APPEAR

financed by

Austrian Development Cooperation

GENERAL DIRECTORATE FOR FISHERIES AND AQUACULTURE

SUSFISH
pêche-eau

BOKU

IHG

APPEAR PhD Topic :
Assessment of aquaculture potential in Burkina Faso, West Africa

Philippe SAWADOGO
Msc Aquaculture

June 2013

OUTLINE

1 **INTRODUCTION**

2 **OBJECTIVES**

3 **LITERATURE REVIEW**

4 **METHODOLOGY**

5 **WORK PROGRESS/ RESULTS**

6 **EXPECTED OUTPUT**

7 **WORK PLAN**

8 **CONCLUSION**

INTRODUCTION

Despite importance of food fish, the Sub Saharan Africa is the only region in the world where fish supply per person is declining due to the leveling off in capture fish production and the still-growing population (World Fish Center, 2005).

The development of aquaculture therefore appears to be a possible solution (World Fish Center, 2005, Halwart et Van Dam, 2010, Khan et al, 2011, FAO, 2012 a) to meet future growing gap between supply and demand of fish food.

INTRODUCTION

World aquaculture production continues to grow at a rate of 8.8% during the period 1980 to 2010. It reached 79 million tons, equivalent to 125 billion U.S. dollars in 2010 (FAO, 2012).

Its share in total world production of fish for human consumption was equal to 47 per cent in 2010 against only 9 percent in 1980.

Africa's contribution to world production increased over the past decade from 1.2 percent to 2.2 percent, mainly due to the rapid development of freshwater aquaculture in sub-Saharan Africa especially in countries such as Nigeria, Uganda, Kenya, Zambia and Ghana (FAO, 2012).

INTRODUCTION

However, Burkina Faso is a Sub-Saharan Africa country with very low development of it aquaculture (400 tons in 2008) despite a potential which can afford to produce about 110,000 tons fish per year (National Strategy for sustainable Development of Fisheries and Aquaculture, 2012) .

The challenges for Burkina Faso Aquaculture sector now is to replicate the cases of successes in the other countries of West Africa in the country.

Is Burkina Faso has a potentiel for aquaculture development ?
What is the potentiel ?
Where is the potentiel ?

INTRODUCTION

Overview of fisheries and aquaculture sector in Burkina Faso (National Strategy for sustainable Development of Fisheries and Aquaculture , 2012 Preliminary report)

- Fish consomption rate 3,5 kg per pers/year

- capture fish = 12 000 tons

- Aquaculture = 400 tons in 2008

- Fish import= 44 400 tons

- 32 700 Fishermen

- 5 700 Fishsalers

- 3 000 Fish processors

- Fish contribution to GDP =1%

OBJECTIVES

Overall objective

Assess the aquaculture potential in Burkina Faso

Specifics objectives

1. Study systems of aquacultures well established in West Africa;

2. Assess the potential for implementing viables aquaculture systems in Burkina Faso, based on the other West African countries experiences;

3. Examine cases studies of 2 systems of aquaculture (Intensive system in Bagre and semi-intensive in Bazega.

LITERATURE REVIEW

Geographic Information System (GIS)

GIS can be defined as tools for consulting, analyzing and editing data, maps and spacial information in general.

They are computer systems (hardware and software) used for analysis, consulting, developing, manipulating, storing, or in short, for handling geographic information (*Juan M. Sánchez-Lozano and al., 2013*).

The first application of GIS in the aquaculture sector dates back to the 1980s (Perez et al. 2005). GIS is also use in site selection, zoning and land-suitability classification (Hossain et al. 2007; Kapetsky et al. 1987).

LITERATURE REVIEW

There are two types of GIS representation :

Vector Representation

Maintaining the geometric features of the figures.
The vector geometric elements used are: dots, lines and polygons (*Juan M. Sánchez-Lozano and al., 2013*).

