

Sustainable development assessment on Grass-based circular business models for rural agri-food value chains (GO-GRASS)

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Abstract Climate change affects temperate areas by increasing the risk of suffering extreme climatic events and sharpening major problematics. Moreover, climate change and its related effects jeopardize water and food supply. Rural areas are key for sustainable development and provide socio-economics advantages, but it also exists a downside on key aspects such as less job, education and infrastructures accessibility for its inhabitants. The European Commission is strongly committed to improving life quality and business opportunities in rural areas. Thus, the GO-GRASS is an H2020 project that aims to create innovative business opportunities in rural areas based on grassland and green fodder. Key Performance Indicators (KPIs) development is a very useful instrument for organizations management. that allows testing the efficiency of a system considering elements and standards related to a specific topic or work field. Within the GO-GRASS, KPIs development is key to evaluate the sustainability of grass-based value chains and assessing the replication potential of demos business models. Based on SAFA indicators and GRI standards, the evaluation of value chains was geared to economic, social and environmental issues to obtain finally, a set of eight, six and 10 KPIs selected by the project's experts that allows grass-based value chains evaluation.

Keywords: Grassland, Value chain, Bioeconomy, Key Performance Indicator, Bussines model.

1. Introduction

Climate change affects temperate areas by increasing the risk of suffering extreme climatic events and sharpening major problematics as air pollution, increasing allergens, producing environmental degradation and water quality impacts (Betts and Sawyer 2015). Moreover, climate change and its related effects jeopardize water and food supply affecting both urban and rural areas on its linkage from producers to consumers. Rural areas are key for sustainable development and provide socio-economics advantages linked to a healthier lifestyle and substantial resource availability but also reflect socio-economic problems and disadvantages on key aspects such as low job

opportunities and a lack on education and infrastructures accessibility for its inhabitants. Grassland management is a capital activity within the rural economy and ecology, promoting biodiversity conservation and fodder supply on its traditional concept and use. Grass productivity is mainly linked to livestock production in Europe. Still, an excess of grass is not being used. The potential grassland production varies across Europe due to the climate conditions (Fig. 1) (Smit et al. 2008), being higher in west European areas benefited by the Gulf stream and reduced in the south of Europe, due to high temperatures associated with droughts, and northern Europe, associated with low temperatures that limit grass production.

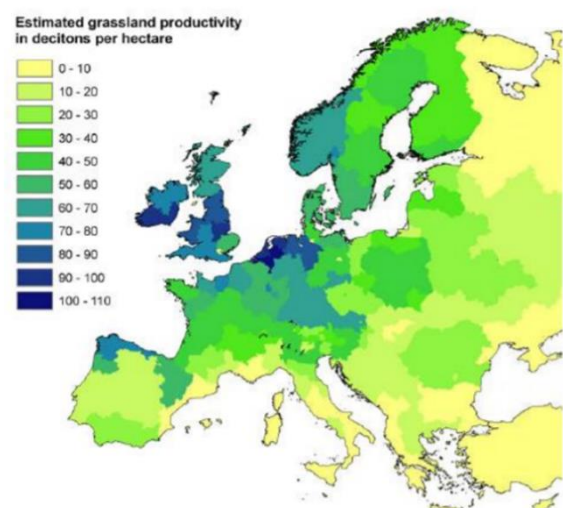


Figure 1. Grass productivity in Europe (Smith et al. 2008)

The European Commission is strongly committed to improving life quality and business opportunities in rural areas (EC 2021). Thus, the GO-GRASS is an H2020 project that aims to create innovative business opportunities in rural areas based on grassland and green fodder. Key Performance Indicators (KPIs) development is a very useful instrument for organizations management. that allows testing the efficiency of a system considering elements and

standards related to a specific topic or work field. Within the GO-GRASS, KPIs development is key to evaluate the sustainability of grass-based value chains and assessing the replication potential of demos business models. The objective of the present study is to analyze the business landscape sustainability indexes based on Sustainability Assessment of Food and Agriculture systems (SAFA), compared with GRI (Global Reporting Initiative) and RUBIZMO key indicators to provide a list of common KPIs for the successful implementation of grassland-based business models across Europe.

