Young Farmers: Circles of Circular Economy
FarmCircle
09_ECVII_PA08

Recommendations summaries

A4: Recommendations on bioeconomy summaries

Implementing Project Partner(s): EIHP, LK, MAICh

Indicator 6:
No of other studies/papers: 3
No of pages: 5 each
Name: Recommendations on bioeconomy summaries in HR, EL, AT

The DSPF is part-financed by the European Union and the City of Vienna

Agriculture (including forestry, fishery and aquaculture), will have to radically change from food, feed and fuel production sector to decarbonization sector.

There is a dual role of agriculture in decarbonization process – on-farm energy consumption and producing biomass and bio-based products to decarbonize the society.

On-farm energy use will depend on farm profile (cereals, corn, vegetables, fruit, cattle, dairy…) and the length of the agro-food chain (food processing) but also size, location, farm organization, energy efficiency… and socio-economic environment in which each particular farm is placed.

The default values per farm profile on energy consumption are difficult to assess for numerous reasons.

The recommendations for actions and measures to encourage farmers to become bioeconomy players:

- Engage in bioeconomy not only farmers but also land owners that are, for various reasons, not utilizing the agricultural land;
- Embracing existing bioenergy plants/facilities in bioeconomy by developing new added value bio-based products – fertilizers, soil improvements, agrochemicals, biopolymers… ;
- Streamline research from agronomic faculties to look for varieties of food&feed crops that have more CO_2 absorption (above and below ground parts) than the common varieties and varieties that produce more biomass per unit of land (e.g. wheat varieties with more straw in grain/straw ratio, by keeping the grain yield constant or increased);
- Secure financing for bioeconomy projects that is suitable for the beneficiaries;
- Increase the yields to the EU average by using non-fossil inputs;
- Develop sustainable intensification practice suitable for the needs of decarbonization of agriculture;
- Motivate the land owners to become bioeconomy players by:
    - Providing ready-made solutions (e.g. short rotation crops production, dairy biorefinery, anaerobic digestion…)
    - Secure their motivation to utilize the land efficiently by giving a share of value added from bio-based business not only by land rent fee only
- A proactive approach in advanced biofuels production by defining locations for large biorefineries that would have most positive multiplier effect such as soil remediation, repopulation, water retention, agro-forestry… ;
- Educate and inform agriculture stakeholders that are in direct contact with farmers (e.g. COPA-Cogeca, European Rural Development Network, IALB, SEASN and other extension services) to identify, outline and suggest possible and suitable business cases as well as local stakeholders for the rural area in question;
- Build bio-hubs upon existing infrastructure that has been underutilized due to the migration and depopulation – buildings, business zones, energy infrastructure, roads… ;

The DSPF is part-financed by the European Union and the City of Vienna

- Engage existing waste management companies for biomass collection;
- Educate Agriculture advisory services on the bioeconomy options/business cases and to communicate those options to the farmers that have potential to expand their business to bioeconomy;
- Adjust Rural development measures to facilitate that transition;
- Embed agriculture decarbonization in energy strategy and bioeconomy strategy.

Crucial roles of European Rural Development Network and Agriculture advisory services to connect the high policy goals (SDGs, Paris Agreement, Bioeconomy) with land owners' goals (better utility, social responsibility).

Moreover, yields foreseen in the EU Strategy for Danube Region (EUSDR) and EU Strategy for the Adriatic-Ionian Region (EUSAIR) are still not reaching the average yield of the EU, although some regions of the Danube region are meeting the standards. However, as going towards the Eastern and Southern parts of the geographical region, the room for cereal yield improvement increases.

