Integrated agriculture calculator – CalcGosPuck

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The research presented was conducted as part of the project on modelling of the impact of the agricultural holdings and land-use structure on quality of water in the Bay of Puck – Integrated information and forecasting Service "WaterPUCK" (www.waterpuck.pl) [1]. The web tools obtained within the project (service WaterPUCK with CalcGosPuck) were modified account for many innovative measures, processes and models to provide a basis for the "green economy" development that could be implemented in other Baltic Sea catchment areas. This is in line with the objectives of European legislation, including: i) the Nitrates Directive (91/676/EEC), ii) the Water Framework Directive (2000/60/EC), iii) the Marine Strategy Framework Directive (2008/56/EC) and iv) the Habitats Directive (92/43/EEC) as well as with the HELCOM Baltic Sea Action Plan and the strategic program of environmental protection for the Puck Commune. The "At the farm gate" nutrient balance method usually involves calculating separate balances for NPK nutrient elements. The principle is the same for all three nutrients, with the exception that the N balance sheets include more factors because of larger number of N nutrient sources into the farms (e.g. legumes crops, deposition from the atmosphere). The procedure for establishing balance of nutrients using the "At the farm gate" method has been described in detail [2].

In accordance with the "At the farm gate" concept method, the agriculture calculator "CalcGosPuck" was developed. The CalcGosPuck calculator works as an independent application designed to calculate the nutrient inputs and outputs, and then the surplus/deficit and the nutrient use efficiency on a farm. The user gives the farm size and selects the required province, input and output products for balance and gives their amount. CalcGosPuck works properly (see the website www.waterpuck.pl in Service – Figure. 1).
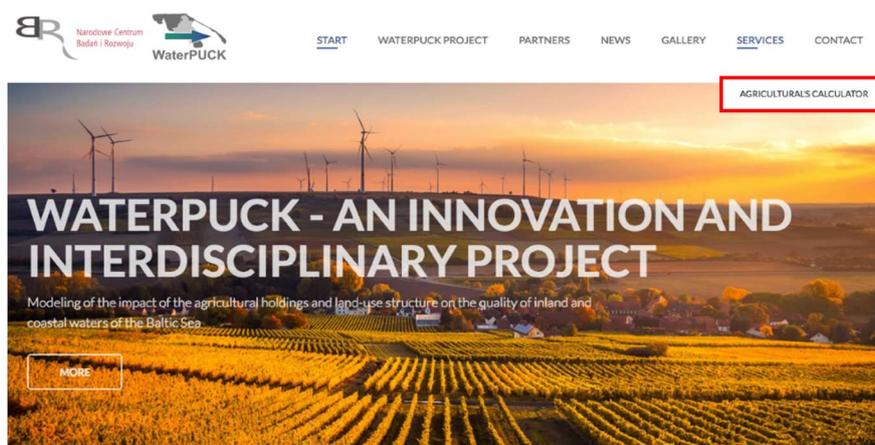

Figure 1: The selection page of the CalcGosPuck calculator [1]

One should enter specified data (Figure 2) into the CalcGosPuck calculator in order to determine inputs, outputs, NP surplus (or deficit) and the use efficiency of nutrients on the farm: i) the area of agricultural land of the farm (in hectares) (Figure 2a); ii) the province in which the farm operates (Figure 2b); iii) select indicators of what is imported onto the farm (mineral

fertilizers, concentrated fodder (mixed cattle feed, mixed pig feed, mixed poultry feed), purchased animal products, natural fertilizers, other purchased plant products, by atmospheric precipitation, by legumes, and fixed by soil microorganisms) (Figure 2c); iv) select indicators of what is exported from the farm (in animal and plant products sold) (Figure 2d); v) give the amount of each selected indicator (Figure 2e). After each parameter is selected, the basic data are automatically set down input, output, surplus (or deficit = value with a minus sign) and the data related to the efficiency of the farm are displayed in the top bar (Figure 2f).

Figure 2: Calculating nutrients balance in farm. Choose parameters for farm. [2]

Acknowledgements

References

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[2] Dzierzbicka-Głowacka, L., Pietrzak S., Dybowski D., Białoskórski M. & Marcinkowski T., (2019). Impact of agricultural farms on the environment of the Puck Commune: Integrated agriculture calculator – CalcGosPuck. *PeerJ* 7:e6478 https://doi.org/10.7717/peerj.6478