

The criteria for agricultural innovations for smallholders and family farms in the FAO-REU region

Technical paper prepared in connection with the

Regional expert consultation on knowledge sharing for agricultural innovations applicable for smallholders and family farmers in Europe and Central Asia

Gödöllő, Hungary, 10-13 September 2018

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Introduction

One of the main priorities of the Food and Agriculture Organisation of the United Nations (FAO) in the (Central and Eastern) European and Central Asia (EECA) region is to provide policy advice to governments in support of sustainable intensification of production for small and family farms as part of its Regional Initiative 1 ‘Empowering Smallholders and Family Farms for Improved Rural Livelihoods and Poverty Reduction’ (FAO, undated)¹. To facilitate sustainable intensification, FAO believes that more efforts should be dedicated to investigating the ‘ecosystem’ of innovation in family farming, horizontally across the sectors (food, crop production, livestock husbandry, fisheries and forestry), and also vertically, by exploring gender, agribusiness and other aspects.

This approach is consistent with one of FAO’s five strategic objectives, namely number 2 ‘make agriculture, forestry and fisheries more productive and sustainable’ (FAO, 2013a). However, in its publication *Save and Grow*, FAO recognises that environmental virtue alone is not enough: farmers must see tangible benefits in terms of higher incomes, reduced costs and sustainable livelihoods, as well as compensation for the environmental benefits they generate (FAO, 2011a). This can have a positive, direct impact on the strategic objective 3 ‘reduce rural poverty’, and contribute to the remaining three such objectives, numbers 1 ‘help eliminate hunger, food insecurity and malnutrition’, 4 ‘enable inclusive and efficient agricultural and food systems’ and 5 ‘increase the resilience of livelihoods from disasters’.

On 10-13 September 2018, FAO-REU convened a regional expert consultation on knowledge sharing for agricultural innovations applicable for smallholders and family farmers in Europe and Central Asia. The consultation discussed (i) criteria for data collection on agricultural innovations for smallholders; (ii) mechanisms for data collection and validation, (iii) related existing platforms/mechanism and gaps; and (vi) interaction and collaboration with other platforms and networks to avoid duplication. More specifically, the expert consultation sought to elaborate and validate criteria for selection and data management of agricultural innovations, applicable for smallholders and family farms in Europe and Central Asia. This technical paper has been prepared to support this work.

Overview of farm structure in the region

In the last twenty-five years, farming in EECA has been marked by an overall shift from collective to individual land tenure, accompanied by land restitution and privatisation. This

¹ This contributes to FAO’s Strategic Objective 3 ‘Reduce rural poverty’.

has (a) created a large number of family farms with unequal access to knowledge, markets, conditions and opportunities for innovation, and (b) left governments with challenges regarding policies and institutional capacities to address adequately innovation demands. The great majority of the farms in EECA are family farms, and most are small or very small. Even so, family farming is very diverse, ranging from subsistence production to fully market-oriented, often intensive farms based on modern technologies. Furthermore, the social and economic contributions of small farms differ widely between countries across EECA.

In its *State of Food and Agriculture: Innovation in family farming* report (FAO, 2014a), FAO states that of the world's 570 million farms, 7 per cent are located in EECA. However, this definition of EECA includes the Russian Federation and Turkey with around 23.2 million and 3.1 million farms respectively. Excluding these numbers, FAO (2014a) records around 12.4 million farms in the region (Table 1), but data from many countries outside the EU are missing. In line with the country groupings adopted by Bruinsma (2012), EECA can be divided into three sub-regions, namely *post-socialist Member States of the EU* (11 countries), *Eastern Europe and the Western Balkans* (9 countries) and *Southern Caucasus and Central Asia* (8 countries)². Recent farm developments for each sub-region are as follows:

In terms of the number of farms, the 11 *post-socialist Member States of the EU* are dominated by Poland and Romania (Table 1). In Poland (which did not see collectivisation) and in Romania (which did), most of these farms are 2 ha or less in size. In the ten countries that joined the EU in 2004, Eurostat data show that in 2007 there were 4.5 million agricultural holdings of less than 2 ha out of 8 million farms. The accession of Romania and Bulgaria in 2007 greatly increased this share. Two features of small-scale farming in the EU identified by Davidova and Thomson (2013) are particularly applicable to the post-socialist Member States. Firstly, it is very labour intensive, with a (high) labour-to-land ratio of 0.55 full-time equivalent employed per hectare. Secondly, it is still socially of key importance, providing income and keeping millions of farmers and their households in rural areas.

Czechia is an EU Member State where the role of small farms (in terms of land area) remains minor, although almost 45 per cent of farms are no bigger than 2 ha. However, very large farms continue to exist in some countries. In Bulgaria, Czechia and Hungary, the area accounted for by farms of 50 ha or more is comparable to the UK, but in the latter country over 30 per cent of farms are larger than 50 ha (cf. 1, 10 and 6 per cent respectively). In the region as a whole, in 2010 around 99 per cent of farms were family farms, according to Eurostat data. Davidova and Thomson (2013) note that 85 per cent of all semi-subsistence farms (i.e. those that sell less than 50 per cent of their output) in the EU are located in Hungary, Italy, Poland and Romania.