The context – from the global scale to Danube and Adriatic-Ionian Region

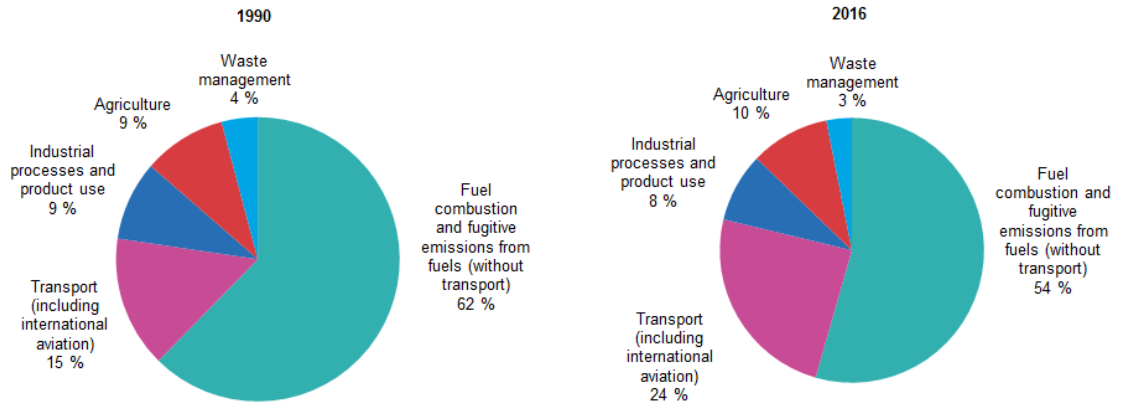
Starting from the global and interlinked goals articulated in 17 Sustainable Development Goals (SDGs[1]) and 169 measures associated targets are global in nature, universally applicable and interlinked.

The 2030 Agenda integrates in a balanced manner the three dimensions of sustainable development - economic, social and environmental - and reflects, for the first time, an international consensus that peace, security, justice for all, and social inclusion are not only to be pursued on their own but that they reinforce each other. The Agenda also includes the recent highlights from the IPCC Report (October 2018)[2]:, which is concentrated on the demand for decarbonization process. This could be done through implementation of bioenergy, which is used as to produce carbon sinks, that would reduce GHG emissions.

[1] UN (2015): The 2030 Agenda for Sustainable Development and the Sustainable Development Goals (SDGs)
[2] IPCC (2018.): IPCC Special report on global warming Source, http://www.ipcc.ch/report/sr15/

The DSPF is part-financed by the European Union and the City of Vienna

Greenhouse gas emissions, analysis by source sector, EU-28, 1990 and 2016
(Percentage of total)



Source: European Environment Agency (online data code: [env_air_gge])

eurostat

With decarbonisation process of agricultural sector, one tackles with ~10% of GHG emissions from agriculture (in all emissions), but also works with all 7 GHG emission categories (if farming is done within the bioeconomy principles):

1. Electricity and heat production: on-farm production of renewable energy;
2. Industry: supplying food-processing industry either with excess renewable energy or biomass for bioenergy; growing energy crops or BECCS; developing new bio-based added value products with low carbon footprint (bio-plastics, bio-agrochemicals, bio-fertiliser…);
3. Transportation: supplying agro-residues or growing energy crops for biofuels; providing biomethane from biogas for the market;
4. Forestry and land use change: sustainable intensification of agriculture and BECCS systems;
5. Buildings: using on-farm renewable energy for own household demand records GHG emissions reduction in this sector
6. Other energy is related to utilization of fossil fuel use for non-energy production: chemicals, plastics, fertilizers… all that could be replaced by bioenergy by-products or by supplying biomass for other sections of bioeconomy pyramid than bioenergy.

All the aforementioned is included in the EU Strategy for Danube Region (EUSDR), within the 4 pillars and 12 policy areas of cooperation, which pave the way towards implementation.

GHG emissions to agriculture are statistically recorded in two main categories – energy and agriculture where energy use on farm is attributed to energy sector while indirect use of fossil fuels and methane emissions from cattle belching. In the chart below one could notice that all EUSDR and EUSAIR countries, but

The DSPF is part-financed by the European Union and the City of Vienna

Croatia and Greece have increased their energy consumption by agriculture in a decade. The decrease of energy consumption in agriculture in Croatia and Greece is rather related to rural-to-urban exodus, depopulation of rural areas and land abandonment than to applied energy efficiency measures in agriculture[3]. The Netherlands' highly sophisticated agriculture demonstrates the trend of decoupling agriculture yields from weather conditions and minimizing the yield loss from the field to the fork. It is very likely that all agriculture sector will increase energy consumption due to the extreme weather conditions related to the climate changes to build resilience. Renewable energy sources available at farm could increase farm resilience and grow independence at reasonable costs.

