BIOPLAT-EU

Promoting sustainable use of underutilized lands for bioenergy production through a web-based Platform for Europe

D4.3

Report on tested results discussion and fine-tuning the tool

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 818083.

Project no.	818083
Project acronym:	BIOPLAT-EU
Project title:	Promoting sustainable use of underutilized lands for bioenergy production through a web-based Platform for Europe
Call:	H2020-LC-SC3-2018-RES
Start date of project:	01.11.2018
Duration:	36 months
Deliverable title:	D4.3- Report on tested results discussion and fine-tuning the tool
Due date of deliverable:	October 2021
Project Coordinator:	WIP Renewable Energies

Organisation name of lead contractor for this deliverable: FAO

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Dissemination level		
PU	Public	X
CO	Confidential, restricted under conditions set out in Model Grant Agreement	
CI	Classified, information as referred to in Commission Decision 2001/844/EC	

History			
Version	Date	Reason	Revised by
01	27/10/2021	Draft	FAO
02	28/10/2021	Final	WIP

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1 Objectives

The webGIS tool has been extensively tested by all members of the BIOPLAT-EU Consortium and by members of the Advisory Board (Task 4.3). In addition, under Task 4.4, webinar participants also had the opportunity to test the tool in their own regions and to present their questions and requests to enhance the tool and its results. The objective of this report is to summarize the needs for calibration, the limitations and the constraints of the platform on the basis of real case studies information coming from the feedback of participants of tasks 4.3 and 4.4. In WP4, sub-national regions with high potential of MUC lands in the target countries (Italy, Germany, Ukraine, Hungary, Romania and Spain) have been selected. The most promising bioenergy pathways and feedstock for these case study sites were chosen and the tool was applied for the different value chains with a full sustainability analysis of all environmental, social and techno-economic indicators included in the webGIS tool. The results of these exercises have brought up a series of lessons learned about the tool and its capabilities and were used for its fine-tuning.

It is common practice in software development to open draft versions of the code for “beta testing” or other forms of early access offered to potential users. This was also done for the webGIS through invitation to Advisory Board members and even external interested users to test the draft version of the BIOPLAT-EU platform and evaluate its features for further adjustments. Their feedback was useful to consolidate certain impressions of the Technical Team within BIOPLAT-EU and surfaced additional interesting points as well.

The objective of this report is to firstly summarize the background of this action, as to where this need comes from and what have been the preceding actions that led to the webGIS to where it stands now. Consequently, the results of the discussions and lessons learned from the testing with all aforementioned actors are presented and conclusions are drawn.

2 Results

Deliverable D4.2 returned a wealth of key lessons for the further development of the WebGIS tool. The overall evaluation of the webGIS has been positive and the tool was perceived, already in its beta version, as a useful aid to foster market uptake of bioenergy produced on marginal, underutilized and contaminated lands in Europe and Ukraine. The tool works well in most scenarios without particular criticalities, no test reported crashes or relevant impediments, and results are consistent. Therefore no additional efforts were necessary to refine the expeditiveness of the operational functions of the tool, and the attention of the fine-tuning team was devoted to enhancing other aspects of the system.

In fact, numerous suggestions about areas for improvement have been made. These have grouped into two categories (see also D4.2 for additional details):

(A) key functions of the system;
(B) adjustments to visualization style, language and translation edits, etc.

Several case study Partners, through their thorough assessments of the value chains they are more familiar with in their own territory, brought to the surface and highlighted aspects that were overlooked during the development of the webGIS tool including STEN. Others, already known issues and criticalities, have been confirmed as particularly important and the responsible partners dedicated further work to attempt to fix these aspects.

During the fine-tuning phase, the first fix carried out concerned the land suitability of bioenergy crops. When selecting a given MUC patch the system used to refer solely to the database of suitability maps to identify and pre-select the sub-group of crops for the list of BIOPLAT-EU bioenergy crops that can be grown on those MUC lands according to GAEZ[1]. During the kick-off meeting a decision about the threshold for suitability was made. Crops whose suitability was lower than 30% of optimal, were considered not suitable for a given MUC land and therefore the system was built around such assumption. However, this assumption was based on the trust towards the capabilities of the GAEZ which remain strong, however, further research revealed that the suitability of recent varieties and clones, especially of perennial crops where much research has been concentrated over the years, is not correctly considered by GAEZ. Additionally, for those bioenergy crops not mapped by GAEZ, the dataset used (from the JRC Forest Atlas) show potential suitability of regular breeds, whereas improved varieties can show much higher survivability and consequently, higher yields. New clones and varieties of poplars, willows, but also miscanthus for example, can grow well in areas where naturally occurring varieties struggle, and produce with less inputs and higher efficiency considerable amounts of biomass.

The presence of *advanced user* features of STEN allowed to circumnavigate such lack of default data. The technical Team found an effective solution by permitting to advanced users to bypass the default suitability selection carried out by the webGIS tool and provide them with the

[1] The Global Agro-Ecological Zooning tool of FAO. http://www.fao.org/nr/gaez/about-data-portal/agricultural-suitability-and-potential-yields/it/

complete list of crops at any given point. Therefore, crops not considered suitable by the databases available, can now still be simulated by the advanced users after inserting expected yields, as these are now available in the same drop-down menu. The inclusion of this feature did not cause glitches or bugs and the software now can run analyses for any crop from its list in any location of Europe, although the user must possess the knowledge of attributes that define the value chain without relying on the software (i.e. yields).