For *Eastern Europe and the Western Balkans*, FAO (2014a) presents data only for Albania. During the period 1990-2004, 564,000 ha of agricultural land were privatised, creating around 450,000 family farms. Despite out-migration from rural areas and mergers of farms, average farm size remains very small and the number of farms bigger than 5 ha is negligible. Mizik (2012) presents comparable data for all Western Balkans countries³. These show that, although Albania represents an extreme, small farms dominate across the region. In Serbia the average farm size has increased to 9.6 ha UAA in the north of the country and 3.6 ha in the south, while the fastest growing group of farms are those with 20 ha or more (Davidova and

² Bruinsma (2012) defines the (then) 27 Member States of the EU as a single group, and includes Croatia in the *Eastern Europe and the Western Balkans* group.

³ Data for Kosovo are included in Serbia.

Thomson, 2013). In FYRO Macedonia, around 80 per cent of agricultural holdings are estimated to be around 2.5 and 2.8 ha on average, but they are often fragmented into several plots. ‘Agrocombinats’ left over from the previous system are being privatised.

Table 1: Total number of agricultural holdings⁴ (thousands), and shares (in per cent) in the number of holdings (bold text) and agricultural area (*italics*) by land size class (ha) in nine EECA countries, and Italy and the UK⁵ (various recent years according to data availability).

Country	No. holdings	<1	1-2	2-5	5-10	10-20	20-50	>50
Albania	324	60	7	30	<i>11</i>	10	<i>83</i>
Bulgaria	370	77	7	20	<i>8</i> 2 7 1 78
Croatia	450	51	6	16	7	19	<i>20</i>	9 <i>21</i> 4 <i>15</i> 1 <i>31</i>
Czechia	23	29	0	15	0	17	<i>1</i>	11 <i>1</i> 9 <i>2</i> 8 <i>4</i> 10 <i>92</i>
Estonia	84	20	1	20	2	24	<i>6</i>	16 <i>9</i> 11 <i>12</i> 6 <i>14</i> 3 <i>56</i>
Georgia	730	70	<i>24</i>	23	<i>23</i>	5	<i>12</i>	1 <i>5</i> 0 <i>4</i> 0 <i>4</i> 0 <i>27</i>
Hungary	967	27	2	13	1	19	<i>3</i>	11 <i>4</i> 14 <i>6</i> 10 <i>10</i> 6 <i>74</i>
Italy	2591	38	2	19	4	21	<i>9</i>	10 <i>9</i> 6 <i>11</i> 4 <i>16</i> 2 <i>19</i>
Kyrgyzstan	1131	85	8	7	8	5	<i>15</i>	2 <i>10</i> 1 <i>8</i> 0 <i>9</i> 0 <i>42</i>
Latvia	180	0	..	6	0	20	<i>3</i>	22 <i>8</i> 24 <i>17</i> 20 <i>31</i> 7 <i>40</i>
Lithuania	611	0	0	8	1	47	<i>14</i>	23 <i>15</i> 14 <i>18</i> 6 <i>17</i> 2 <i>35</i>
Poland	2933	33	3	18	5	21	<i>13</i>	15 <i>18</i> 9 <i>21</i> 3 <i>16</i> 1 <i>25</i>
Romania	4485	50	5	20	8	23	<i>20</i>	6 <i>11</i> 1 <i>4</i> 0 <i>2</i> 0 <i>50</i>
Slovakia	71	70	..	12	..	10	..	2 .. 1 .. 1 .. 3 ..
Slovenia	75	28	..	13	..	23	..	18 .. 13 .. 5
U. Kingdom	233	14	0	9	<i>1</i>	11 <i>1</i> 13 <i>3</i> 21 <i>10</i> 32 <i>85</i>

Source: FAO (2014a) and Hungarian Central Statistical Office (www.ksh.hu)

In the post-soviet countries of EECA, agricultural land had belonged to the state and the first step was to legalise private ownership. Currently, the agricultural sector in Ukraine is subdivided into large corporate farms and, by comparison, small individual farms that range from household plots to farm cooperatives jointly operated by a few families and small corporations. Among the former group, the trend towards extreme concentration of land is continuing, as large farms merge further to mega agro-holdings (Keyzer *et al.*, 2012). Small landowners owned 27 million ha of the national total of 41.5 million ha in 2013, but leased out 17.3 million ha. In the Republic of Moldova in 2012, 39 per cent of agricultural land was controlled by agricultural enterprises and other institutions, while peasant farms and household plots accounted for 29 and 15 per cent respectively (Davidova and Thomson, 2013). Belarus has not appreciably individualised landholdings.

⁴ FAO’s theoretical definition of an agricultural holding is “an economic unit of agricultural production under single management comprising all livestock kept and all land used fully or partly for agricultural production purposes, without regard to title, legal form, or size. Single management may be exercised by an individual or household, jointly by two or more individuals or households, by a clan or tribe, or by a juridical person such as a corporation, cooperative or government agency” (FAO, 2014a).

⁵ Italy and the UK are included for comparison as examples of major northern and southern European countries.

Among the countries of the *Caucasus and Central Asia*, FAO (2014a) presents data only for two countries. In Georgia almost 50 per cent of land is covered by farms of 2 ha or less (indeed the average family farm size in Georgia is less than 1 ha). This reflects the fact that family farms dominate the farm structure in the three Southern Caucasus countries: in 2007, 97 per cent of agricultural land was managed by individual farms (Lerman, 2012). This figure far exceeded those for other sub-regions of EECA.