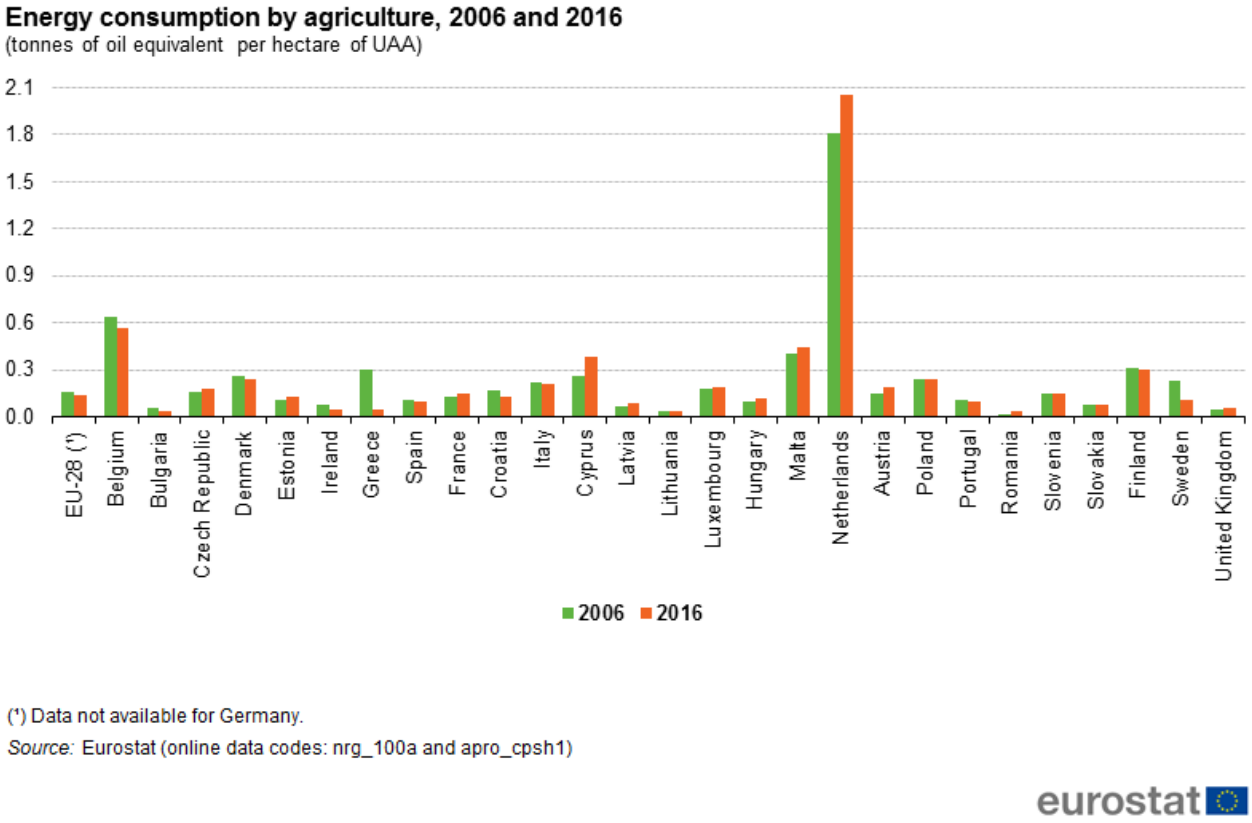


Figure 1 Energy consumption by agriculture, 2006 and 2016 (toe/ha of UAA)[4]

