Genetic improvement of yak in Arunachal Pradesh – constraints and opportunities

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Introduction:

Yak (*Poephagus grunniens* L.), the multipurpose bovid of mid to high hills (2500 - 5000 metre above m.s.l) of Arunachal Pradesh plays a pivotal role in the socio-economic and ethno-cultural life of the local people. It is considered to be as one of the most important sources for economic return among the people of Arunachal Pradesssh as because other source of economic return is very negligible. Mainly the yaks are distributed in West Kameng and Tawang districts of Arnachal Pradesh. This animal is reared by the 'Monpa' - the Tibeto-Mongoloid Budhist tribes of this state. This ia a unique animal of its nature which can withstand temperature even up to -50ª c during extreme winter which other animal can not.

Utility of yak genetic resources :

Being the multipurpose animal of hilly terrain yak provides milk with a range of 0.90 to 2.90 with an average of 1.63 ± 0.04 kg per day. Whereas, the fat per cent generally varies in between 4.2 -10.8 with an average of 7.05± 0.47 (Das et al., 1998b). The meat produced by this animal with little or no marbling which are in great demand among the local people. Regarding wool / coarse hair production the report indicated that this animal produces 0.4 to 0.6 kg of fine wool and 0.3 -3.0 kg of coarse hair per annum (Pal, 1994). Recently, it has been proved through the effort of National Research Centre on Yak, Arunachal Pradesh that the leather produced out of yak skin / hide is of good quality. Report indicated that the yak can carry a load of 40-50 kg at stretch on the precipitous snow-bound tract for 6-8 hours together due to its sure footed nature (Pal, 1995).

Constraints for Yak genetic improvement :

Pattern of yak herding :

The farmers of Arunachal Pradesh mainly rear yaks in the nomadic pattern of animal husbandry. The animals are shifted to the high hills during summer (May - October), whereas, they come down during winter season (November - April). They maintain a small number of animals with inappropriate herd structure. The animals are kept until they die without proper culling. They do not adopt any measure for selection. Random mating is a common phenomenon in yaks as they are reared under open range system without any restriction (Das et al., 1998a).

Low genetic variation and chances of inbreeding :

It has been observed that the yak herders use a bull for consecutive generations without replacement and the females are not also replaced from other population. The small herd size with inappropriate herd structure is a common phenomenon in yak husbandry. So, there is every possibility of low genetic variation which leads to poorer animal performance through occurrence of inbreeding depression (Das et al., 1998a).

Environmental effect:

As per seasonal change and availability of natural pasture the yaks are being shifted from one terrain to another. So, there is a chance of macro environmental change and variation of G x E interaction. The animals

face severe pasture scarcity particularly in winter season when environmental temperature touches even up to -50ªc. During severe winter, the genotype can not be exploited with its full potentiality as the environment reacts in reverse direction. The effects of genotype and environment are not always additive. The change of a specific environment may have a greater impact on some genotypes than others. That's why, there is a chance of ranking difference for genotypes when measured in diversified environments. This interplay of genetic and non-genetic factors on the phenotypic expression is termed as genotype-environment (GxE) interaction. In yaks, this interaction plays an important role and the phenotype can not express its desired potentiality. (Das and Bhattyacharya, 2002)

Traditional breeding strategies in Arunachaal Pradesh :

After 1962 there is stoppage of exchange of germplasm from China and Tibet to India and *vice versa.* It created a tremendous problem in the genetic improvement of yak germplasm of Arunachal Pradesh through its natural process such as presence of low genetic variation in the population. For enhancement of milk production in yaks, species hybridization was the common phenomenon. For that the farmers usually procured pure Tibetan bull (Glang). It is similar in appearance to that of humpless dwarf cattle (*Basaunus typicus* of Tibet (Pal,1992).

In their breeding practice they have considered two basic parental generations - i) yak and ii) Tibetan cattle. The nomenclature for yak hybrids are given by the farmers. Sometimes, different names are given for single category of animal e.g pure female yak is termed as Bree / Chuk or Nuk. The farmers are benefitted for species hybridization as follows :

- The hybrids which are superior in performance to the parental generations are best suited at an altitude of 2500-3000 metre above m.s.l, which is not congenial for pure yaks as well as pure cattle..
- To enhance milk production in yaks' species hybridization is one of the most useful solutions as adopted by the yak herders since time immemorial.
- The male hybrids are being utilized as pack animals in the mid and sometimes at high hills.
- From meat production pont of view hybrids are quite useful and there is tremendous scope for it..