In Kyrgyzstan a small number of huge agro-holding companies account for a large share of the agricultural area. This belies the fact that 85 per cent of the estimated 1.1 million farms are believed to be smaller than 1 ha in size (Table 1). Across the five Central Asian countries, individual farms are the dominant form of organisation of agriculture, accounting for 71 per cent of agricultural land in 2007 (Lerman, 2012). Agro-holding companies play a major role in Kazakh agriculture, but individual farms and household plots accounted for over two-thirds of total agricultural output in 2009 (OECD, 2013). In Tajikistan, the prevailing farm types are *dekhan* (peasant) farms (including extended family *dekhan* farms that are similar to partnerships) which mainly specialise in crop production, and household plots that specialise in livestock. Turkmenistan and Uzbekistan have not formally recognised private ownership of land but do allow family lease holding (Davidova and Thomson, 2013).

Innovation and family farming

Definitions of innovation

FAO has formulated the following definition of what constitutes family farming: “Family farming includes all family-based agricultural activities, and it is linked to several areas of rural development. Family farming is a means of organising agricultural, forestry, fisheries, pastoral and aquaculture production which is managed and operated by a family and predominantly reliant on family labour, including both women’s and men’s” (EC, 2013). This umbrella concept incorporates farms of many different types and sizes, with both full- and part-time farmers: some are commercial business operations while others, termed semi-subsistence farms, produce mainly to satisfy household food needs.

Numerous definitions of innovation appear in policy documents. WB (2006) states that “[i]nnovation is the process by which individuals or organizations master and implement the design and production of goods and services that are new to them, irrespective of whether they are new to their competitors, their country, or the world”. Similarly, OECD (1999) defines it as “anything new introduced into an economic or social process” and as “the ability to manage knowledge creatively in response to market-articulated demands and other social needs”. It does not matter whether this is new to producers, competitors or the economy. According to OECD (2005), innovation can be a technologically new or remarkably improved product, service, process, a new marketing or management method in the business practice, organisation or external relationship. Based on this definition, product innovation, process innovation, marketing innovation and organisational innovation can be differentiated (Box 1). From the European Union, SCAR (2012) uses the OECD’s definition of innovation.

Farmers can innovate in different ways. Change can involve farm products, production processes and/or farm organisation and management⁶. In addition to facilitating sustainable

⁶ Innovation is often used as a synonym of a new technology or product, however a new plant variety can be considered as innovative only after its economic, environmental or social benefit for the farmer has been proven in practice.

intensification, innovation helps farmers to expand, change or diversify their marketable output, thereby increasing the profitability of their farms, to free up resources for use in other economic activities, or enhance the provision of important ecosystem services (FAO, 2014a). It can be argued that there is a difference between an entirely new, ‘breakthrough’ innovation and the adoption and/or adaptation of a massively-spread innovation. Farmers can justifiably point out that, when dealing with plants, animals and the weather, they have been innovating and adapting their practices since agriculture began. However, innovations created out of immediate and urgent needs, for example of smallholders or family farmers, frequently from their existing knowledge and without the appropriate resources to grow, have usually very limited potential to upscale and generate a development change, or lead to transforming the agricultural sector.

Box 1: Forms of innovation.

- **Product innovation.** This involves the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics.
- **Process innovation.** This has to do with the implementation of a new or significantly improved production or delivery method. This might be significant changes in techniques, equipment, and/or software.
- **Marketing innovation.** This involves the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing.
- **Organisational innovation.** This deals with the implementation of a new organisational method in a firm’s or another collective’s practices, collaboration organisation or external relations.

Source: Inventta (2015) via Knierim *et al.* (2015)

Over fifteen years ago, OECD (1999) could state (p.9) “[e]nterprises are the main source of innovation”. More recently, the innovation systems approach promoted by FAO has recognised that innovation is also a social process between different actors. This is linked to the concept of social innovation. Bock (2012) observes (p.57) that “[e]verybody seems to agree that social innovation is important but what exactly is meant by the term often remains unclear”. She lists three main interpretations of social innovation that underline (a) the social mechanisms of innovations (they take place within specific social and cultural contexts and networks of social relations); (b) the social responsibility of innovations (they should take into account ‘people and planet’ and not only ‘profit’); and (c) the innovation of society (where the focus is on changes in social relations, people’s behaviour, and norms and values) (Box 2).

Box 2: Interpretations of social innovation.

- **The social mechanisms of innovation.** Innovation takes place within specific social and cultural contexts and networks of social relations. Innovations are, hence, socially, culturally and territorially embedded.
- **The social responsibility of innovations.** Technological innovation is increasingly met by concern about, for instance, their potential risks for human safety and the environment. In addition, innovations may serve some groups more than others.

- **The innovation of society.** The need for society to change as a prerequisite for solving problems such as discrimination, poverty or pollution. Here the focus is on changes in social relations, people's behaviour, and norms and values.

Source: Bock (2012)

Crucially, however, there is a clear distinction between *innovation* as the *process* whereby new or existing products, processes or ways of organisation are brought into use for the first time, and plural term *innovations* which refers to the *outcome*, i.e. the products, processes or ways of organisation that are brought into use. This distinction challenges the traditional thinking of 'innovation' as referring only to technological solutions. While 'innovations' rather than 'innovation' are the focus of this technical paper, criteria for innovations must of necessity take into account the process of innovation, especially interactive innovation.

