year 2000, Bachmann turned Nagel's model into a flower-picture of functions, adding monitoring to the list, see figure 1.

Meanwhile, the concept of 'systems of innovation' was developing within the general industry (Edquist 1997). This concept was introduced in agriculture as 'agricultural innovation systems', AIS, by Hall et al. (2001). AIS was defined as "a network of organizations, enterprises, and individuals focused on bringing new products, new processes, and new forms of organization into economic use, together with the institutions and policies that affect their behaviour and performance" (Hall 2006:vi-vii).

Hence, the two concepts of AKIS and AIS have different roots, as they have emerged from an extension perspective and a research perspective, respectively (Rivera et al., 2006). However, today they are often

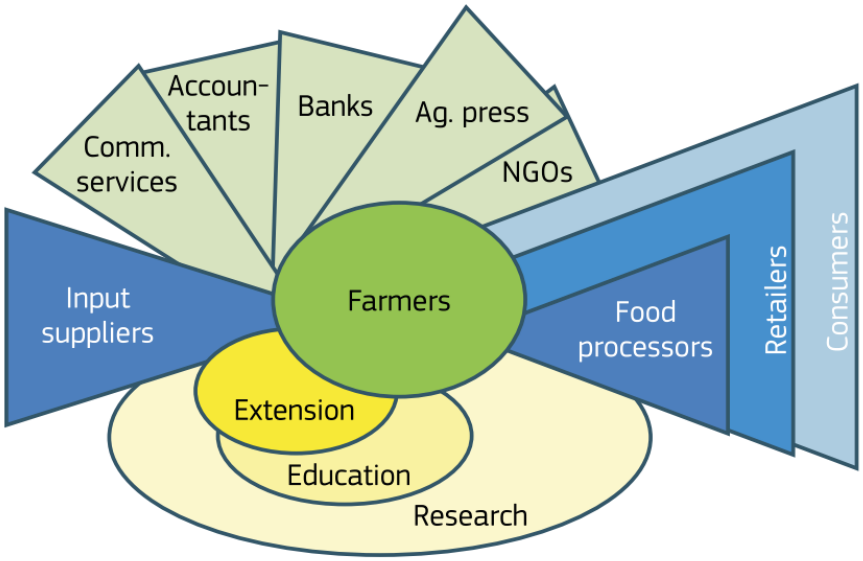

Figure 2. A model of AKIS according to the EU SCAR report (2012:9)

regarded as being merged into the concept of 'Agricultural Knowledge and *Innovation* System' (EU SCAR 2012). The new AKIS is defined as "a useful concept to describe a system of innovation, with emphasis on the organisations involved, the links and interactions between them, the institutional infrastructure with its incentives and the budget mechanisms" (ibid:8), see figure 2.

International AKIS

The EU's Standing committee on agricultural research has concluded that the current knowledge and innovation system is not fit to deliver knowledge and innovation to modern agriculture (EU SCAR 2009). The committee stresses the need for renewed political attention on the effectiveness and relevance of AKIS's in Europe, and for a redefinition of AKIS. They note that various disciplines in agricultural research lack inter-connection, and that there is a need to strengthen the research – practice interface (EU SCAR 2012:33).

A study of eight EU countries reveals some of the difficulties of contemporary AKIS's: Decreasing funding, overregulation of innovation policy, lack of evaluation criteria, decreasing trust between actors, lack of capabilities to articulate knowledge needs, competitive knowledge market structures, etc. (Hermans et al. 2015).

An investigation of AKIS's in the EU concludes that there is no unified AKIS structure in the member states; many features differ, and no general recommendations can be made (Knierim and Prager 2015), see figure 3.

In the scientific literature on AKIS, the shift from linear innovation models to a systemic view has been further emphasised as agriculture is transforming from purely food production to the provision of a variety of products and services by farmers and rural entrepreneurs. Innovation is viewed as a result of multiple interactions between many actors, affected by policy environments, institutions, and societal systems, where farmers' knowledge, motivations, and values are important (Knickel et al. 2009).