Raster Representation

Raster models are represented by a mesh or grid of rectangles, all with the same size. Each element is called a pixel or cell and has its information and geographic location assigned to it.
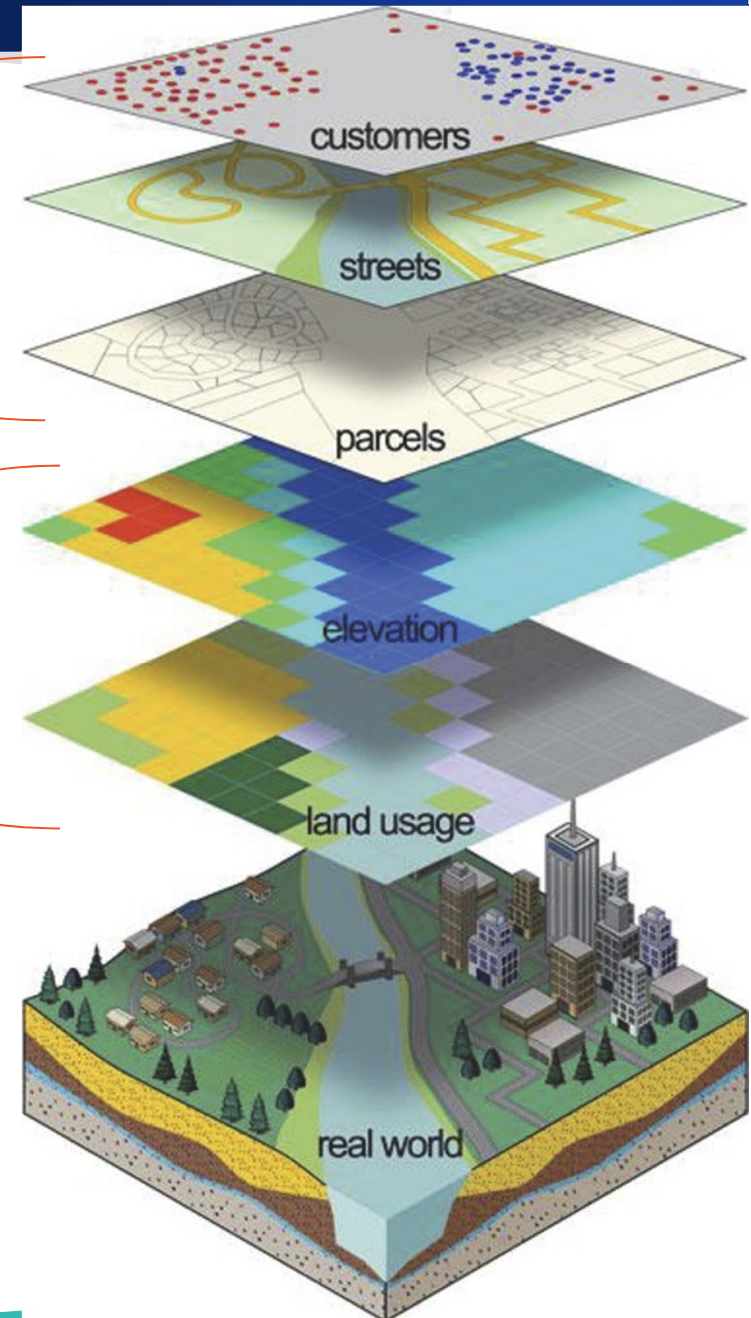
Fig. : GIS layersmodel. www.gembc.ca.
(*Juan M. Sánchez-Lozano and al., 2013*)

