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Status Paper

CATTLE BREEDING IN PAKISTAN - SOME POLICY OPTIONS

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INTRODUCTION

Cattle population has surpassed 50 million in Pakistan. There are 15 breeds of cattle out of which Sahiwal, Red Sindhi and Cholistani are milch breeds while the rest are considered as draught puprose breeds. There is no defined beef breed for meat production. Non-descript cattle has a negative population trend but their number is still quite huge. A general perception persisting among livestock farmers is that non-descript are probably 'useless animals'. This perception is due to lack of understanding of the term 'non-descript' which simply means that the animals that have not been described as yet. Should these be described to bring them in the 'mainstream' and categorize them into strains and breeds, need resolution and resources.

Another issue is stagnancy in cattle productivity. We inherited a veterinary setup at independence. When commercialization improved, system should have been changed to animal production setup with veterinary as an important segment of livestock development strategy. However, we have been persistant with veterinary setup and now when productivity issues haunt, we are trying to find quick fixes. Increased demand of animal products is likely to put more pressure on the smallholder low input system in future. Purebred native breeds are under huge pressure of crossbreeding due to weakly enforced livestock breeding act(s). Holsteins and their crossbreds with Jersey and other breeds are being imported (generally) as pregnant heifers. Exotic semen is also being imported for breeding these animals. Policy makers believe that replacing the indigenous cattle with exotics such as Holstein and Jerseys is the only solution to reduce the huge populatin of low producing cows. This may not be a practicable solution.

Livestock estimates published by the federal government do not match with provincial statistics. We don't have the exact statistics of non-descripts, puredred indigenous and imported cattle. We need realistic figures on the population estimates of these subgroups of cattle. We can't transform our low producer animals to American and Australian cattle standards in 5-years of any political government. It requires much more time than that.

A recent issue of milk protein allergies from exotic cattle has given a new dimension to importance of indigenous cattle. In early 90s discovery of two types of caseins, the main milk protein in cattle, A1 and A2 were reported to have a different impact on humans after digestion. Of the two, A1 was linked to produce beta casomorphin-7 (BCM-7) which was declared opid, can have inhibitory effect on immune function. It was suspected to induce type-1 diabetes, heart disease, infant death and autism. Most of the European cattle breeds (including Holstein and Jersey) produce A1 type milk and percentage of such cattle is more than 50%. Zebu cattle breeds such Sahiwal, Cholistani, Red Sindhi and Thari, all produce good milk (A2 type). The Livestock Breeding Services Authority in Punjab, therefore, banned import of semen from bulls carrying A1 gene. A2 milk is now being marketed in Pakistan. Indians are also marketing ghee from indigenous cattle and from buffaloes branding it from A2 type animals.

These and other related issues are being discussed in this article to help policy makers tackle the dilema of non-descripts and low productivity. Before getting into details of breeding options it is important to understand what is a breed, how their affairs are controlled by breed associations and if we need to discuss various options, for which production system we are suggesting these options.

Defining a breed: Breeds of livestock (and other species) evolved through genetic isolation and either natural adaptation (to the environment) or selective breeding or a combination of both. Lack of communication means and preferences for certain attributes by different communities were therefore, important factors for breed development. Racing for example, to remain unique and fittest in the prevailing agroecological conditions, was important to many communities. It is obvious that just the shape of tail, horn length or structure, unique body color or even body size were enough to attribute a group of animals to a certain tribe or territory, giving these animals a unique name. The definition of breed accepted by various countries allows geographical separation as an argument to call a group of animals having similar characteristics, a breed (http://www.fao.org/docrep/i4787e/i4787e017.pdf).
Classically, a breed is a group of domestic animals,

termed such by 'common consent of the breeders' (http://afs.okstate.edu/breeds/). Calling farmers wrong and accepting any scientific definition is till not acceptable with breeders yet, it's a reality. Geographical separation is also a political decision. This is quite uncomfortable for those who originally owned the breed and gifted or sold to another country and after few decades the recepient now claims the breed as its own and wants to sell the breed to the country of origin. Definition of breed has alternate proposals, too, and arguments may be quite strong but change in the definition is difficult at international level. (https://www.fao.org/3/y3970e/y3970e02b.htm;; https://doi.org/10.5194/aab-61-229-2018; https://www.fao.org/3/y3970e/y3970e00.htm). It has been argued that the term breed has been more important in the Western world where pedigree recording is common and associations and societies own breeds for promotion and trade. Types and strains do exist in developing world too and are maintained by communities without a written account of physical attibutes.

Local communities rarely follow international nomenclature of describing breeds (http://www.fao.org/3/i2686e/I2686E.pdf). A relevant issue in defining breeds is definition of breeding objectives. Even when these objective? are available, these are vague and qualitative only. Breeding objectives are quite variable from place to place and even within communities. A good example is of Cholistani breed:A tribe may be inflexible to have grey color in their Cholistani cattle while the other tribe might allow only red as the main color for the breed. At other location, all color-combination may be considered as of Cholistani animals. The official understanding for different colors of the breed, however, is quite different from these ground realities. Another example is defining of Ravi breed of buffalo. A better body score and body size for the breed was result of nutritional status of the animals. When the nutritional status was improved the Nili animals got closer to Ravi, in their stature. Some of the vague definitions of head features also resulted in fading of Ravi breed of buffalo.

