GIS Mapping of Pond Aquaculture Potential in Henan Province, China

基于GIS技术的河南省池塘养殖潜力研究

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Background and Approach

Figure 1

Freshwater aquaculture development in Henan province is uneven, with more intensive systems occurring in the Huanghe basin while the southern part is relatively underdeveloped and is the target for improving productivity growth of the aquaculture sector.

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 frame-work was adopted (Fig. 2) and implemented.

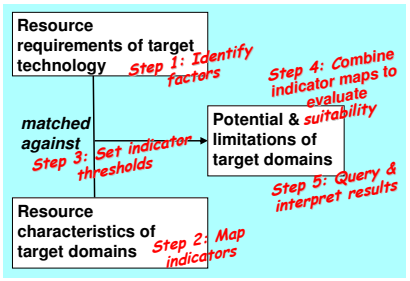

Figure 2

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
- ➢ Proximity to rivers & perennial streams
  supplemental water supply
- ➢ Slope steepness
  ease of pond construction
- ➢ Soil PH
  acidity constraint

SOCIO-ECONOMIC FACTORS

- ➢ Ranking of pond aquaculture experience
  experience in aquaculture
- ➢ # of aquaculture technicians
  sources of technical knowledge
- ➢ # of pond aquaculture workers
  labor availability
- ➢ *% of pond aquaculture HH / agriculture HH*
  prominence of aquaculture
- ➢ *Area of commercial fish enterprises*
  fry and commercial feed supply
- ➢ Population density
  local demand
- ➢ Average annual income
  affordability to purchase fish
- ➢ *# of wholesale markets*
  accessibility to markets

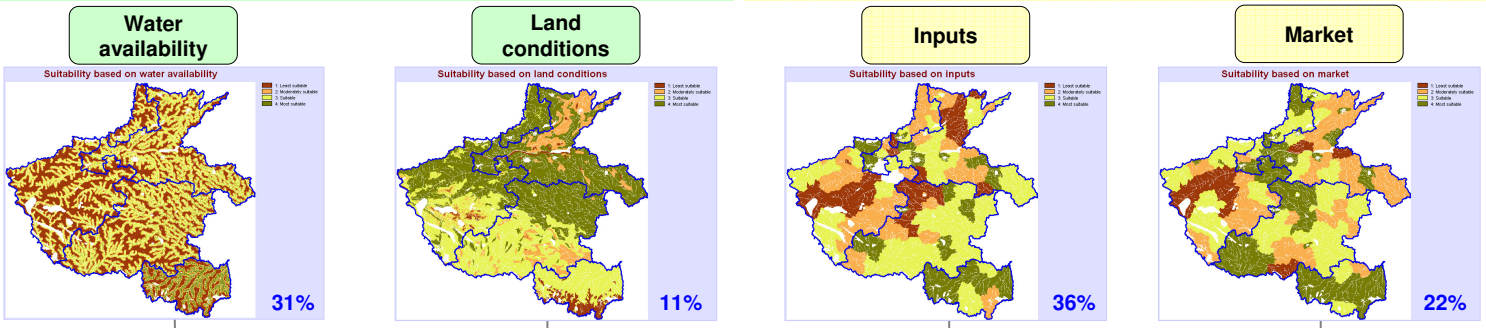

Figure 3

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.

In order to make the results more meaningful to local conditions, the analysis was done for four zones, that reflect different conditions and state of aquaculture development in Henan.

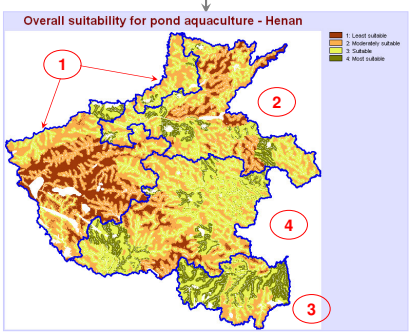

Figure 4

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

1: *Western hilly*
2: *Huangwei plain*
3: *South of Huaihe*
4: *Between Huanghe & Huaihe*

Querying results to identify limitations

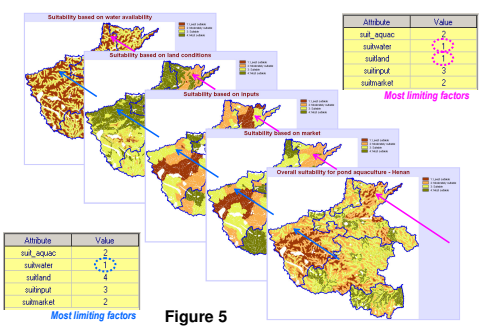

Figure 5

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 (see Fig. 6 for zone South of Huaihe).

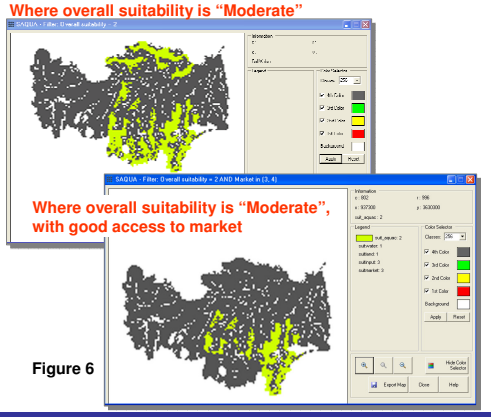

Figure 6

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