GIS study will consist of seven phases

▲   Involvement of end users

●   Subject matter specialists

■   GIS analysts

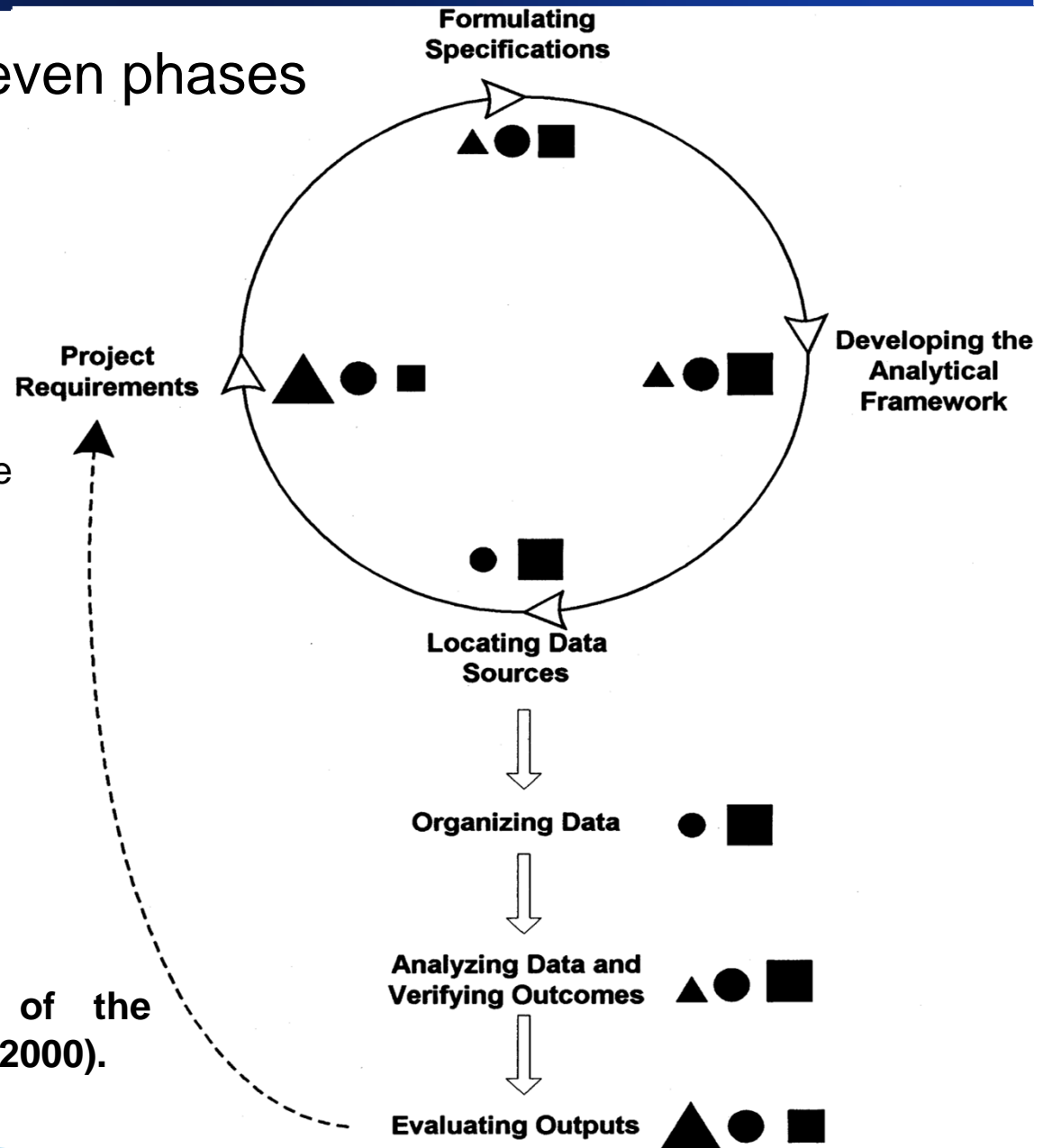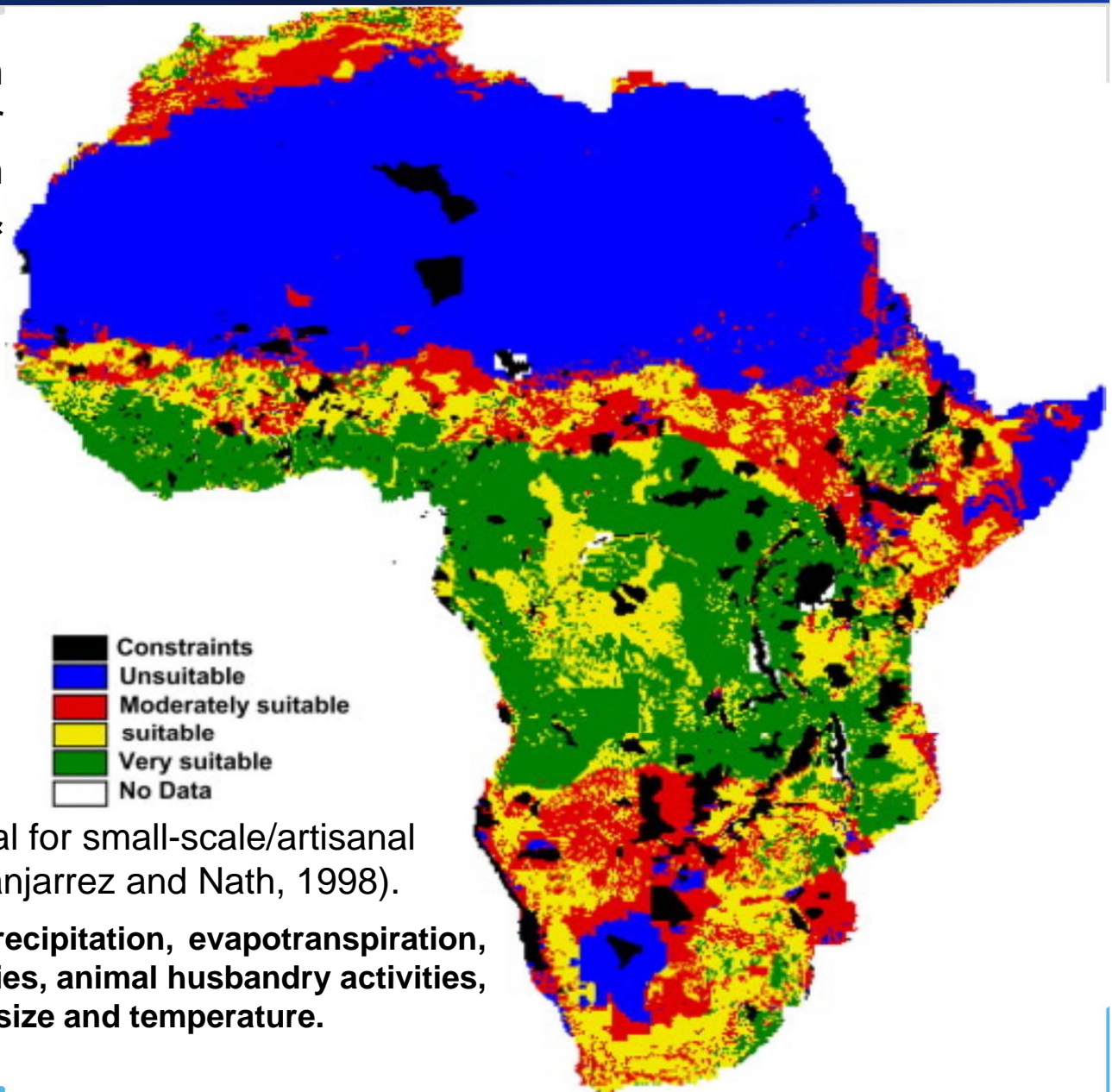Symbol sizes reflecting the importance of their respective roles.

