TOOL FACTSHEET

Tool name

FARM

Tool type

Production Model for shellfish

Short description of the tool

The Farm Aquaculture Resource Management model (FARM; www.garmscale.org) is a local scale model that combines physical and biogeochemical models, shellfish growth models, and screening models at the farm scale for the determination of shellfish production and for the assessment of water-quality changes on account of shellfish cultivation. The model inputs are water quality (temperature, salinity, chlorophyll, particulate matter), farm dimensions and operations (seeding density, mortality, culture period, and type of operation [i.e. cage or bottom with no gear], seed price, harvest value). Outputs include harvest amount, value of product, particulate and nutrient removal, changes in dissolved oxygen and chlorophyll. The model has been used previously for decision support for aquaculture siting taking into account food conditions inside a farm, shellfish ecophysiological characteristics, and farming practices and has also been used to evaluate the capacity for aquaculture operations to remove nutrients directly from the water.

Source (where/ link)

http://www.farmscale.org

Licence cost or other type of costs (e.g. maintenance)

Context-dependent, please use contacts above.

General requirements (technical and input data)

Input data are usually tabular data of any kind of nature: environmental, economic, social, etc.

Management dimension for which the tool could be used

☒ Policy / Management

☒ Environmental

☒ Economic / Market

☒ Other sectors

Main functionality

☒ Site identification ☒ Modelling

☒ Mapping ☒ Stakeholder engagement

☒ Economic analysis ☒ Ecosystem services assessment

☒ Scenario analysis ☐ Other: (Please specify)

Fields of application (i.e. issue to be solved)

FARM can be used for site identification of where aquaculture will be most successful, can estimate nutrient reduction potential of shellfish based removal and the economic value of the product and the ecosystem service value of removed nitrogen.

Circumstances in which it can be implemented (strength and opportunities)

FARM lets user to combine both empirical data and expert opinion.

Limitations

This is a local scale model, cannot be used to determine system wide production or nutrient removal without several caveats and assumptions.

Technical skills needed to operate the tool

Basic computer skills related to data inputs.

Background knowledge needed to implement the tool

User needs to have enough expertise of the system to be modelled (e.g. ecosystem functioning, economic trade-offs, etc.) in order to evaluate model results.

How can the tool contribute to the EAA

Please select the EAA steps that the tool can contribute:

1. ☒ Scoping

2. ☒ The identification of issues and opportunities

3. ☒ Prioritisation of issues

4. ☒ Objectives

5. ☒ Management actions

6. ☒ Monitoring

TOOL FACTSHEET

How can the tool contribute to the MSP

Please select the MSP steps that the tool can contribute:

1. ☒ Define goals and objectives

2. ☒ Gather data and define current conditions

3. ☒ Identify issues, constraints, and future conditions

4. ☒ Develop alternative management actions

5. ☒ Evaluate alternative management actions

6. ☒ Monitor and evaluate management actions

7. ☒ Refine goals, objectives and management actions

AquaSpace case studies in which it has been implemented

Case study name:

Long Island Sound and Great Bay Piscatqua, USA

Reference and link to case studies report:

AquaSpace D4.2 at http://www.aquaspace-h2020.eu/ Library/Reports

FARM website at www.farmscale.org

Other bibliographic references

Bricker, Suzanne B., Joao Gomes Ferreira, Changbo Zhu, Julie M Rose, Eve Galimany, Gary Wikfors, Camille Saurel, Robin Landeck Miller, James Wands, Philip Trowbridge, Raymond Grizzle, Katharine Wellman, Robert Rheault, Jacob Steinberg, Annie Jacob, Erik D. Davenport, Suzanne Ayvazian, Marnita Chintala, and Mark A. Tedesco. 2017. The role of shellfish aquaculture in reduction of eutrophication in an urban estuary. *Environ. Sci. Technol.*, Just Accepted Manuscript • DOI: 10.1021/acs.est.7b03970

Bricker, Suzanne B., Tessa L. Getchis, Cary B. Chadwick, Cori M. Rose, Julie M. Rose. 2016. Integration of ecosystem-based models into an existing interactive web-based tool for improved aquaculture decision making. Aquaculture 453:135–146

Rose, J.M., S.B. Bricker, J.G. Ferreira. 2015. Modeling shellfish farms to predict harvest-based nitrogen removal. *Marine Pollution Bulletin* 91: 185–190.

Bricker, S.B., K.C. Rice, O.P. Bricker III. 2014. From Headwaters to Coast: Influence of Human Activities on Water Quality of the Potomac River Estuary. *Aquat Geochem* 20:291-324.

TOOL FACTSHEET

Nobre, Ana M., Joa˜o G. Ferreira , Joa˜o P. Nunes , Xiaojun Yan , Suzanne Bricker, Richard Corner,Steve Groom, Haifeng Gu , Anthony J.S. Hawkins, Rory Hutson, Dongzhao Lan, Joa˜o D. Lencart e Silva, Philip Pascoe, Trevor Telfer, Xuelei Zhang , Mingyuan Zhu. 2010. Assessment of coastal management options by means of multilayered ecosystem models. Estuarine Coastal and Shelf Science 87(1): 43-62. http://dx.doi.org/10.1016/j.ecss.2009.12.013

Ferreira, J.G., A. Sequeira, A.J.S. Hawkins, A. Newton, T.D. Nickell, R. Pastres, J. Forte, A. Bodoy, S.B. Bricker. 2009. Analysis of coastal and offshore aquaculture: Application of the FARM model to multiple systems and shellfish species. Aquaculture 292: 129-138.

Silva, C. , J.G. Ferreira and S.B. Bricker, T.A. DelValls, M.L. Martín-Díaz, E. Yáñez. 2011. Site selection for shellfish aquaculture by means of GIS and farm-scale models, with an emphasis on data-poor environments. Aquaculture 318 (2011) 444–457