



GIS Mapping of Pond Aquaculture Potential in Bangladesh

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Background and Approach



Figure 1

In Bangladesh inland pond aquaculture supplies 45% of freshwater fish, an important protein source for its increasing population. To maintain the desired productivity growth of the aquaculture sector will mean bringing more water bodies into production.

With the high potential areas already developed, increasing aquaculture productivity in the more challenging areas needs to be more strategic and well-supported with relevant information about the opportunities and limitations faced in these areas.

To aid aquaculture planning and management, GIS modeling tools were used to map and evaluate the potential, and identify constraints, for small-holding pond aquaculture development.

A resource evaluation framework was adopted (Fig. 2) and implemented.

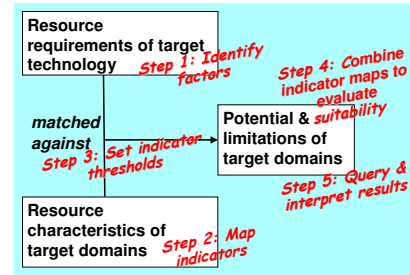


Figure 2

GIS Modeling and Results

Through literature review, consultations with aquaculture specialists and local experts, we identified five groupings of the key determinant factors and their indicators that are quantifiable and mapable. Listed below are the indicators (> bulleted) and their proxy functions (*blue italics*), by factor grouping.

BIOPHYSICAL FACTORS

- > Duration of available pond water
length of culture period
- > Land form
landscape position
- > Frequency of flooding
proneness to floods
- > Soil pH
acidity constraint

SOCIO-ECONOMIC FACTORS

- > Cropping intensity
crop by-products
- > # Bovines per HH
livestock by-products
- > Average HH farm income
having capital
- > Average yield of fish from ponds
commercial feed use
- > Access to hatcheries & nurseries
seed availability & quality
- > Population density
local demand
- > Average travel time to local facilities
physical access
- > Access to wholesale markets
market access
- > Total fish production
size of market
- > Average fish price
price incentive
- > Growth rate of aquaculture
market expansion
- > Literacy rate
capacity to use knowledge
- > # female-headed HH
resource disadvantage
- > Fish farm HH trained
aquaculture knowledge

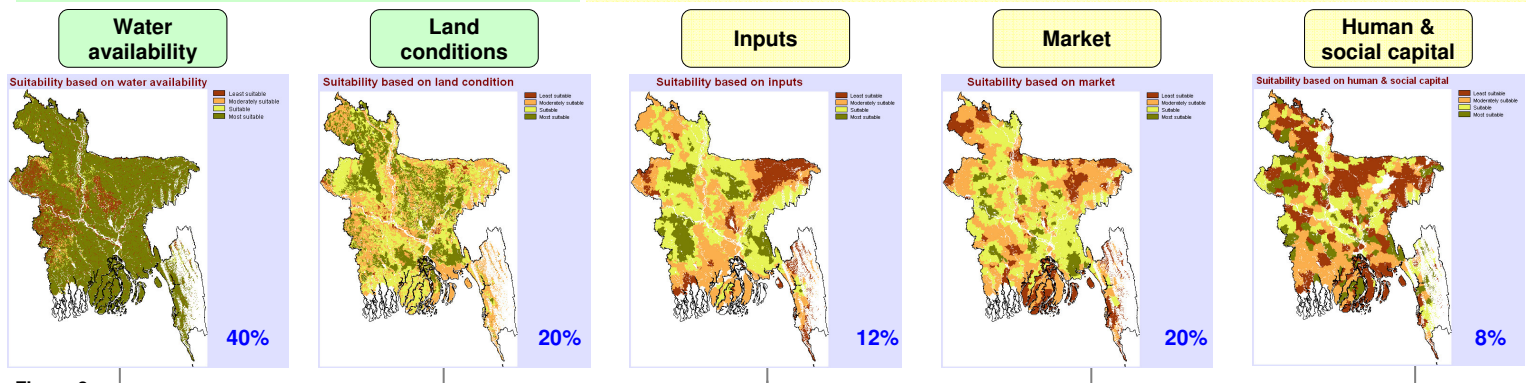


Figure 3

The multi-criteria evaluation technique (MCE), which is a weighted linear combination of the input indicator maps, was applied to each factor grouping as a sub-model. The sub-models would then be combined in the main model for evaluating overall aquaculture suitability.

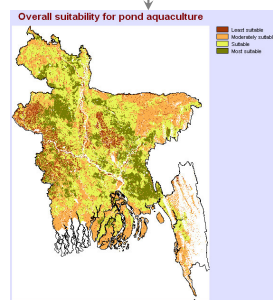


Figure 4

Experts were consulted to assign weights for combining the indicator maps for each sub-model and for the overall model. Fig. 3 shows the mapped results of the sub-models while Fig. 4 shows the resulting overall pond-aquaculture suitability map.

Querying results to identify limitations

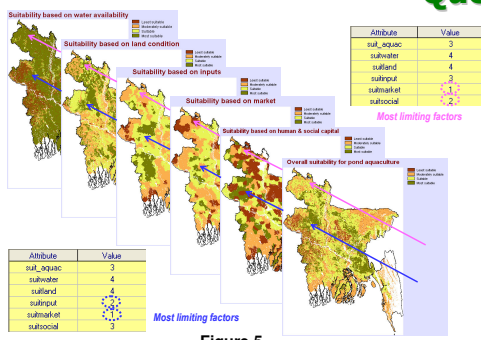


Figure 5

Knowing the limitations at specific places helps determine what interventions are needed to overcome them

For aquaculture planning and management purposes, it is not enough to produce suitability maps. The same rating of low potential at two locations may be due to different sets of limitations (Fig. 5).

For the convenience of target users, we developed the Suitability Analysis and QUery for Aquaculture (SAQUA) freeware for MCE modeling and for conducting drill-down query and filtering of multiple map layers, such as the overall suitability map and its component input maps (Fig. 6).

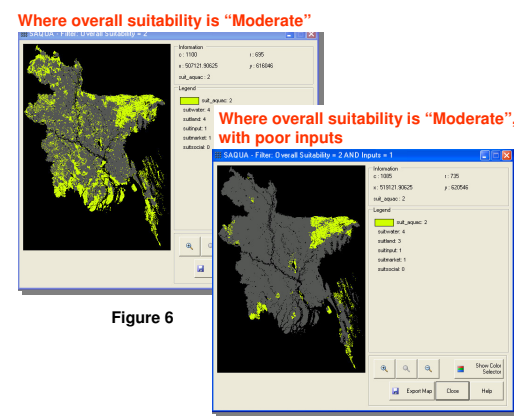


Figure 6