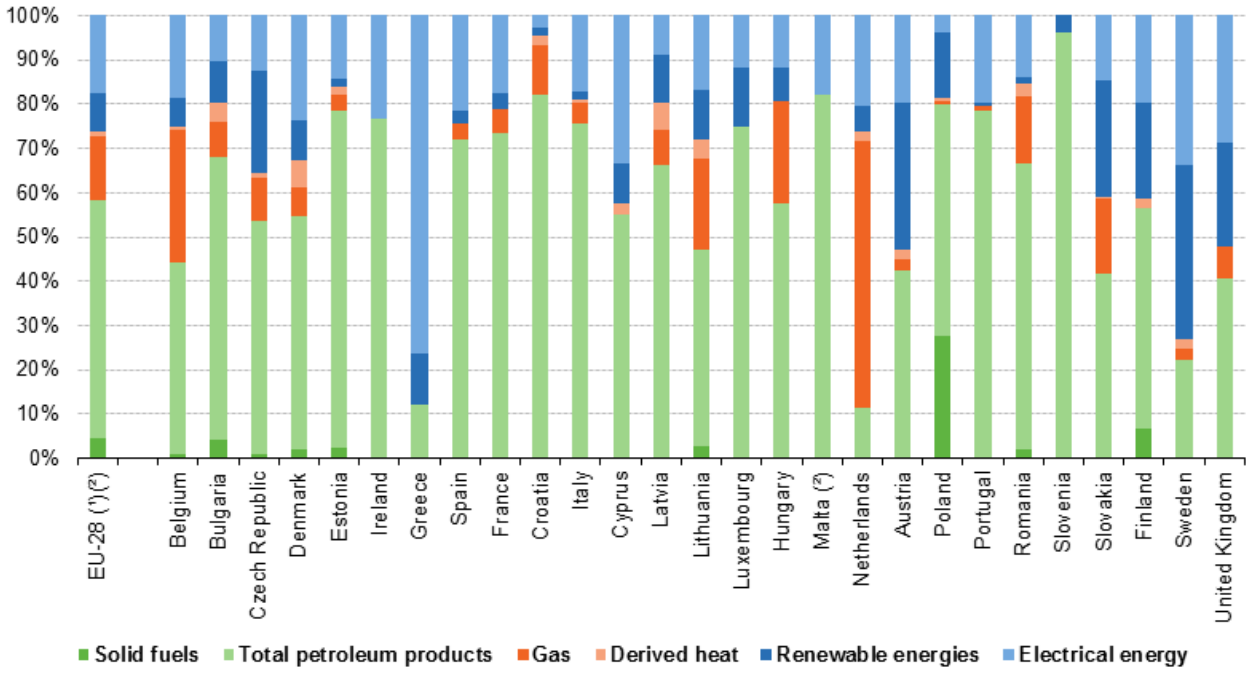
Petroleum products (mostly in a form of diesel fuel for engines and agriculture vehicles) dominate in the energy consumption per country EU-28 but also in the EUSDR and EUSAIR, which is also related to the type

[3] European Union (EU): Migration and migrant population statistics, Statistics Explained, 2018. https://ec.europa.eu/eurostat/statistics-explained/pdfscache/1275.pdf

[4] Source: Eurostat, http://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Energy_consumption_by_agriculture,_2006_and_2016_(tonnes_of_oil_equivalent_per_hectare_of_UAA).png

of agriculture practices (specific for each country). In that respect, each country should develop individual decarbonization plan of agriculture by settling the on-farm energy demand.

Share of fuel type in energy consumption by agriculture, 2016
(%)



(1) Data not available for Germany.
(2) Data on solid fuels not available for Malta.
Source: Eurostat (online data code: nrg_100a)

eurostat

On the other hand, biomass conversion pathways are also various. Biomass supply type, quality and quantity, as well as its most value added in bioeconomy, would differ from country to country. For instance, dominant agro-residues from Croatia are cereal straw and maize stalks and cobs, while most biomass for bioeconomy, other that food, available is in shape of Greece olive oil pruning and olive cake.

Decarbonization of agriculture sector

Agricultural production relies not only on the efficient use of solar energy by photosynthesis but to a great extent on the use of energy from fossil resources, either directly with the use of fuel or electricity or indirect with the use of agricultural machineries, fertilizers or pesticides. While the discussion on energy use in agriculture is often focused on direct energy use, it needs to be acknowledged that 50% and more of the

The DSPF is part-financed by the European Union and the City of Vienna

total energy use is related to the production of nitrogen fertilizer and other indirect energy uses[5],[6],[7]. The following table presents the energy use on-farm and low carbonization alternatives, that are included in the bioeconomy principles.