Scope for genetic improvement in yaks :

Artificial selection and controlled Breeding in yaks :In the field conditions the yaks are solely maintained at free range system mainly based on the natural pasture. Replacement of stocks are not practiced in yak husbandry. No systematic selectioin measure irrespective of male and female yaks is adopted by the farmers. So, the artificial selection with stoppage of natural mating are highly required for rapid genetic progress in yaks. Provision of good shelter along with proper feeding to each category of animal as per seasonal demand and separation of bulls from the females should strictly may be salient measures for rapid genetic improvement (Das and Bhattyacharya, 2002).

Modern Biotechnological tools :

Low generation interval, accuracy of selection and larger genetic variation (h2) are the key factors for enhancing genetic improvement. It is very difficult to manipulate the genetic variation. It is determined by the population itself. The animal breeders can reduce the environmental variation. The following measures may be considered for rapid genetic improvement yaks (Das *et al.*, 1998b).

- For exploitation of its full potentiality yak is to be provided with optimum environmental facilities including proper feeding, health coverage and other managemental tools.
- First, the various traits of economic importance in yaks are required to be identified and further measures are to be taken for its development. There should be stoppage of random mating with timely detection of estrus and its accurate monitoring; set-time AI, pregnancy diagnosis, adequate control of calving with reduction in calving interval and breeding of yaks at younger age.
- There should be encouragement for selection of superior stocks and replacement of unproductive animals to reduce the inbreeding depression.
- The adequate herd size with proper herd structure are also required for rapid genetic improvement.
- **Use of Marker assisted selection:** The marker gene, closely related with target trait is inherited along with the whole segment of chromosome from parent to the offspring. Therefore, the inheritance of marker gene has no effect on the performance of target traits. In the process of data analysis for animal breeding marker data in addition to the phenotypic data are collected and it is referred as marker assisted selection (MAS). Progeny testing in males, and family or

individual selection in females are normally practised in Animal breeding. Traditional selection gives good results with a large numbers of data which are normally distributed. Traditional selection is inefficient for traits like fertility and disease resistance along with crossbreeding / species hybridization programmes and sex-limited traits. Recently, genetic / molecular markers like Restriction Fragment Length Polymorphism (RFLP), minisatellite or variable number of tandem repeats (VNTR) or DNA fingerprints, Microsatellite, random amplified polymorphic DNA (RAPD) etc. which are popular in modern animal breeding practices, may be applied in yaks for identification of genes and their manipulation.

Conclusion :

The world is changing fast as per the demand of people, their pressure on easily accessible natural resources. Due to the increasing population pressure and whimsical use of animal genetic resources without its proper replacement of the precious animals like yaks are reducing in number day by day. So, the first priority is to save this unique bovid with the following guidelins:

- The farmers who are managing yaks are to be properly educated for scientific rearing.
- There should be campaign for enhancement of number animals through traditional system and modern biotechniques.
- The slaughtering of females are to restricted and the males are to be used judiciously for meat trait.
- Modern biotechnological tools like storage of semen / oocytes / embryos, production of transgenic animal may be other options for its conservation and propagation.
- Corporate breeding schemes with natural / artificial insemination of semen collected from proven sires may be despatched in various yak pockets for its quick genetic progress.

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The research information on analysis of causes of death in the Centre's camel herd indicated maximum mortality (48.78%) due to the involvement of digestive system. Respiratory system was involved in 17.56% cases. The Nervous system was involved in 4.88% cases whereas the Cardio-vascular, Urinary and Genital systems were involved in 4.39, 0.44 and 0.44% cases. Deaths in 23.41% cases were due to poisoning, euthanisation due to fracture of long bones / incurable disease, pica etc. The calf mortality at the farm remains around 5%. It was suggested that improved management practices, cost effective management of long bone fractures and timely supplementary feeding can be of great use in reducing the mortality in young and adult camels (Annual Report, 2001-2002).

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