The process of innovation

Historically, there has been an emphasis on the 'linear' model of innovation, also referred to as the Transfer-of-Technology (ToT) model. Here, knowledge is considered to flow in one direction, from researchers through advisors to farmers. 'Codified' knowledge, normally originating from formal research and development programmes (whether in the public or private sector), is perceived to be much more valuable than 'tacit' (or 'lay' or 'local') knowledge that has arisen from farmers' own experiences.⁷ In fact, innovation often involves fresh applications of such traditional knowledge (EU, 2013). Hence, in recent years there has been increasing interest in the so-called 'interactive innovation approach', in which collaborations between actors with a broad range of experience and expertise (farmers, business, academia, NGOs etc.) will generate the *creativity* which may lead to an *innovation*.

It should be recognised, however, that innovations do not occur in isolation and the innovators are not the sole agents of change. Several additional factors, such as policy, legislation, infrastructure, funding and market developments, play key roles (Klerkx *et al.*, 2012). It is the effective operation of the entire 'Agricultural Innovation System'⁸ (AIS) that makes it possible to bring new products, processes and forms of organisation into use to achieve food security, economic development and sustainable natural resource management (FAO, 2012).

At the core of the AIS are individuals and institutions relevant to agricultural innovation in the food chain, and the knowledge flows between them. This core can be characterised in slightly different ways. The Tropical Agriculture Platform (2016) model of the AIS (Figure 1) identifies three groups of actors, namely 'research and education', 'bridging institutions' and 'business enterprise' including agricultural producers. The knowledge flows between these actors are complex and multidirectional. One useful revision that could be made to this part of Figure 1 is to replace 'Agricultural producers' with 'Farm households'. Numerous studies (Garforth *et al.*, 2003), have shown friends and family to be important sources of information

⁷ In the opinion of the author, while the potential role of tacit knowledge must be adequately valued, it would be a mistake to be dismissive of linear knowledge flows, which continue to have an important role in knowledge sharing and innovation in the Agricultural Innovation System, a point also made by Dockès *et al.* (2011).

⁸ Defined by Tropical Agriculture Platform (2016) as 'A network of actors or organizations, and individuals, together with supporting institutions and policies in the agricultural and related sectors, that brings existing or new products, processes, and forms of organization into social and economic use. Policies and institutions (formal and informal) shape the way that these actors interact, generate, share and use knowledge, as well as jointly learn'.

and knowledge for family farmers⁹, but the farming family is often omitted from models of the AIS. Similarly, Koutsouris *et al.* (2017) observed that farmers tend to be most influenced by proof of successful farming methods by their peers, so-called peer-to-peer learning.

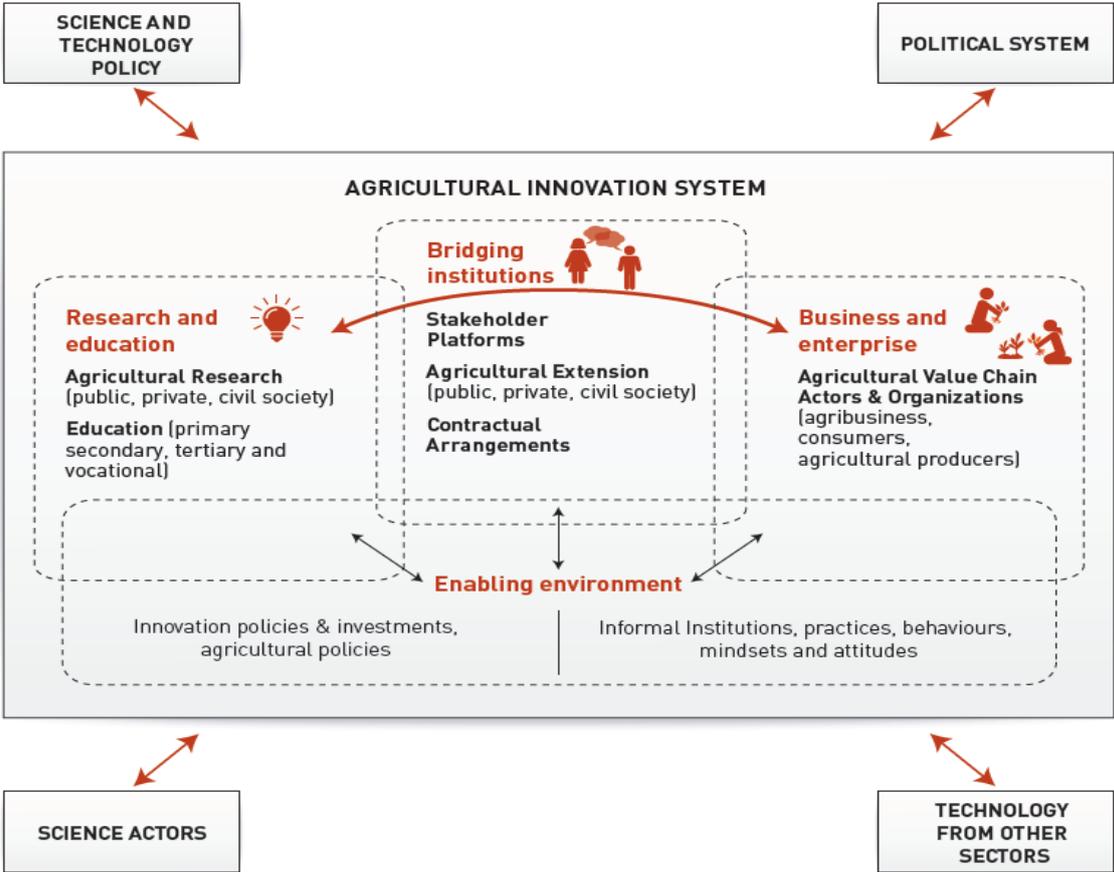


Figure 1: The Agricultural Innovation System.
Source: Tropical Agricultural Platform (2016)