Another rather crucial aspect that was raised by several users was the inability to select more than one MUC patch at the time to run a sustainability assessment. This feature has also been discussed already very early in the development stage and a solution could not be found. It remained of strong relevance for the usability of the tool, especially by potential investors as well as for groups or associations of farmers/biomass producers. The inherent problem encountered at the beginning of the project was with the geographical and coordinate system used by the webGIS tool. The tool was not capable of processing multiple MUC parcels at the same time because these are linked to a specific target area. Distances and consequent time requirements for transporting biomass and bioenergy products are associated with this system where the target area is the fundamental unit. The risk of having to change the fundamental structure of the tool was taking Task 4.3 much further than fine-tuning is intended to be.

The application of an ingenious addition to the existing structure of the STEN made a solution possible. The code of the system was improved with the addition of an area of work internal to the system which has untied the various municipalities present in the TABL and instructed the system to recollect them at any passage of the simulation. By doing so, the system can not include a button to open that window for additional features open resulting in the opportunity to add a MUC patch and letting the STEN Engine calculate a new, relative ***target area*** which considers multiple – and virtually infinite – MUC patches. This introduced a feature that was named SuperMUC, in other words an aggregated individual patch which is the results of the "stitching" of several MUC patches as they are found in the Tier I and Tier II maps. This concept allowed to add infinite patches to an assessment without revolutionizing the proven structure of the webGIS tool.

However, this important addition during the fine-tuning stage of the model did not come without drawbacks. The system has to use one point (by default) to establish as the center of gravity of the MUC patch, from where biomass is transported to a given processing plant. This point, for very large MUC is actually to the center of gravity of the target area and therefore the system could calculate *average distances* and related attributes from that point. Any other variable should remain fixed for the simulation (e.g. same crop, assuming same suitability and an average yield, etc) and in case of particularly super large MUCs, this might not be entirely realistic. Therefore, the first concession to accuracy was made in the name of a much higher practicality and analysis coverage and meaningfulness of the system.

A second drawback, lamented by several stakeholders, is the tediousity of such operation. Unfortunately, due to time limitations it was not possible to include a feature to crop a certain area on the map and instruct the system to consider automatically the addition of all MUC patches found within a given selection. This would have shifted the time consuming action from the user towards the system but unfortunately this shall, as for a few additional aspects, a proposed integration of an extension to BIOPLAT-EU.

Allowing the user to simulate a bioenergy project which interests **multiple MUC parcels simultaneously** certainly raised the bar in terms of representativeness of the results impact on the market uptake of biomass produced from these lands.

Unfortunately, as foreseen in D4.2 the Technical Team of developers could not solve the accuracy issue linked to the map of potentially contaminated sites in Europe. This map, as explained in D2.1, is the result of data provided by the JRC on heavy metal content in topsoils in Europe. The presence of heavy metals in those soils cannot be measured and assessed in the context of BIOPLAT-EU and therefore this change is difficult to address. A disclaimer about the nature of this data is already available to all users, and all users are free to turn off the Potentially Contaminated Lands layer. Further discussion on this took place in occasion of the webinars and meetings with local stakeholders to explain this issue and a clear request to map with increased accuracy contaminated lands at national level was raised. However, this goes beyond the boundaries of this project and a dedicated new project would be required for this. However, provided that a map of Contaminated Soils of Europe is produced as a .shp layer, this will be substituted to the current one.

The webinars provided additional interesting requests for the full integration of the tool. Some stakeholders in light of the versatility and powerful calculation engine of the webGIS tool expressed their interest in having a version of the tool that goes beyond marginal areas potentially considered for the cultivation of energy crops, and in addition considers also information about the availability of agricultural and agro-industrial waste and residues. This could not be implemented in the context of BIOPLAT-EU. However, it was recognized that the integration of different types of biomass could facilitate the supply plan of any energy conversion plants or biorefineries.

3 Conclusions

The fine-tuning of the webGIS tool has allowed to fix issues of the tool that emerged thanks to the reviews and the exchanges with local and international stakeholders, to the extent possible. In terms of bugs and glitches, all discovered errors of the system have been fixed. The calibration of the tool was carried out based on the feedback received and was necessary particularly for the yields and suitability of specific crops in low-suitability areas. The problem has been solved successfully and in the mean time the approach chosen expanded the potential usability of the tool, for advanced users. Data availability still constraints the standard user on fixing the issue of inaccuracy of yields and suitability of certain crops. Most reviewers however, found the tool very well integrated and little work on actual fine-tuning was required, whereas work on refinement and enhancement of the tool was predominant.

All users that have been exposed to the tool reported its high potential for decision making at many levels, and its swift and simple usability. Important missing features were added thanks to clever decisions and relentless work, although not without drawbacks. In the end however, the tool is more comprehensive and capable as a consequence of the fine-tuning phase.

A separated discussion instead, is linked to the numerous feedback and requests received from public and private stakeholders involved in the numerous national webinars and the members of the Advisory Board. In general, all external stakeholder exposed to the webGIS tool found it to be an extremely relevant tool for simulation and planning purposes, as well as for validation of a number of forecasts. The potential usability of the tool was so well received that virtually in every webinar or public discussion, some stakeholder raised a different integration need. It is important to state that most of those were beyond the context of marginal, underutilized land availability for biomass and bioenergy production but shown the need for an extension to the project to express the full potential of the tool. The comments included the possibility to model agricultural residues and agro-industrial wastes as well, or to work on better and consolidated maps of contaminated soils to drive sound agricultural development policies.

It was felt therefore that there exists the need for a continuation to the BIOPLAT-EU project in order to use the base platform developed to integrate a number of additional features and coverage and create a sustainable bioenergy planning and decision making tool.