Economic Valuation of Animal Genetic Resources:
## Importance and Application

Economic valuation methodologies for animal genetic resources (AnGR) play an important role in guiding resource allocation between biodiversity conservation and other socially valuable endeavors. Likewise, these can be used in various types of genetic resource conservation, research and development. Furthermore, these can assist in the design of economic incentives and institutional arrangements for farmers/genetic resource managers and breeders.

Despite its importance, AnGR valuation has, until recently, received very little attention, even though there exists a conceptual framework for the valuation of biodiversity in general.

The Economics of AnGR Erosion

AnGR erosion can be understood in terms of the replacement, not only by substitution but also through crossbreeding and the elimination of livestock. This bias towards
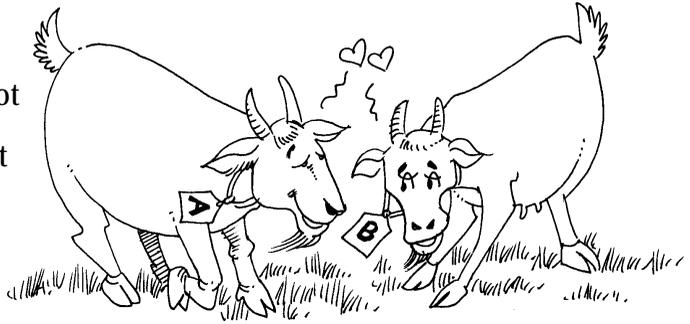
investment in such specialized breeds results in the under-investment of a more diverse set of breeds in a world where human investments are now necessary for the survival of the latter.

To the farmer, the loss of the local breed appears to be economically rational. The returns may simply be higher than that from activities compatible with genetic resources conservation. In particular, the latter may consist of non-market benefits that accrue to people other than the farmer. This divergence will be further compounded by the existence of distortions in the values of inputs and outputs, such that they do not reflect their economic scarcity.

When the activity of biodiversity (and genetic resources) conservation generates economic values, which are not captured in the market place, the result of this 'failure' is a distortion where the incentives are against genetic resources conservation and in favour of the economic activities that erode such resources. Such outcomes are, from an economic viewpoint, associated with market, intervention and/or global appropriation failures.

The Need to Establish Economic Values for AnGR

Economics is about choice and the efficient allocation of scarce resources that have alternative uses. Rationally speaking, choices should be made in such a way as to maximize the "utility" or "welfare" obtained. The large number of AnGR at risk in developing countries, together with the limited financial resources available for conservation, mean that economic valuation can play an important role in ensuring an appropriate focus for conservation efforts.


Economic arguments for conservation and sustainable use of AnGR can be an effective means of garnering the necessary public and political support, including development of appropriate policies. In this regard, important tasks include:

- assessment of the economic contribution that AnGR makes to various societies and provide economic arguments to help evaluate costs and benefits of conserving the genetic diversity;
- assessment of the impact of agricultural incentive payments, including subsidies on domestic animal diversity;

- economic analyses of alternative strategies and actions that might be taken to conserve domestic animal diversity and develop approaches for assessment priorities;
- development of economic incentives to support conservation by individual farmers or communities;
- assessment of the economic contribution of efforts to conserve wild relatives of domestic animals; and
- ensure that projects with direct or indirect implications for the livestock sector include appropriate consideration of economic issues related to AnGR.

The burden of being more specific about the value of genetic resources has come from different directions:
- resource conservationists and government planners who need to identify such values in order to justify budgets;
- Farmers' rights activists who want measures of the value in order to calculate compensation to farmers in developing countries; and
- a further source of pressure for establishing such values which gives legitimacy to much of the above is the Convention on Biodiversity (CBD) which stresses the importance of the "fair and equitable distribution of the benefits arising" from the utilization of genetic resources.
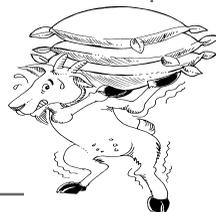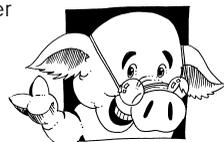
AnGR Valuation

A range of valuation methodologies exists. These are categorized into three groups on the basis of the practical purpose for which they may be conducted. Following the identification of a given breed being at risk, these methodologies can be applied in order to justify conservation costs by:

- determining the appropriateness of AnGR conservation program costs (i.e., environmental values);
- determining the actual economic importance of the breed at risk (i.e., breed values); and/or
- permitting priority setting in AnGR breeding programs (i.e., consider trait values).

In these analytical contexts, unpriced inputs are pervasive obstacles in experimental studies. Therefore, it is of particular interest to have access to methodologies that can attribute values to the unpriced inputs of the household production functions, which are disclosed via the systematic investigation of preferences. Data availability and/or the potential for acquiring relevant data will also be an important determinant. Where such missing markets/imperfections are significant, the resulting impact of any violations of the underlying assumptions of the potential valuation methodologies must be carefully considered. Thus, appropriate measures should be taken. Such violations will mean that much of the required data will have to be collected through specially designed surveys and adequate shadow pricing of relevant inputs/outputs used where market prices do not exist or are distorted.

In choosing a valuation technique, it is important to note that marginal and subsistence food production systems dominate the peasant economies where much of the world's surviving AnGR diversity can be found.

In choosing between methodologies, the analyst will also have to be aware of how different methodologies will be of interest to different actors, which include, inter alia, farmers, breeders and policy-makers in charge of conservation.