These individuals and institutions at the core of the AIS must work within a broader ‘enabling environment’ (which includes factors such as political commitment and vision; policy, legal and economic frameworks; budget allocations and processes; governance and power structures; incentives and social norms). In turn, the operation of the AIS is constrained by the ‘consensus’ (tacitly) agreed between the four components of the so-called ‘Quadruple Helix’ (academia, government, business and civil society; see e.g. Carayannis and Campbell, 2012), albeit one in which the relative influences of the four helices fluctuate over time.¹⁰ This mechanism is comparable to that outlined by Renting and Wiskerke (2010), in which the development and functioning of food systems are subjected to a ‘governance triangle’ of market, state and civil society. The inclusion of ‘academia’ in the governance framework is a logical extension of this in connection with AIS.

Wielinga (2017) concludes that key actors in the enabling community are not always aware of what it takes to create the conditions that are conducive to innovation. She argues that too

⁹ See also section 3.1 of this study.
¹⁰ An innovation such as, for example, genetically modified crops requires academia to develop the methodology for transformation and business to commercialise it. However, the success (or otherwise) of the innovation depends on the legal framework put in place by government and acceptance by civil society (the latter also having an impact on the former).

little attention may be given to the important stages of *inspiration*, in which initiators have to find the right actors to form a partnership, and the *planning* stage, in which this partnership needs to get organised and to claim space for experimenting. As long as the decision makers in their role as Managing Authorities do not make the mind-shift themselves from the ToT towards the interactive innovation model, they will not select the most promising project proposals and probably set criteria that do not allow for the necessary space for innovations. For example, strict requirements for funding project proposals, such as targets to be reached and steps to follow, leave little room for finding new and unexpected solutions.

The reason for stressing this point is because the emphasis on the ‘linear’ model of generating and communicating innovation, and the associated dominance of public-sector agricultural research and advisory services in national AISs, has persisted longer in many EECA countries than in western Europe, including Albania (Zhlilima and Kromidha, 2013), Poland and Hungary (Floriańczyk *et al.*, 2014), and Azerbaijan and Central Asia (FAO, 2014b). Although EECA countries such as Hungary are currently engaged in improving their farm advisory services, the underlying analysis still tends to focus on changes or capacity building activities within the public extension agency (see e.g. Kozári, 2014), when in fact a genuine problem-solving approach would involve a holistic assessment of and reforms in agricultural research and education policies, legislation regime for cooperatives, enabling mechanisms for public-private partnerships, financial schemes etc.

What innovation is not

Very little has been written on what is *not* innovation, which is understandable in view of the very broad definitions of the term. According to OECD (2005), the minimum requirements for an innovation is to introduce something new and to implement it into practice. What is not considered innovation is: to stop doing something, even if it improves a firm’s performance; the purchase of identical models of installed equipment, or minor extensions and updates to existing equipment or software; a change in the price of a product; customisation, regular seasonal and other cyclical changes; trading of new or improved products. Also, innovation encompasses the factors affecting demand for and use of knowledge in novel and useful ways, so if those elements are missing and only the creation (supply) of knowledge is available, then that is not innovation, but invention only.

Key issues concerning criteria for innovations

The EU Horizon 2020 project ‘Liaison’ (Better Rural Innovation: Linking Actors, Instruments and Policies through Networks) has identified several issues that should be taken into account when preparing criteria for agricultural innovations (Van Dyke *et al.*, 2018). These include:

- The distinction between *novelty* and *innovation*. Although novelty is a key aspect of innovation, novelty’s only benefit is its newness; an existing product may be changed simply to differentiate it from the competition and this is not innovation;
- The *impact* of the innovations, i.e. the question how to observe and measure outcomes from the innovations; What is impact and which type of impact need to be understood when we study innovations?
- The *ambiguity* of the innovation. There are ‘winners’ and ‘losers’ from the innovations process and sometimes these cannot be predicted or avoided;
- The *innovation cycle* and different stages in the innovation process, including the creation, and the adoption/implementation stages;

- Driving forces and power relationships (based on field of activity, funding opportunity, resources etc.) among *innovation actors*. Who are they? How do they start to work together and how they structure and govern relationships among them? How and when does an actor become an innovation actor?
- The *degree of change* that the implementation of the innovation induces into practice. Which innovation matters - the radical and disruptive one or the incremental one?
- the *type of knowledge* as the driving force of the innovation. The question which type of knowledge matters –tacit (practice) or codified (science/R&D);
- *Demand-driven and/or supply-driven* innovation. Which are the driving forces that boost the innovation process and how are they understood by the actors, i.e. as pressure or as source of change?
- Observable '*hard*' *aspects* (innovation as a product or a process) vs. innovations' '*soft*' *side*, described as learning processes, social adaptation, network creation, process of co-creation;
- two comparatively new 'buzzwords' – 'social innovation' and 'open innovation' and the question if they are two additional types of innovation besides product, process, marketing and organisational innovations or are they transversal issues, associated with any kind of innovation?
- *Context-specific characteristics* of innovation and its potential to be replicable and transferable;
- How to approach innovations? As *an isolated phenomenon* important for the concrete sector/ industry/ firm or farm or as a *system-type phenomenon*, which introduces changes in the whole supply chain and in all sectors – upstream and downstream?
- Finally, and more globally: Which *type of change* do innovations introduce - a transformative one, which allows for a shift from one system of thinking and production to another one or system-transformation change which helps the system to remain almost the same but to correct some observed failures?