Table 1 Energy use on farm and low carbon alternatives

Utilization of fossil sources on farm	**Purpose**	**Low carbon alternative**
Direct		
• Energy		
Power	lightning, climatization, ventilation, automatization, IT	PV
Heat	space heating, hot water, cooling, drying, evaporation…	Solar thermal, biomass (incl. biogas)
Fuel	mechanisation, vehicles, transportation…	Biomass for biofuels (compressed biomethane, biodiesel, bioethanol)
Indirect		
• Fertilizers	Yield maximisation	Sustainable intensification, precision farming, cropping, agro-forestry, improved digestate, biorefinery, bioplastics
• Agrochemicals	Yield maximisation	cropping, agro-forestry, biorefinery
• Plastics	Packaging, wrappings, containers of produce and agro-inputs	Biorefinery

Within the decarbonization process, farmers can be included in two ways (their inclusion in the system is shown in Figure 2). Large scale systems are mostly directed towards advanced biofuels production within the bundle of products in biorefineries, while small scales are centred in hubs:

- Large scale: biorefinery
  - Farmers as biomass suppliers / land rent
  - Collection centres (Bio-hubs)
- Small scale: decentralisation, fugal innovations, collection centres (Bio-hubs), *prosumers* (simultaneous producer and consumer)
  - Connection with production
  - Connection with market – market players
- Carbon sequestration (carbon farming): engaging all agricultural land, choosing coppice with most CO_2 net balance

[5] M. Verma, Energy Use in Global Food Production, SpringerBriefs in Food, Health, and Nutrition, 2015. DOI 10.1007/978-3-319-16781-7_2
[6] Pelletier, N., E. Audsley, S. Brodt, T. Garnett, P. Henriksson, A. Kendall, K.J. Kramer, D. Murphy, T. Nemecek, and M. Troell. 2011. Energy intensity of agriculture and food systems. Annual Review of Environment and Resources 36: 223–246.
[7] Woods, J., A. Williams, J.K. Hughes, M. Black, and R. Murphy. 2010. Energy and the food system. Philosophical Transactions of the Royal Society B: Biological Sciences 365(1554): 2991–3006.

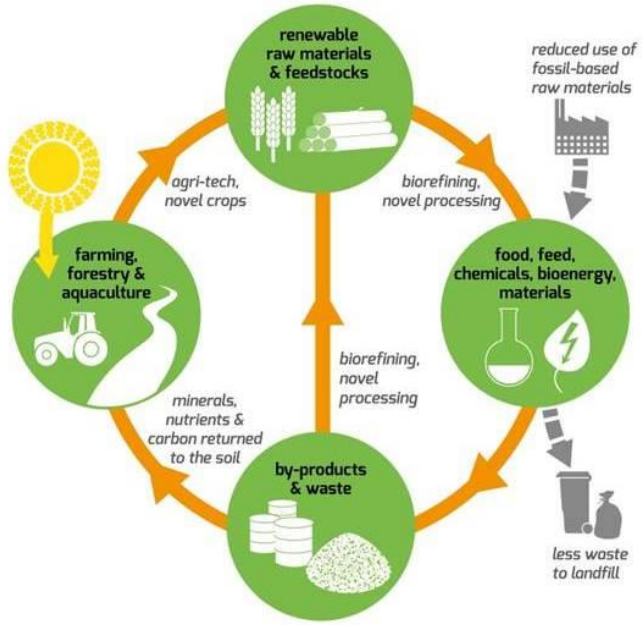


Figure 2 Bioeconomy principle[8]

Conclusion

Bioeconomy and circular economy have a large potential in the Danube Region, especially in the sector of agriculture, combined with the need for decarbonization. Considering the aforementioned, there is a great potential for employment increase, but more importantly return of the young people in the agriculture sector. This would lead to utilization of idle areas that are abandoned due to increased urbanization and lost of interest for "field work" in the young people. Moreover, this could lead to utilization of knowledge obtained by young farmers within innovative and sustainable way of bioeconomy implementation.

However, given the different levels of development of the Danube Region countries' labour market, tailor-made responses are needed, with policies that may vary considerably from one country to another. Policies in the less developed countries may focus on the adjustment of vocational training to the needs of the economy and make vocational training in general more attractive for the young.

Setting up dual training systems may help combat high youth unemployment by enhancing and institutionalising cooperation between the poor and best performers with respect to labour market initiatives, e.g. through the exchange of best practises, training people in administration/public employment services and strengthening social partnership.

[8] Bioeconomy Policy Day, 14-17 November 2017, https://ec.europa.eu/programmes/horizon2020/en/news/bioeconomy-policy-day