Fig.: Schematic representation of the phases in a GIS project (Nath et al.,2000).

37% of the Sub-Saharan Africa land is suitable for small-scale and artisanal fish farming (*Aguilar-Manjarrez & Nath, 1998*).

Most of Burkina Faso land is suitable for aquaculture at small scale and artisanal

Fig.: GIS assessment of potential for small-scale/artisanal aquaculture in Africa (Aguilar-Manjarrez and Nath, 1998).

GIS model related to soil type, precipitation, evapotranspiration, seepage, slope, agricultural activities, animal husbandry activities, human population, roads, market size and temperature.

METHODOLOGY

Study areas

Burkina Faso

- 274 200 km 2

- Capital =Ouagadougou

- 15 275 115 inhabitants in 2012

(MEF, 2009)

- 45 Administrative

  Provinces

- 3,2 % of population growth rate

(1996-2006)

- GDP/pers 440 € (UEMOA,2012)

- Rate of poverty 43,9% (SCADD,

2011)

METHODOLOGY

Major Species

Tilapia (*Oreochromis niloticus*)

Catfish (*Clarias gariepinus*)

METHODOLOGY

1. Identify systems of aquacultures well established in West Africa

▪Review of litterature by using internet (**www.sarnissa.org , Sciences direct , http://www.capafish.org/, WWW. FAO.org etc..)**

▪Interview the expert of FAO (National, Regional)

▪ Study in west African Farm and Recherche Institutes to analyze the viability of differents aquaculture systems in West Africa

✓ Crystal Lake Fish in Ghana (http:// **crystal- lake**-fish.com) for Tilapia Cage system in Volta Lake

✓ Royal Fish Benin and HydroFish in Abdjan for recirculating systems

✓Mrs JOHAN ESTEVE Integrated Fish Farm in Abomey Calavi Cotonou for pond system (ferme.johan_esteve@yahoo.fr)
✓ Water Research Institute in Ghana (Akosombo)

✓ ADRAO/ in Bouake, Ivory –Coast for rice and fish farming systems

✓FAO Subregional Office for West Africa Accra, Ghana
http://www.fao.org/africa/west/)

METHODOLOGY

2. Assess the potential for implementing viables aquaculture systems in Burkina Faso, based on the other West African countries experiences