2. Methodology

The methodology followed for this KPIs selection consists of four parts that are the following and necessary to perform the KPIs selection. The (i) description of previously selected business models value chains, (ii) a survey to the relevant actors of the value chain (farmers), (iii) a comparative analysis of recognized KPIs sustainable systems (SAFA, GRI standards and RUBIZMO) and, finally, (iv) the expert survey that allowed the selection of the most relevant economic, social and environmental KPIs for grass-based alternative products business models.

A total of 15 grass-based business cases value chains were analysed (Table 1). Seven from Germany, two from The Netherlands, two from Denmark, one from Spain, one from Belgium, one from Romania and one from Sweden. The description of the value chains included grass production, processing and marketing and distribution.

Table 1. Grass-based business cases selected for value chain analysis

Company name	Country	Feed or food	Liquid Milk	Seeds	Bio-plastics	Paper	Fertilizers	Bio-fuels	Hay or silage	End-users
Ausumgaard	Denmark	X						X		Farmers
Blattwerk Biofabrik	Germany	X					X	X		Industry Farmers
Naturmælk	Denmark		X							Consumers
Grassa	Netherlands	X					X	X		Industry
DLF Trifolium	Denmark			X						Farmers
Biowert	Germany				X					Industry
Cortec	Germany				X					Industry
Zelfo Technology	Germany					X				Industry
Paper Mill Craft Village	Romania					X				Industry
Bokashi	Netherlands					X	X			Industry
Schut papier	Netherlands									Industry
CEWARD AB	Sweden						X	X		Industry
AGACA	Spain	X	X					X	X	Industry
AGACA	Spain		X				X			Industry

Considering this description, two surveys were conducted to select the KPIs by using a multi-actor approach, one to 16 farmers, as value chain suppliers,

and the second one to experts involved in the GO-GRASS project.

The opinion of farmers regarding feedstock supply was analysed and an in-deep desktop analysis comparing the SAFA, GRI and RUBIZMO potential indicators was implemented.

3. Results

The final list of KPIs was based on SAFA, being the indicators consequently classified on Economy, Social and Environmental categories and subcategories. (Table 2).

The Economic KPIs are split by the SAFA system into four sub-categories; investments, vulnerability, product quality and information and, finally, local economy practices. The GO-GRASS experts selected the **“Net Income”** and **“Cost of Production”** as key indicators for the Investment subcategory. Taking into account all indicators are relevant, bioeconomy highlights to reflect the main benefits of the alternative bioeconomy products. The same was reported by farmers for grass-based alternative products since both increasing benefits but also costs were stressed as critical points on business performance evaluation. The subcategory of vulnerability can be related to the company (farm or processor) supply, the market conditions and finally, with the own company risks. One KPI considered as relevant by the experts as key to reducing future farms vulnerability is **“Product Diversification”**, also considered as relevant by farmers, followed by ensuring the feedstock supply that can be linked to the implementation of the KPI indicators of **“Procurement Channels”** ensuring the stable supply and **“Stability of Supplier Relationships”**. The most relevant indicator associated with the third subcategory, Product quality and information of the Economic KPIs was related to the possibility of the identification of the product to get extra value for it as **“Product Labeling”** followed by the **“Certified Production”**. For the last category of the economic KPI, local economy, experts selected **“Local Procurement”** as a key aspect, strongly supported within the bioeconomy, circular economy and EC Green Deal Agreement to reach the different global commitments concerning sustainability that the EU recently acquired.

Social KPIs are split into six subcategories including decent livelihood, fair trading programmes, labour rights, equity, human safety and health and cultural diversity. For the decent livelihood subcategory, two KPIs were considered adequate by experts, the **“Wage Level”**, as the economic return for workers, and farmers’ **“Capacity Development”**. There are two indicators selected within the subcategory Fair trading practices that are highly adequate for all value chains. Thus, **“Fair Pricing and Transparent Contracts”**, including the policies and practices of buyers recognizing and supporting the primary producers’

