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STUDY OF INTERTIDAL ZONES THROUGH SIMULATED SPOT DATA:

APPLICATION TO AQUACAL SITES INVENTORIES IN INTERTROPICAL AREA

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Development of coastal zones needs fullfilment of three main functions : land-mark, inventory, forecasts. Nevertheless, this is particularly true in intertropical area where these three functions are often badly assumed, nearly non-existing. Because of the importance of work to accomplish, especially in developing countries, great hopes are expressed towards teledetection which, through its characteristics, is considered as a privileged way likely to partially or totally satisfy the three above-said functions. The benefit of high resolution with satelites of 2nd generation (LANDSAT, thematic Mapper, SPOT) will probably be considerable. The high resolution particularly suits the observation of coastline zones.

Following SPOT simulations realized in New Caledonia by the G.D.T.A. (Group for Development of Aerospatial Teledetection) in December 1983, an application to cartography and inventories of aquaculture potential sites has been done.

Favourable areas for implantation of prawn-farming in tropical zone are located on the intertidal estate. We can find two main types of sites :

- first are constituted by wide bare and flat extanses on low coastline generally called "marshes", directly next to the "mangrove" and located behind. This first type of site can easily be developed and impact of environment arrangements is often not so important and such sites can suit a semi-intensive farming.

- Seconds are constituted by "mangrove" itself which are cut to create basins mostly used for extensive farming.

In case of direct development of "mangrove" itself, contraints on environment must be closely controled. In fact, if arrangements of flat and bare areas or adjacent "mangroves" marshes (first type of sites) do not disturb the environment or create a bit of damage to the environment, this is not the case for the direct "mangrove" arrangements. The main question is : which part of "mangrove" can we transform in basins without disturbing the ecosystem and its consequences being, in particular, adjacent coastal fishing ?

Factors of sites selection - Land arrangements

Selection of sites is made in function of various contraints of which we can find details hereunder :

- contraints of environment

    . settlement of sites, surfaces and shapes
    . soil quality
    . tides characteristics, stream study, temperature, salinity
    . natural productivity (wealth of living environment)

    . topography and drainage
    . Depth of neighbour areas
    . meteorology (rain-fall, winds)
    . risks of natural catastrophes
    . occupation of hinterland
    . possible land arrangements impact

- Logistic contraints

    . areas accessibility
    . electricity and fresh water resources
    . pumping possibilities and pumping protection
    . cities, industries proximity

- Economic contraints

    . land availability and cost
    . labour
    . technical works and support
    . market
    . competition between forecast, arrangements and other uses of environment
      itself or its neighbourhood
    . socio-political contraints

In New Caledonia, certain sites propitious to aquaculture have already been recognized by traditional means. One of these sites, the MARA Marshe, located in MOINDOU at 130 KM North of Nouméa, is being arranged and it was interesting to confront results from use of high resolution images with those obtained by traditional methods and to study their complementarity.

The methodology general procedure for treatment of images consists of lowering variance of original images by stratification of same. As a matter of fact, one of high resolution images characteristics intercepting the coastline areas is their variance due to a multitude of present topics.

From the original image, we extracted the intertidal zone eliminating the aquatic area and pointing out highest seas line.

Then, by modification of original coloured composition of intertidal zone, we can get a better visualization of four interesting areas, being from sea to earth :

- forest of MANGLE-TREES with preponderance of RIZOPHORA
- MANGROVE zone with preponderance of AVICENIA
- grass area with SALICORNE
- bare zone with MARSH

It is quite possible to identify each of these areas and to isolate them.

Nevertheless, we must keep in mind that use of images is limited by simulations which particularly interest reduced geographical extension. However, from rough images and by treatment of same, we can get the following main results :

- localisation of sites propitious to development

- shape of potential sites and information in regard to the type of land-patching

- surface of various potential areas. For instance, surface of South-East part of marsh resulting from calculation on images represents 43,8 Ha. Topographical survey realized during arrangements of that specific part gave a surface of 42 Ha.

- possible extensions and land arrangements priorities. Looking at sketches, we notice by decreasing priority order, A, B, C, areas favourable to arrangements and located in marsh bare region, as well as possible extensions of these three parts A, B, C, towards zone of "salicorne", extensions being respectively indicated by sketches 1, 2 and 3.

- types of access and practical side of accesses. The "panchromatic canal" is used. Same, through its resolution, provides precious informations in relation to network of roads, its extension, its coating (dust road or tar for instance).

- pumping possibilities. It is important to find installation site for a pumping station. Characteristics of that site will be : proximity of basins to be immersed in water, a good protection, presence of waters presenting a relatively low rate of turbidity.

The "ARROYO" no. 1 could be a favourable site taking conditions above-mentioned into consideration.

- pollution. Origins of pollution such as those in cities, industries or certain types of soil occupation in hinterland can be identified.

In reply to other contraints of sites preselection and arrangements, the high resolution image and its development bring qualitative answers, for instance the type of existing "intertidal" vegetation is an indicator of water salinity and of soil nature.

Finally, we note that study of repetitive images, when possible, are a potential source of qualitative and/or quantitative further informations in regard to ebb and flow means, linked to tide, flowing system, environment evolution, its characteristics and, in particular, for that last point, if we have an image to refer to.

The SPOT data, panchromatic canal of resolution 10 m and multispectral canals of resolution 20 m, enable us to answer, by the means of specific treatments, to a great many factors of preselection of aquacal sites to be used for prawn-farming. It is obvious that final choice of sites goes through land measures and controls.

However, we believe in the importance of completing the notion of implement used for a quick preselection of sites propitious to arrangements just as we have previously developed.

In fact, the high resolution image information, numerical, repetitive, as well as its treatment, give the chance to answer totally or partially to the three fundamental contraints already indicated : land-mark, inventory, forecast, especially with the possibility of adding any type of information directly unaccessable by teledetection, under the form of a geographical codification. Following actual pressions on "mangroves" all around the world, as well as on their adjacent areas, management programmes for that environment are established in various countries. High resolution images and numerical associated manipulations are presented as implements, basic to establishment of coastal regional arrangements schemes.

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