While some AKIS studies focus on 'enabling environments' of innovation, such as static analysis of actors, networks and institutions, other studies focus on the dynamic analysis of systems-in-the-making and the emergence of niches challenging incumbent systems (Klerkx et al. 2012). Yet other studies target the functions needed for a well-functioning system. All three perspectives have similar views on key enabling factors, e.g., multi-actor networks, niche management, articulating visions, and social learning processes. In addition, alternative forms of doing research are emphasised, including monitoring and evaluation practices to enhance reflexivity (ibid).

With the increasing fragmentation of AKIS, the role of innovation brokers and intermediary organisations becomes more important, with SLU Partnership Alnarp as an example of this (Larsson et al. 2009).

AKIS in Sweden

In the new EU agricultural policy, the member states are encouraged to map their AKISs, and work to enhance knowledge flow and strengthen links between research and practice (EU SCAR AKIS 2019). The Swedish Government and the Swedish Board of Agriculture are preparing to adapt the new EU agricultural policy to domestic conditions, establishing AKIS work for the coming years. The OECD (2018) notes that Swedish efforts around targeted research and education can help overcome natural disadvantages such as remote location, cool climate, and the high costs of regulatory compliance, labour and taxes.

Several Swedish investigations have already analysed domestic AKISs from various perspectives, listing perceived deficiencies and suggested improvements. Rabinowicz et al. (2012) studied the functions of the agricultural innovation system from the viewpoint of innovation brokers, and found that it is difficult to determine the quality of

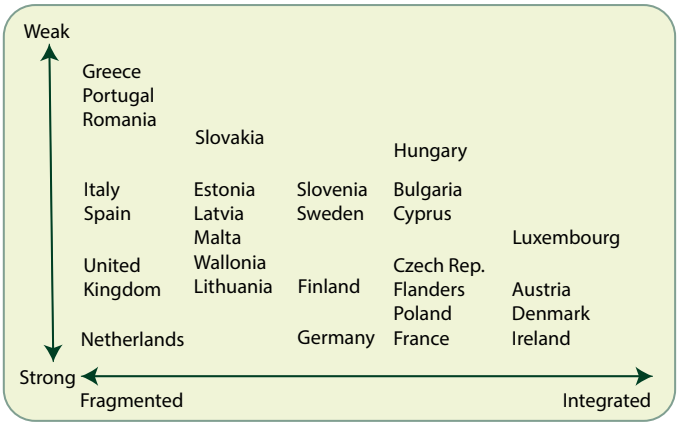

Figure 3: An overview of AKIS's in Europe along a continuum from weak – strong and fragmented – integrated (adapted from Knierim and Prager 2015:4).

their functioning. The authors point to the articulation of needs and inter-disciplinary networking as two functions that need further attention.

Reviewing AKIS from an advisory service perspective, Yngwe (2013) emphasises the need for more independent advisory services, as advice by public funding (influenced by political goals) and by selling companies (influenced by sales goals) has increased. Yngwe also points to the need to attract students to advisory careers, to keep advisors up to date on new technology, and to organise advisory services according to the increasingly complex reality of farmers. In a similar vein, Nordlund and Norrby (2021) investigate AKISs focusing on advisory services. They report that domestic research today is rarely used, due to a lack of applied research, which impels advisors to turn abroad for relevant knowledge. The current situation for advisors and advisory organisations is analysed in greater depth by Höckert (2017), finding that an individualistic and resource-driven culture still prevails, despite efforts to move towards new roles and visions.

Reporting the AKIS of animal production, Gielen and Nyström (2019) find that while there are already several actors involved, their coordination and collaboration is less well developed. The authors suggest the building of a new platform to act as an intermediary. Studying rural entrepreneurship, Cederholm Björklund (2020) argues for urgent changes in the support system for rural entrepreneurs and innovators.