▪ Use of GIS modeling approch with MultiCriteria Decision Making methods (MCDM)
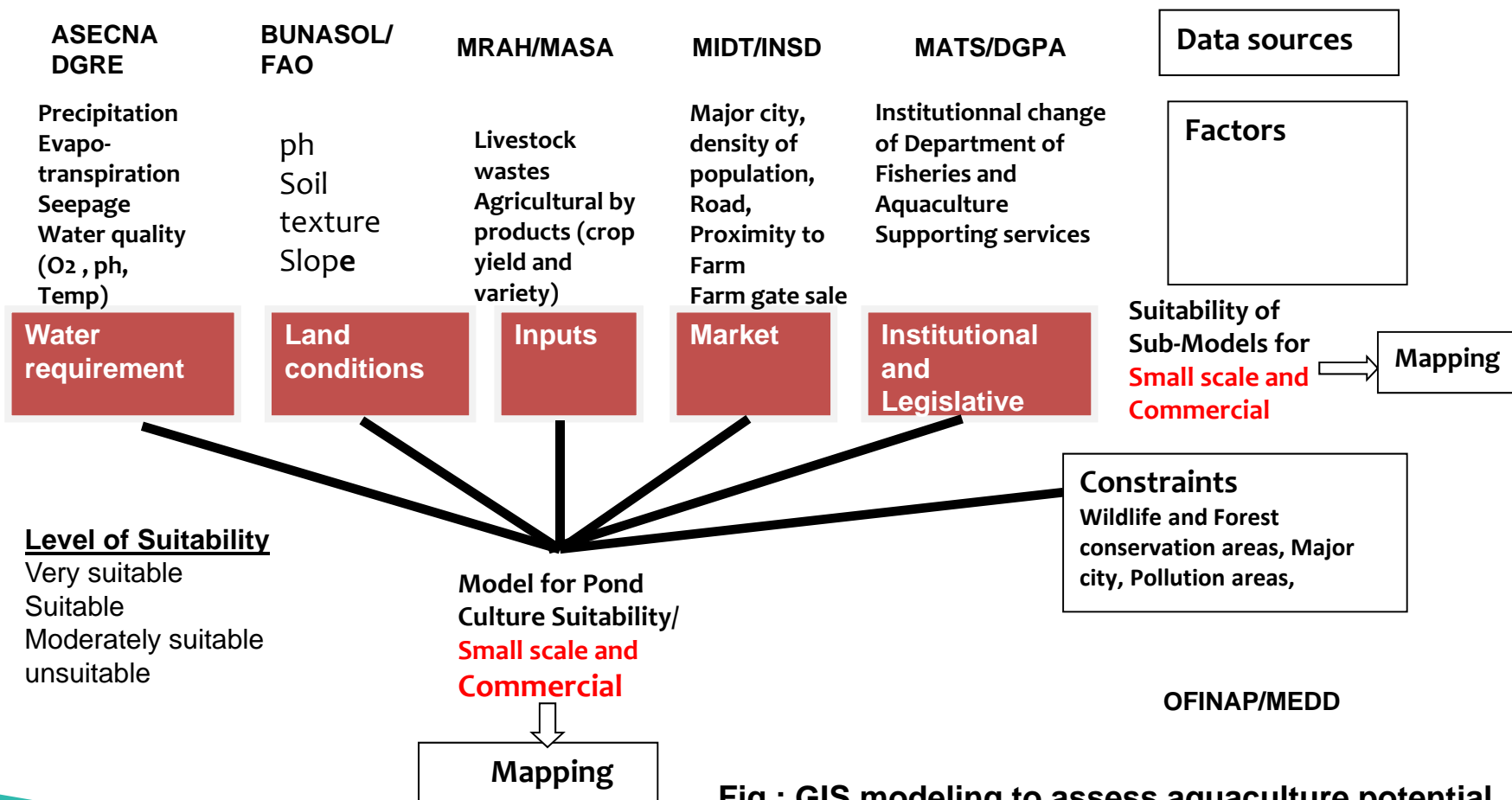
ASECNA DGRE	BUNASOL/ FAO	MRAH/MASA	MIDT/INSD	MATS/DGPA	Data sources

Precipitation Evapo-transpiration Seepage Water quality (O_2, ph, Temp)

ph
Soil
texture
Slope

Livestock wastes Agricultural by products (crop yield and variety)

Major city, density of population, Road, Proximity to Farm Farm gate sale

Institutionnal change of Department of Fisheries and Aquaculture Supporting services

Factors

Water requirement	Land conditions	Inputs	Market	Institutional and Legislative

Suitability of Sub-Models for **Small scale and Commercial** ⟹ Mapping

Level of Suitability
Very suitable
Suitable
Moderately suitable
unsuitable

Model for Pond Culture Suitability/ **Small scale and Commercial**

⇩

Mapping

Constraints
Wildlife and Forest conservation areas, Major city, Pollution areas,

OFINAP/MEDD

Fig.: GIS modeling to assess aquaculture potential in Burkina Faso

Multi-Criteria Decision Making methods (MCDM)

MCDM is a procedure that consists in finding the best alternative among a set of feasible alternatives. A MCDM problem with m alternatives and n criteria can be expressed in matrix format as follows Fig. where A1; A2; ···; Am are feasible alternatives; C1; C2; ···; Cn are evaluation criteria; zij is the performance value of alternative Ai under criterion Cj; and wj is the weight of criterion Cj. (*Juan M. Sánchez-Lozano et al., 2013*).

$$M = \begin{pmatrix} A_1 \\ A_2 \\ \vdots \\ A_m \end{pmatrix} \begin{matrix} w_1 & w_2 & \cdots & w_n \\ C_1 & C_2 & \cdots & C_n \end{matrix} \begin{pmatrix} z_{11} & z_{12} & \cdots & z_{1n} \\ z_{21} & z_{22} & \cdots & z_{2n} \\ \vdots & \vdots & \cdots & \vdots \\ z_{m1} & z_{m2} & \cdots & z_{mn} \end{pmatrix}$$

Fig. : Decision matrix.

