Changing the research and innovation landscape – the case for agriculture in a bioeconomy world

Workshop held 12 June 2014, Brussels

Workshop summary

The economic and financial crisis that started in 2007 revealed the pressing need for Europe to draw up reforms that promote growth, increase effectiveness and create new innovative solutions for critical social challenges. The Europe 2020 strategy (2010), which aims at 'smart, sustainable and inclusive growth', is an outcome of this process. The Commissions bioeconomy strategy (2012) proposes a comprehensive approach to address some of the global challenges (i.e. climate change, food security, and diminishing fossil fuels) which are core issues of the agricultural sector and thus agricultural research. As the bioeconomy is promoted as a driver for economic growth the agricultural sector besides and in combination with forestry and the marine and aquatic sector will be key providers of innovative and viable solutions.
During the workshop we discussed the potential use of the technology readiness level (TRL) to improve the innovation efforts in our domain given the opportunities of the bioeconomy and the constraints of the planetary boundaries. TRL is a measurement of the maturity level of particular technologies, providing a common understanding of the respective technology status. TRLs address the entire innovation chain. The scale consists of nine levels. Each level characterises the progress in the development of a technology from 'basic principle observed' (level 1) to 'actual system proven in operational environment' (level 9), as defined in H2020.

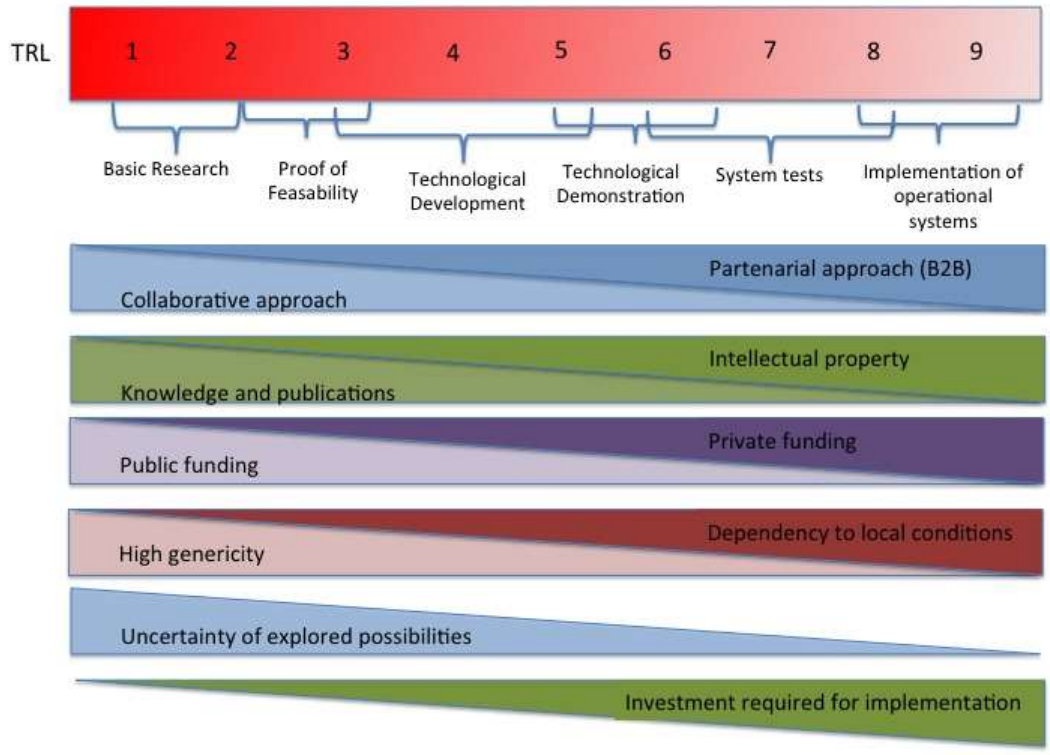

Figure: TRL scale 1-9 with corresponding technology status and shifting drivers.

This scale was initially developed in the space industry in the mid-70 and was consolidated in the mid 90 (Mankins 1995) as a discipline independent program figure of merit (FOM) to allow more effective assessment of and communication regarding the maturity of new technologies (Mankins 2009). It was then successfully adapted and implemented in various economic sectors such as Health and Human services, the Energy sector and in Environment and Eco-innovation (Quotes).

During the workshop it was argued that the TRL scale can act as a useful tool in the innovation process in agriculture. Its employment would make it possible to position the whole range of players who contribute to the introduction of innovation from concept to adoption. It would also make it possible to define the competencies, funding mechanisms, drivers and deliverables related to each level of the TRL scale. Indeed it could help to shift the focus to the different players involved in the innovation process rather than the movement of a given technology, product or service through the levels. Thus it permits to categorise the different actors involved and describes and classifies what is done by whom. The respective drivers, strengths and limitations with regard to the innovation process could be characterised and it could help to define the competencies needed at each level and the key deliverables to be achieved and how they connect to neighbouring TRLs. Focus would shift to the cooperation opportunities between different levels and the management of those opportunities. Thus the TRL scale can help researchers to define the 'end-users' of their research outcome and to clarify with which partner at which specific level they should collaborate to achieve most impact with their respective research. Indeed it can be used as a means to illustrate more clearly to research funders the particular contribution of public funded research to impact achieved.

The participants agreed that innovations through purchase of embodied technologies (GPS, milking robotics, etc.) are not so difficult to achieve. They happen continuously and have led to tremendous capacity gains in agriculture. Complexity arises when system innovations should be adopted that are not exclusively technology driven. In order to accommodate these more complex system innovations the TRL scale has to be extended with the possibility of loops that allow responsiveness of partners at different levels in the entire innovation process to undesired side effects and/or change of settings. One of the biggest challenges of the bioeconomy is to combine the necessary increase in biomass production with the provision and maintenance of ecosystem services to achieve a sustainable bioeconomy in the long-term. This means that biomass production and corresponding side and waste streams will have to change for a better effectiveness which will have consequences for landscape use and those who live in it. These changes cannot be predicted. Technology development will take time and investments possibly leading to undesired new lock-ins. Therefore a decision support tool based on TRLs to promote the innovation process will require a built in reflexivity steps so that also societal needs and the use and distribution of public goods can be integrated in the innovation process.