Another concept that is relevant to the topic of criteria for innovations in agriculture is the sustainable livelihoods approach (SLA) described in DFID (1999). This is a way of thinking about the objectives, scope and priorities for development. A livelihood is defined as comprising the capabilities, assets (including both material and social resources) and activities required for a means of living. The sustainable livelihoods framework (SLF) consists of five major components that are related through sequential relationships and feedback:

- The *vulnerability context* which describes the external uncontrollable factors that influence people's assets and livelihood opportunities, namely shocks (e.g. environmental, conflict-related); trends (e.g. resources, technology); and seasonality (e.g. price fluctuations, employment opportunities);
- In turn, these *assets*, which are necessary for the pursuit of positive livelihood outcomes, are summarised as human, social, physical, financial and natural capital (Box 3). As we shall see, the applicability of a potential innovation in a specific situation can depend on the availability of one or more of these capitals;
- The third component consists of *transforming structures and processes*, the former including organisations that create and enforce legislation, and the latter being the determinants of interactions between the structures and individuals such as policies, legislation, power relations, norms, market stability, and general rule of law. It is equivalent to the enabling environment in Figure 1.

- Fourthly, *livelihood strategies* concern the individual's available and implemented options for pursuing livelihood goals. The greater the diversity of livelihood strategies, the higher the household's resilience to the shocks, trends, and seasonality conditions;
- Finally, *livelihood outcomes* refer to the outputs of livelihood strategies, such as higher income, greater well-being (e.g. self-esteem, physical security), reduced vulnerability, greater food security and/or improved environmental sustainability. Agricultural innovation can contribute towards achieving these livelihood outcomes.

Box 3: The five 'capitals' of the asset pentagon of the sustainable livelihoods framework.

- **Human capital.** The skills, knowledge, ability to labour and good health that together enable people to pursue different livelihood strategies and achieve their livelihood objectives. These skills are acquired both through formal education and through on-the-job and life experiences;
- **Social capital.** The social resources upon which people draw in pursuit of their livelihood objectives. They include the networks of relationships among persons, firms, and institutions in a society, together with associated norms of behaviour, trust, cooperation, etc., that enable a society to function effectively;
- **Physical capital.** The basic infrastructure and producer goods needed to support livelihoods. Components of infrastructure include transport, shelter and buildings, water supply and sanitation, energy and access to information (communications). Producer goods are the tools and equipment that people use to function more productively;
- **Financial capital.** The financial resources that people use to achieve their livelihood objectives. There are two main sources of financial capital: available stocks e.g. savings and regular inflows of money such as earned income and pensions;
- **Natural capital.** The natural resource stocks - such as land, water, and minerals - from which resource flows and services (e.g. nutrient cycling, erosion protection) useful for livelihoods are derived. Natural capital can be either renewable or non-renewable.

Source: DFID (1999)

Criteria for agricultural innovations

Based on the foregoing considerations, the extensive discussions during the regional expert consultation and the information presented in the two Annexes, the following criteria for agricultural innovations for smallholders and family farms in REU region are proposed. As these criteria are to be used for data collection and sharing, an attempt has been made to define them as concretely as possible to assist farmers, extension agents and entrepreneurs in the region to innovate (or get inspiration to innovate). A useful tool in this regard, suitably adapted, to their practical application are the so-called SMART criteria¹¹ often used in project management, performance management and personal development, namely:

- *Specific:* target a specific area for improvement;
- *Measurable:* quantify or at least suggest an indicator of progress;
- *Assignable:* specify who will do it;
- *Realistic:* state what results can realistically be achieved, given available resources;
- *Time-related:* specify when the result(s) can be achieved.

¹¹ Several variants of this approach are discussed at https://en.wikipedia.org/wiki/SMART_criteria

The first set of criteria are designed to describe the innovation, its current usage, newness and tangible benefits, and its likely/potential impact.

1. The basic nature of the innovation

- Is it actually an ‘innovation’, or rather an ‘invention’ (technology) or a ‘novelty’ or any of the other examples mentioned in the ‘what innovation is not’ paragraph above?
- What type of innovation is it, a product, process, marketing or organisational innovation as defined in Box 1?
- Is it an example of social innovation, as shown in Box 2? If it is a form of technological innovation, can it only be implemented in parallel with the necessary social innovation?
- Is the innovation (the most) appropriate to be applied in that particular situation?

2. Current application of the innovation

- What is the precise description of the innovation? Was it user-friendly to adopt?
- When, where and by whom has the innovation been applied? How widely (in a locality or region) has it been applied?
- To which innovation area (e.g. livestock husbandry, arable, forestry, fisheries, agri-food chain, rural development) is it most applicable?
- Has the innovation already been applied by smallholders/family farmers in the broadest sense of the term (q.v. previous bullet point)?
- Is the innovation only applicable to market-oriented farms or also subsistence farms?