rights to fair pricing, contracts or agreements, is mostly associated with the type of products that will be produced. The second KPI is referred to “**Rights of Suppliers**” which in this case is based on buyers recognition and ensured by the competition with other products in the market that may be replaced by the grass-based alternative products. The remaining subcategories recognized by SAFA were not considered relevant linked to grass-based business since most of the KPIs are based on social aspects that EU has under control for their companies, which should respond with fees or jail in case of lack of fulfilment. However, there are social aspects considered of high relevance in Europe where population ageing and youth employment is key. For this reason, the GO-GRASS team proposed two different KPIs to be analysed “**Youth Employment**” and “**Job Creation**”, which are key for the current strategies of the EU. Youth employment measures the number of young people employed along the value chain, aiming at identifying if grass-based alternative product production is able to reduce rural population ageing in Europe. On the other hand, job creation is key to reduce the social cost of the rural areas, boosting and revitalizing the economy and increasing the use of the resources from the underused rural areas.

Table 2. List of selected KPIs

SAFA		INDICATOR NAME
ECONOMY	INVESTMENT	Net Income
		Cost of Production
	VULNERABILITY	Product Diversification
		Procurement Channels
		Stability of Supplier Relationships
PRODUCT QUALITY AND INFORMATION	Product Labelling	
	Certified Production	
LOCAL ECONOMY	Local Procurement	
SOCIAL	DECENT LIVELIHOOD	Wage level
		Capacity development
	FAIR TRADING PRACTICES	Fair Pricing and Transparent Contracts
		Rights of Suppliers
GO-GRASS input	Youth Employment	
	Job Creation	
ENVIRONMENTAL	ATMOSPHERE	GHG Reduction Target
		GHG Mitigation Practices
	WATER	Wastewater Quality
	LAND	Soil Improvement Practices
	BIODIVERSITY	Ecosystem Enhancing Practices
		Land Use and Land Cover Change
	MATERIALS AND ENERGY	Material Consumption Practices
		Renewable Energy Use Target
		Energy Saving Practices

Regarding environmental KPIs. SAFA includes the subcategories of atmosphere, water, land biodiversity, materials and energy and animal welfare. The most relevant KPIs for experts were those related to atmosphere and materials and energy, as they can be used along the whole value chain, while water, biodiversity, land, and animal welfare are KPI more associated with grass suppliers. Concerning atmosphere subcategory two KPIs are considered relevant for most

of the experts, “**GHG Reduction Target**” and “**GHG Mitigation Practices**”, both associated with climate change and of capital importance in EU policy through instruments like the EU Green Deal. About the category of water, experts did not find indicators highly relevant for the different value chains, being “**Wastewater Quality**” the one considered more adequate for the different value chains. Within the land subcategory, only “**Soil Improvement Practices**” seems to be interesting for most analysed value chains, as grasslands are recognized soil improvers. “**Ecosystem Enhancing Practices**” and “**Land Use and Land Cover Change**” are the selected KPIs linked to the biodiversity subcategory. These selected KPIs may be interesting to evaluate biodiversity ecosystem services associated with grass-based value chains but also the number of lands transformed in areas with more or less ecological value. Finally, experts selected the higher number of KPIs within the materials and energy subcategory. Three were the indicators considered relevant for all value chains, “**Material Consumption Practices**” linked to the replacement of non-renewable materials for renewable materials, “**Renewable Energy Use Target**” associated with the use of renewable energy such as biogas, and “**Energy Saving Practices**” related to the reduction of energy requirements on both farms and processor companies.

4. Conclusion

This study aimed to develop a list of common KPIs for the successful implementation of grassland business models across Europe. In order to achieve a final list, it was developed a methodology to identify the most useful KPIs for the grass-based business models based on actors interaction (farmers and experts) and an in-depth desktop study (SAFA, GRI and RUBIZMO). To summarize, both Economic and Environmental KPIs coming from SAFA and GRI indicators were found adequate. On the opposite, the KPIs linked to social aspects were found not so relevant in the European context, since both SAFA and GRI standards were designed at global scale, including countries with social rights not as ensured as in Europe.

Result of this work, a set of eight, six and nine economic, social and environmental indicators was finally included in the proposed KPIs list selected to evaluate the sustainability of the grass-based value chains.

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