Valuation Methodology Results

Given that the field of economic valuation of AnGR requires substantial development, the International Livestock Research Institute (ILRI), together with its partners, initiated a project entitled "Economic Valuation of Farm AnGR." Its main objective was to field test potential valuation

methodologies to see which ones will work at reasonable costs. Some of the results of this on-going project and the work of ILRI's partners are presented below and show that such methodologies can be used to orient breeding strategies and conservation policy development.

- Contingent valuation methodologies (CVM) using a choice experiment (CE) approach, show that such a multi-attribute stated-preference method can be used to value the phenotypic traits expressed in indigenous breeds of cattle (i.e., Kenya and Burkina Faso). Results indicate that CE does not only provide good estimates of trait values. These could also be used to investigate values of genetically determined traits currently not prominent in livestock populations. Furthermore, farmer preferences for specific traits and the trade-offs they are willing to make between them can be quantified.

In Burkina Faso, the most important traits for incorporation into breed improvement program goals were identified as: disease resistance; fitness for traction; and reproductive performance. Beef and milk production was less important, despite their being the focus of more traditional economic analyses. In addition, the data permits an analysis of how household characteristics determine differences in preferences. This information can be of use in designing policies that counter the present trend towards marginalization of indigenous breeds.
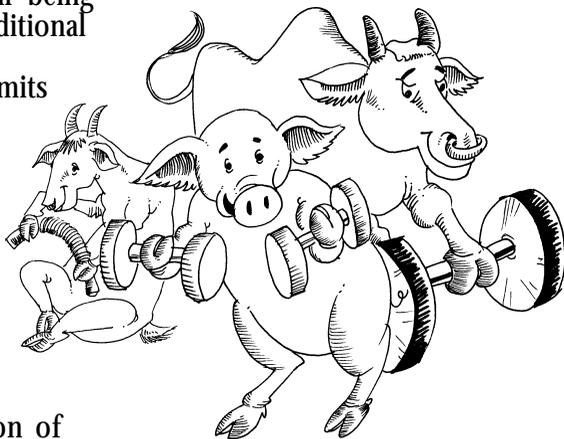
- An alternative CVM, using a dichotomous choice approach, was used to estimate the benefits of establishing a conservation program for the threatened Italian "Pentro" horse. A bio-economic model was developed and used to show that a large positive net present value associated with the proposed conservation activity does exist. This approach is thus a useful decision-support tool for policy-makers allocating scarce funds to a growing number of animal breeds facing extinction. It also provides an indication of how existence values (one component of total economic value) for livestock breeds may be significant. Through the use of appropriate mechanisms, they could be harnessed to provide funding for AnGR conservation.

- An aggregated productivity model approach revealed that under the subsistence mode of production in Ethiopia, the premise that crossbred goats are more productive and beneficial than the indigenous goats is wrong. The findings challenge the prevailing notion that indigenous livestock do not adequately respond to improvements in management and are always inferior (regardless of production system) to "improved" breeds.
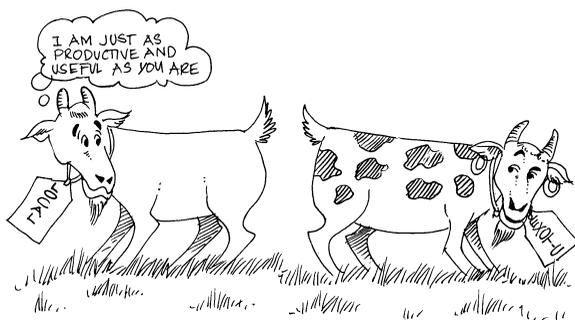
- The assumption that crossbred animals are always superior is also questioned in a cost-benefit analysis framework which suggests that the net benefits of crossbreeding programs may have been overestimated, leading to the promotion of exotic livestock breeds at the expense of indigenous livestock breeds.

> Conventional economic evaluations of these programs have often not considered subsidies provided by national governments and international donors.

In addition, the mandatory changes in production systems necessary for increased productivity are often associated with higher levels of risk while replacement of indigenous breeds has socio-environmental costs due to the loss of the (usually non-market) values of the indigenous genotypes. A conceptual framework for evaluating crossbreeding programs in Sub-Saharan Africa is under development to take such costs into account.

The Way Forward

Although some methodologies have already been successfully tested, these and other valuation approaches remain to be applied under differing circumstances for different breeds/species. The challenge now is to apply them in a context where they can contribute to actual development and planning activities. This requires a combination of stakeholder awareness-raising as to their importance and capacity building to ensure that they can be applied to support the incorporation of the results into actual decision-making frameworks.

Mechanisms for translating social values into efficient incentives for farmers/genetic resource managers and breeders are also required as the current divergence of private and social costs mean that the relative costs and benefits of AnGR conservation tend to accrue unevenly at local,

national and international levels. Several such mechanisms have been proposed and include, *inter alia:*

- genetic call options;
- licensing agreements;
- prospecting/royalty rights; and
- Farmers' Rights.

It is worth noting that despite the importance of the economic valuation of AnGR, it is not, however, an end in itself. Even where it is possible to identify the total economic value of AnGR, mechanisms to capture these values are necessary.

The removal of any adverse subsidies, the establishment of environmental funds and public financing, as well as market creation and support for commercialization can also provide incentives. Such mechanisms and policies may even help speed the development of improved valuation models.

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