3. Newness, type of change and tangible benefits to smallholders/family farmers

- Has the innovation previously been applied elsewhere? If so, where? Outside EECA? Elsewhere in EECA? Elsewhere in the same country, region or locality?
- Was the innovation intended to correct some observed failures in the existing system or to allow a shift from one system to another?
- How does the innovation impact on the farm business? Increased output? Different products? Greater added value? Diversification? Reduced environmental impacts?
- Is the innovation incremental by nature, or a ‘breakthrough’ (disruptive) innovation?
- What is/are the main tangible benefit(s) of the innovation to smallholders/family farmers? Higher incomes? Lower costs? Saving in labour demand? Poverty reduction? Enhanced food security? More sustainable livelihoods? Higher resilience to shocks?

It is then necessary to understand clearly the drivers of the innovation, its broader impacts (positive and negative) and the business model applied.

4. The drivers of the innovation, and constraints

- What was the concrete challenge that triggered the innovation? Was the innovation demand-driven or supply-driven?
- Was the development of the innovation driven by an individual ‘change agent’?
- Was the innovation developed using codified (academic/research) or tacit (traditional) knowledge or a combination of the two?
- Was any kind of (formal or informal) multi-actor partnership (i.e. the interactive innovation approach) involved in the development of the innovation?
- Did any aspect of the enabling environment (e.g. availability of subsidies or other funding) support the development of the innovation?
- What constraints, if any, worked against the implementation of the innovation?

5. The broader impacts of the innovation

- Was there any gender dimension to the implementation of the innovation?
- Who were the winners and the losers from the innovation? Could the occurrence of any losers be predicted or avoided?
- Was the innovation perceived locally to be ‘progress’ or a ‘backward step’?
- Were there any tangible off-farm outcomes or impacts from the application of the innovation, including at local, regional or other levels?
- Were there any ‘soft’ spin-offs from the innovation such as social adaptation or network creation?

6. The business model

- What business model is applicable to the innovation? One-time sell? Commercial service on a regular basis? Advisory service on a regular basis? Public-private partnership? Free to use/open source/community supported? Other?

Innovations are frequently context-specific. Assessing correctly the potential replicability/scalability and/or transferability of innovations between farms, localities, regions or countries is of major importance. When transferring an innovation, it is essential to incorporate the lessons from any failures as well as to be aware of the specific situation in the new locality. Implementation is reliant on a favourable combination of circumstances across the entire AIS. Without this, the innovation will fail.

7. Market considerations including risk

- Does a reliable, long-term market exist for the innovation, or from the additional output arising from it?
- Are smallholders/family farmers realistically able to access/exploit this market?
- Is there adequate capacity in the other links of the supply/value chain to support the implementation of the innovation?
- To what extent does the innovation have to be adapted before it can be implemented in a new locality? To what extent? Who will do it? Who will pay?
- What is the expected level of return on investment? Can this be demonstrated to farmers?
- What risks may be associated with the implementation of the innovation (e.g. job losses, out-migration, corruption, concentration of wealth, creation of a monopoly)?

8. The enabling environment

- Is the innovation compatible with, or likely to be supported by, the relevant policies and investment, including political commitment and vision; legal and economic frameworks; budget allocations and processes?
- Is the innovation acceptable to prevailing practices, behaviours, mindsets and attitudes, including organisational culture, trust, communication practices and routines? Are local farmers innovation-minded? What is their attitude to risk-taking?
- Specifically, do smallholders/family farmers have the necessary level of access to farm advisory services and/or other forms of knowledge and technical support such as educational institutions (including lifelong learning) and demonstration farms?
- Are there any local constraints to implementation such as patenting issues?
- Are there likely to be any issues related to ownership of data?
- Would insurance mechanisms help to mitigate risk of financial loss, and do they exist?

9. Availability of the five ‘capitals’

- What skills (e.g. entrepreneurial, technical, managerial) are needed to implement the innovation? How many people are needed to apply it? How much time is needed? Do(es) the farmer(s) have time? Is there any language barrier to implementation?
- Does its implementation require cooperation between smallholders/family farmers, or depend on any other aspect of social capital, such as the presence of a ‘change agent’? Is the innovation viewed by the local smallholder community as being credible?
- What on-farm and off-farm physical capital is needed for successful implementation? How critical are farm size and land ownership/tenure? Is the innovation based on information and communication technologies (ICTs) or does it depend on their availability (e.g. broadband Internet)? What other physical infrastructure is needed?
- Is the innovation likely to be affordable by smallholders/family farmers, either from their own resources or with available grants or loans including bank loans? Is its continued implementation likely to be economically sustainable?
- Is the innovation appropriate for the natural capital of the locality? Does/can it contribute to environmental management, such as climate change mitigation?

Concluding remarks

The data in Table 1 show that smallholders/family farms are a significant and sometimes dominant component of farming in countries across EECA. Innovation can reduce the vulnerability of smallholders’ livelihoods to shocks, trends and seasonality (*sensu* DFID, 1999). However, smallholders must feel *inspired* to innovate/adopt innovations. Every farm has its own specific set of circumstances and this means that when considering the process of diffusion of innovation, the idea of five categories of adopters (innovators – early adopters – early majority – late majority – laggards) elaborated by Rogers (2003) should be viewed with caution. Knierim *et al.* (2015) correctly point out that [an] innovation is not equally appropriate and advantageous for all concerned, and that there are people for whom inhibiting forces for adoption are far stronger than the driving forces. This fact must be respected. While promoting innovation in family farming is very rightly becoming a priority for politicians and policy makers around the world, it can only be achieved successfully *in partnership* with smallholders/family farmers, who are ultimately the best judges of their innovation needs.