Reviewing the entire agri-food innovation system, the OECD (2018) finds that, although the Swedish economy in general is innovation-oriented and competitive, this is not the case for many parts of the agri-food sector. They note that "research is not well connected with the needs of the agriculture and food sector" (OECD 2018:12), causing the agri-food sector to be less innovative than the rest of the Swedish economy. Johansson (2021) points out that the agri-food industry has a limited capacity for investing in research and innovation, and neither networks nor cooperation strategies are well developed between industry, research, rural entrepreneurs and innovation support actors.

To improve the societal impact of the research done at SLU, Glynn et al. (2018) suggest improved merit incentives for practice-oriented research, investment in communication efforts, and better integration of social and natural sciences. von Bothmer et al. (2013) note that 'information and collaboration' are probably the activities which have undergone the most radical changes within the university over the years.

The difficulties of communication between research and practice are hardly new. During the period from 1945-1987, it took an average of 16-18 years from the start of an agricultural research project until the results had any practical implications at the farm level (Renborg 2010). In a very early 'AKIS' model, Carlsson (1979) point to the close link between physical flow and information flow, see figure 4.

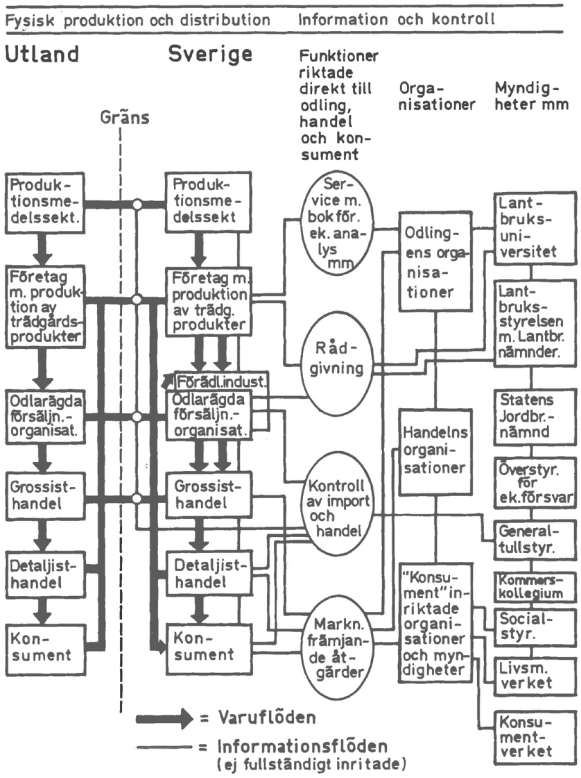

Figure 4. System elements, flow of products and information in Swedish horticulture (Carlsson 1979:2)

Reflections on the AKIS concept

Is there really a system? While AKIS can be seen as an analytical construct, a tool for illustrating actors and networks in a specific context (Bergek et al. 2008), it is also useful to be aware of some of the pitfalls of our understanding of AKIS.

The early AKIS concept adopted a 'hard systems approach', in the sense that actors were viewed as rational parts of a machinery that could be optimised and engineered towards certain ends. This view was suitable for the mass production of standardised (advisory and technical) products. Later, this view was complemented by a 'soft systems view', focusing on social learning and change in dynamic processes between heterogeneous actors (Leeuwis 2004).

The AKIS concept tends to emphasise a common goal for the system, i.e., generating, extending and utilizing knowledge with the aim of increasing system synergy. This leaves little room for the variegated aims and incentives of individual actors. Indeed, actors do not always act as if they are in the same system, nor are they aware of any system goals (ibid). Moreover, where should the boundaries of an AKIS be drawn? Should they be drawn by geography, sector or technology? The actors, networks and institutions involved will vary depending on the delineations made.

Finally, the innovation systems policy framework, on which AKIS rests, is built on historical perspectives depicting innovation as a panacea. However, it has been argued by Schot and Steinmueller (2018), among others, that there is a need to foster new innovation policies that emphasise socio-technical system change in order to tackle current societal challenges, such as climate change, poverty and inequality. With an awareness of its strengths and weaknesses, the AKIS concept can be an asset in cultivating multi-actor collaboration and contributing to achieving societal goals.

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