METHODOLOGY

Multi-Criteria Decision Making methods (MCDM)

To determine the weight of each criterion or factor in the model, the Analytic Hierarchy Process (AHP method), proposed by Saaty in1980 will been used within the MCDM.

Table: Saaty's preferences in the pair-wise comparison process	
Verbal judgements of preferences between alternative i and alternative j	Numerical rating
Ai is equally important to Aj	1
Ai is slightly more important than Aj	3
Ai is strongly more important than Aj	5
Ai is very strongly more important than Aj	7
Ai is extremely more important than Aj	9
Intermediate values	2,4,6,8

METHODOLOGY

2. Assess the potential for implementing viables aquaculture systems in Burkina Faso, based on the other West African countries experiences

- Financial viability of fish farming in West Africa (Burkina Faso, Benin, Ghana, Ivoary Coast)
  - ✓ Elaboration of questionnaires
  - ✓ Survey (commercial Fish Farm and Small scale Fish farm)

- Market avaibility for fish farming products in Burkina Faso (Ouaga and Bobo)
  - ✓ Elaboration of questionnaires
  - ✓ Survey (Fish farmers, Fish salers, Food service operators, Consumers)

3. Case of study

- Bagre Fish Farm (Analyze the quality of Bagre fish food)

- Small scale fish farm (Analyze the productivity of natural food)

METHODOLOGY

Planned analysis for Financial viability

- **Break-even analysis**

- **Production function analysis**

- **Financial viability indicators**

Planned analysis for Market availability

- **Market availability Analysis**

Planned analysis for Cases of Studies

Cases of studies Analysis

✓ Analyse of quality of fish food produced in Bagre (% of proteins, carbohydrates and fats), Food Conversion Rate (FCR), SGR , ICJ.

✓ Evaluation of zooplanctoon production in fertilized pond , SGR

SGR, % j^{-1}) : 100 $(LnM-LnM_0)/Dt$

(ICJ): 100 $(M^{1/3}-M_0^{1/3})/Dt$

METHODOLOGY

Expected publications:

1. Assessment of pond aquaculture potential in Burkina Faso

2. Analysis of aquaculture viability in west Africa

3. Analysis of market for aquaculture products in Burkina Faso

4. Evaluation of natural fish food production in semi-intensive aquaculture systems in Bazega, Burkina Faso.

WORK PROGRESS/RESULTS

1. Collection of GIS databases for water resources, livestook ,agriculture, soil conditions, constraints areas (Wildelife, protected areas, and mining zones)

2. Review of Burkina Faso aquaculture systems (pond, cages, enclosure and rice fish culture)

3. Review of litterature , contact with the National Aquaculture and Fisheries Experts of FAO and CAMES Professor in Fisheries

EXPECTED OUTPUT

1. To assess the potential for small-scale/artisanal and commercial scale of aquaculture in Burkina Faso

2. To analyze viables aquacultures systems in West Africa

3. To evaluate the quality of Bagre fish food

4. To evaluate the natural fish food production in pond

WORKPLAN

Period	Activities	Place
March 2013-September 2013	Review of literature Finalination of protocol Data base collection	Burkina Faso
September 2013 – March 2014	Lectures Review of literature	Vienna, Austria
May 2014- August 2014	Review of literature Identification and analyzing of viability of West African Fish Farms systems	Benin, Ghana, Ivory -Coast
September 2014 – March 2015	Lectures Review of literature Data analysis	Vienna, Austria
May 2015- December 2015	Field work, Surveys data collection	Bagre, Ouaga, Bobo ect…
January 2016- october 2016	Lectures Review of literature Data analysis Scientific Papers preparation Thesis defense	Vienna, Austria

Thank you for your attention