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Annex 1: Definitions relevant to agricultural innovation used by FAO

In its call for proposals for success stories of agricultural innovation for the Innovation Fair held in Rome on 21-23 November 2018 in association with the International Symposium on Agricultural Innovation for Family Farmers, FAO listed the following relevant definitions:

- ***Agricultural innovation***: the process whereby individuals or organisations bring new or existing products, processes or ways of organisation into use for the first time in a specific context in order to increase effectiveness, competitiveness, resilience to shocks or environmental sustainability and thereby contribute to food security and nutrition, economic development or sustainable natural resource management.
- ***Innovation versus innovations***: While agricultural innovation refers to the process whereby new or existing products, processes or ways of organisation are brought into use for the first time, the plural term innovations refers to the products, processes or ways of organisation that are brought into use.
- ***New or existing***: The products, processes and ways of organisation may be new (never used elsewhere) or they may already exist (used before but not in this location and context). They are, however, new to the individuals or organisations who are using them for the first time in that context.
- ***Into use for the first time***: products, processes or ways of organisation only become innovations when they are brought into use, i.e. when they are used by individuals or organisations, and when they are new to those individuals and organisations who use them for the first time. It does not, therefore, include products, processes or ways of organisation which are at the conceptual, research, development or trial stage and have not yet been used in practice.
- ***In a specific context***: some products, processes or ways of organisation may be already in use in a specific location and context. However, when they are brought into use in the same location but in a different context for the first time this is considered to be agricultural innovation. For example, if farmers in a certain region have been using biofertilisers for maize production and then begin to use them for the first time in the forestry sector.

- **Products:** refers to a broad category that encompasses all final goods (e.g. an agricultural tool/machine or a new variety of fruit) and services (e.g. specific financial advisory services to farmers) destined to a market for consumption, including the technologies involved. Other examples include new biofertilisers, crop varieties, vaccines, conventional technologies, ICTs or new radio programmes for farmers.
- **Processes:** refers to innovations aiming to improve, inter alia, the production methods (techniques, equipment and software used to produce goods or services) or ways of delivery (broadly speaking, logistics). Process innovations are often aimed at reducing unit costs for production or delivery, and improving products. Examples include ways of delivering farm produce to markets, grading farm produce into different quality classes or using new farming techniques that can boost yield.
- **Ways of organisation:** includes, inter alia, business practices or business models, workplace organisation, institutional arrangements or improvements in different elements of marketing. Examples include producers organising themselves in new ways to increase their bargaining power when buying inputs and selling their produce; reform of rural advisory services so they are more demand-driven and able to respond better to the needs of the farmers; and introduction of participatory research approaches so that research institutions and farmers work more closely together.
- **Sectors:** agricultural innovation encompasses innovation in the crop, livestock, forestry, fishery and agro-industry sectors, thereby encompassing use of new or existing products, processes and ways of organisation by individuals and organisations in the different production systems and value chains of these sectors.
- **Knowledge:** innovation is made possible by knowledge. Generally speaking, the knowledge involved in innovation may be entirely new or it may be new knowledge combined with existing knowledge. This knowledge can come from one or a combination of different sources – from farmers and other individuals; formal scientific research institutions or other kinds of public or private organisations, including civil society organisations.
- **Invention vs. innovation:** an invention can be defined as a novel idea that has been given form (e.g. as a diagram, model or technology) which has potential for application. The term ‘innovation’ refers to the actual implementation of the invention into society. An invention become an innovation only when used.
- **Risk:** innovations are expected to be beneficial. These expectations may come, for example, from reports of experiences by individuals or organisations in other areas or from results of research trials. However, the innovations may turn out to be less beneficial than expected, or even not beneficial at all, for some or all of the individuals or organisations who use them. This may happen because it is the first time they use these innovations and some learning and adaptation to their current working practices may be required or because they have not been successfully adapted to the local context. Despite the expectation of benefits, there is therefore an element of risk involved in their adoption of the innovations.
- **Effects:** innovations can have large effects (so-called disruptive innovations, e.g. using a tractor in place of animal traction for farm work) or more gradual effects (incremental innovations, e.g. using a new model of tractor).
- **Monetary benefits:** innovations can be adopted by individuals/organisations for the purpose of gaining monetary and/or non-monetary benefits. Examples of the latter might include use of new labour-saving devices which allow the producers to have more time available for other activities.
- **Degree of use:** use of innovations by individuals or organisations does not mean they have been put into use by all of them. In practice, the process of bringing innovations

into use can take some years (often following a diffusion pattern whereby successful innovations are typically used by a small minority of producers first and the remainder use them at different rates thereafter).

Annex 2: Pre-event survey of examples of agricultural innovation

In advance of the regional expert consultation, the following survey was circulated among participants:

- Who is the innovation provider?
- Description (what is the main innovation, what is the added value);
- What was the concrete challenge that triggered the innovation?
- Why is the innovation especially suitable for smallholders?
- Type of innovation: technological, social, process, product, organisational, other;
- Type of knowledge used: new, traditional, combination of the two;
- Is the innovation based on ICT?
- Business model: one-time sell, commercial service on a regular basis, advisory service on a regular basis, public-private partnership, free to use/open source/community supported, other;
- Factors of successful adoption: technical skills, managerial skills, existing infrastructure, financial support, own financial capacity, using support services, farm size, support from a cooperative, collaborative (including local) authorities, other.