Agricultural Biotechnologies for Livestock in Developing Countries

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Biotechnologies for Livestock

- **The paper is very comprehensive, and presents biotechnologies for livestock in three areas:**
  - ✓ **Animal reproduction, genetics and breeding**
  - ✓ **Animal nutrition and production**
  - ✓ **Animal health**
- **All of them are extremely important, but by far, the <u>reproductive biotechnologies</u> are the most widely used in developing countries**

Reproductive Biotechnologies

Artificial Insemination - AI

- **AI is the cheapest and most popular reproductive biotechnology**
- **Even though it is known since the 30's, some developing countries still do not have the necessary infrastructure and capability**
- **Allows the utilization of genetic material to increase production**

Reproductive Biotechnologies

- **AI is a simple technique with a tremendous impact in productivity. A few aspects have to be pointed out, however:**
  - ✓ **International projects stimulated the use of semen of exotic breeds, substituting the local ones**
  - ✓ **This loss of the local breeds and the higher nutritional requirements of the exotic ones, brought the hunger to many communities**
- **Complementing AI with other services will potentialize the results, increasing its adoption in developing countries**

Reproductive Biotechnologies

Embryo Transfer - ET

- **ET is more expensive than AI**
- **Needs more infrastructure than AI**
- **Allow the re-establishment of a breed**
- **There is a huge difference in the utilization of ET among developing countries:**
  - Only CRs from 5 African countries reported the use of ET
  - 17 Asian countries reported the use of ET, but largely confined to research stations
  - In LAC, Brazil was responsible by 25% of the estimated 1,2 million embryos produced worldwide in 2007

Reproductive Biotechnologies

- **Cryopreservation**
  - ✓ **Allowed the broadening of AI, by the storage of genetic material for later use**
  - ✓ **Extremely important for the preservation of endangered breeds (Gene banks)**
  - ✓ **Can be used for gametes, embryos, DNA and cells**

Other Reproductive Biotechnologies

- **Semen and Embryo sexing – not reported for developing countries:**
  - ✓ Beef industry ➔ males
  - ✓ Dairy industry ➔ females
- **Cloning (Dolly in 1996) – few developing countries reported some experience. The problem is the reduction of genetic diversity**
- **Transgenesis – no transgenic livestock have been commercialized as food. There are a number of transgenic animals producing therapeutic proteins in milk, at different stages of development**

Molecular Markers

- **MM are a very important tool on the conservation of AnGR as well as in breeding programs**
- **ISAG defined a number of MM for the characterization of different species of livestock**
- **Eleven countries of LAC, 8 in Asia and only 4 in Africa reported the use of MM for genetic characterization.**
- **Much of this work involves international collaboration, and ILRI has a program including Asian and African breeds**

Molecular Markers

- **Marker/gene assisted selection is a reality in some developing countries**
- **DNA chips developed in recent years allow to genotype tens of thousands of SNPs.**
- **This is an example of an international cooperation, in which developing countries would participate with their local breeds, and developed countries with the biotech**
- **In many developing countries, however, there is no phenotypic characterization or pedigree information, making impossible to fully use the results of MM.**

Animal Health

- **Even though this is a very important field, not many developing countries develop this kind of research**
- **Infectious diseases not only reduce productivity as well as avoid developing countries to export animal products**
- **The example of Kenya that in partnership with United Kingdom almost eradicated Rinderpest should be followed**
- **The eradication of foot and mouth, for instance, is a goal in many countries, and when achieved, would facilitate the exchange of germplasm**

Animal Nutrition and Production

- **Among the three areas discussed in this paper, biotechnologies in Animal Nutrition are the less utilized in developing countries**
- **And this is due to the main production in developing countries which are mostly extensive**
- **The use of feed additives such as amino acids and enzymes appear to be most prominent and widespread in developing countries**
- **China, India and Brazil are among the developing countries where the utilization of additives is common**

Priorities for Action

- **Establishment of Gene Banks and formulation of a legal framework for their use and operation**
- **Strengthen AI infrastructure and capabilities**
- **Creation and maintenance of markets for the increase in end products after the adoption of biotechnologies**
- **Early and accurate detection and efficient monitoring and control of transboundary animal diseases**
- **Partnership between developed and developing countries for the development of biotechnological vaccines**

Priorities for Action

- **Public-Private partnership would help the development and production of animal nutrition products of biotech**
- **Cooperation to address issues pertaining to animal biotechnologies should be improved**
- **Capacity building of young scientists is essential**
- **Academic and professional institutions in developing countries must be strengthened**
- **Public awareness of advanced animal biotechnologies, such as animal cloning and genetic modification, should be encouraged**

Conclusions

- **Biotechnologies available and discussed in this paper may produce a huge impact in animal production**
- **Unfortunately, their adoption in most of the developing countries is very slow**
- **Most of the Priorities presented had been already pointed out in the Global Plan of Action for AnGR approved by 109 countries at the International Conference held in Interlaken, in September 2007**

Thank you!