

**FAO International Technical Conference
Agricultural biotechnologies in developing countries:
Options and opportunities in crops, forestry, livestock,
fisheries and agro-industry to face the challenges of
food insecurity and climate change (ABDC-10)**

**Current status and options for biotechnologies in
fisheries and aquaculture in developing countries.**

General reflections

- There is no doubt that biotechnology has caused economic and social impacts on feeding, health and reproduction of plants, animals and human beings of great importance.
- Due to every biotechnology has some risk, is our duty to put the balance in the middle, in order to increase aquaculture production but without the degradation of the environment, the affectation of animal or human health and impacts over the biodiversity.
- It could be possible to produce GMO's of native species in close systems, but with strict national and international control and regulations. The application of risk analysis and the precautionary approach can be the way to reduce hazards.
- Biotechnology must reach all societies (developed and developing countries), all species (fish, crustaceans, molluscs and algae), all farmers (low scale commercial value to feed the poor and high commercial value species).

General reflections

- There are multiple examples of native species in the world with important advances in its culture, but they are blocked for technical and/or financial reasons.
- Producing native species, we keep the use and conservation of the biological diversity of the national and local communities which is important for its cultural legacy
- On the other hand, for biotechnology to successfully reach the poor and small scale production, their transfer and adoption has to be economically feasible and supported by governments through extension services, education and technical assistance.

General reflections

Requirements at national level

- Countries must be biotechnologically independent to increase their competence and productivity in any primary activity.
- Biotechnology generation, adoption and adaption has to be established as a high priority government policy, supported by programs and funds and continuously evaluated for its efficiency and goal achievement.
- Since recourse are scarce priorities have to be set for biotechnology generation for small-scale farming.
- It is crucial that private industries collaborate and participate with the academy and governments in the developing of biotechnologies and establish national networks.

General reflections

Requirements at regional level

- After the installation of the national networks, there is the need to create a multidisciplinary and inter institutional regional network .
- The regional network needs to establish priorities of biotechnologies to increase regional aquaculture production. They can be:
 - policies at regional level
 - To increase regional capacity through collaboration of the countries with more capability to the less competence.
 - Needs of biotechnology transference
 - To identify common problems that needs of the biotechnology to increase production and work in bilateral or multilateral projects, for example in common native species.

General reflections

- Periodical meetings of the network to develop strategies to reduce the impacts of climate changes and to identify the necessary biotechnologies to increase the range of temperatures where species can be reproduce and grow.
- Feeds in aquaculture will be of a great constrain in the near future to increase production. Regions have a wide biodiversity in plants with high protein content to substitute total or partially fish meal. Genetic enginery may identify the genes of the plants that had antinutrients to inactivate them.

Biotechnology in Latin American and Caribbean Countries (LACC)

- Biotechnology for aquaculture start to be developed in Latin American and Caribbean countries in the 80's and in the 90's innovative enterprises begins to proliferate in different nations.
- Some of the most advanced countries in LACC with capacity to developed their own biotechnology in aquaculture are Mexico Argentina, Brazil, Chile, Cuba, Ecuador.
- Most of the infrastructure of research and biotechnology of the advanced countries in LACC are from public budget.
- Latino American countries which recognize the importance of biotechnologies, have been adapting or adopting technologies from developed countries; however few viable commercial developments have been obtained by their own.

Biotechnology in Latin American and Caribbean Countries (LACC)

- In most of the developing countries in LACC research and biotechnology are developed mainly by universities and academic institutions. However in many of them there is no connexion with the private and invest sector. So it is necessary that the three sectors (government, academy and private sector) be involved.
- In the case of LACC aquaculture, the majority of biotechnologies are developed specially for shrimp and salmonids culture with the application of molecular biotechnology and immunology for disease diagnosis and genetic enginery.
- In some of the advanced countries of LACC it is necessary to create strategies to transfer technologies and to protect the intellectual property.

Biotechnology in Latin American and Caribbean Countries (LACC)

- Aquaculture in LACC has a great potential because represent the higher rate of growth of production in the world (22%) while the rest of the world was less than 11% (FAO, 2008), being Chile, Brazil, Ecuador and Mexico the leaders. In spite of this, the region at global level only produces 3% which must be increased. Therefore a special goal must be to work with native species and develop their technology of culture.

Biotechnology in Latin American and Caribbean Countries (LACC)

- Many LACC countries face big challenges and great obstacles in different ways to develop science and technology such as:
 - Political instability
 - Lack of national policies to stimulate research, innovation, transference and commercialization of biotechnologies.
 - Lack of legal framework in many countries.
 - Lack of authorities in biosecurity and intellectual property
 - Low budgets to education and development of science and technology (low Gross Domestic Product) and as a consequence few specialists in different biotechnological fields (molecular biology, genetic engineering, immunology, etc.).
 - In many developing countries private enterprises are resistant to technological changes and technology.