Breed Associations: The breed associations for managing the affairs of breeds is a phenomenon of few hundred years. For example, American Holstein Association (https://www.holsteinusa.com/) started in 1885 and is now claimed as the largest dairy breed organization in the world with 28,000 members and 370,000 registered cattle. The American Jersey Association (https://www.usjersey.com/) existed in 1850 and The American Guernsey Association (https://www.usguernsey.com/), formerly known as the American Guernsey Cattle Club, was establshed in 1877. For Shorthon cattle, the breed society was founded in 1874, whereas a herdbook had aleady been published in 1822. It contained 710 bulls and 850 cows. The breed was considered a dual purpose breed till the early part of the 20th century, whereas specialization for milk and beef started in 1958 (http://shorthorn.co.uk/the-breed). Breeders got organized for developing beef breeds as well. The American Aberdeen-Angus Breeders' Association was established in 1883 and the American Brahman Breeders Association (https://brahman.org/) was formed in 1924 although the breeds for producing Brahman breed (Guzerat, Nelore, Gir and Krishna Valley, etc.) were imported to USA some 100 years before.

The herdbooks have been a primary requirement for registration of purebred animals of a breed. These were registers having record of individual animals with their pedigrees. Breed associations generally kept the herdbooks open and allowed grade animals (an animal that is not eligible for registration by a breed association) to be part of the breed so that base of the breed remains wide. Centuries of breeding for a cow suitable for grasslands started with crossing of black cattle of the Batavians and white cows of Friesland. The Dutch provinces of North Holland and Friesland, and Schleswig-Holstein in Northern Germany are credited for early development of Holstein Friesian. When Europeans migrated and settled in US, breed was called Holstein-Friesian. The association developed in 1885 by merging various groups already maintaining pedigrees and herdbooks, was then renamed as Holstein Association USA in 1994 (https://www.holsteinusa.com/holstein_breed/holstein101.html?tab=1#TabbedPanels1). In Pakistan, Sahiwal Cattle Breeders Society is the only cattle society registered since 2007. The breed standards for Sahiwal breed were published in 2016 (http://uaf.edu.pk/oubm/Files/books/Sahiwal%20cattle%20-%20Judging%20and%20%20 Selection.pdf). This was part of requirements for registration with Punjab Livestock Breeding Services Authority (PLBSA). A dozen other native breeds such as Achai, Bhagnari, Cholistani, Dajal, Dhanni, Gibrali, Kankraj, Lohani, Red Sindhi, Rojhan and Thari have not been described as yet.

Cattle production systems: Basic understanding of production system is also important to decipher the issue of non-descript cattle. It is important to understand how animals perform in a given agro-ecological environment and how inputs and output determinants interact (https://www.fao.org/3/v8180t/v8180t0y.htm). System in Pakistan is quite diverse and there are many businesses directly involved with cattle. These make an important contribution to our economy. Cattle (approximately 50 million heads) also produce protein rich food, provide security, enhance crop production, generate cash incomes, provide draft power to transport, and produce value added goods which can have multiplier effects and create a need for services. Their huge number is,

however, considered detrimental to the environment (https://www.fao.org/3/w0027e/w0027e.pdf).

Traditionally, cattle in this country were raised for production of bullocks for ploughing and were used for pulling loads as well. This is in contrast to Eurpoe where horses were used for this purpose. In subcontinent, surplus bullocks were abundant because cows were important for religious reason and slaughtering was prohibited.

In Pakistan, as a muslim majority country, cow males are for slaughter and are the most commonly slaughtered sacrificial animal at Eidul Azha. Before independence, muslims faced death punishment for slaughtering a cow (including adult males and calves). It was true in Maharaja Ranjit Singh's empire (1801-1839). Even today majority of Indian states ban cow slaughter both for domestic or for export use. Hindus, majority in India are vegetarians. When Britishers were ruling the sub-continent, cows remained sacred but there was no official ban on cow slaughter. So level of feuds depended if it was a muslim majority area or not. At present, the foreign trade policy of India prohibits the export of beef from cows, oxen and calves but it allows buffalo meat to be exported. It is worth mentioning that buffaloes are not a preferred species for slaughter purpose although they are favoured for producing high quality milk. To control the slaughter of animals in Pakistan, laws exist in all provinces. For Punjab, the current version of amendment of Animal Slaughter Control Act of 1963 was updated in 2016 as The Punjab Animals Slaughter Control (Amendment) Act 2016. (http://www.9211.com.pk/LiveStockAdmin/uploads/Rules&Laws/kjlfx.pdf). It does not allow slaughter of useful animals including male calves below the age of four months and female calves below the age of 3 years. Pregnant, in-milk and fit-for-breeding females are also not allowed for slaughter. Male animals between three to ten years of age which are fit for draught prupose are also protected in the act. Animal which on account of culling, injury or any other cause not adversely affecting the quality of meat for human consumption, is not considered useful animal for the purposes of the Act. Tuesday and Wednesday are still banned for slaughter of small and large ruminants. When draft needs of the farmers were the primary reasons for cattle raising to continue to survive in this country, they became first choice as a sacrificial animals after independence. Tractor repalced ploughing needs to a reasonable extent. Pulling loads in cities has been reasonably repalced by rikshas / automobiles. Bullocks are still used for draft purpose along with donkeys, horses, mules and camels.

In South Punjab, cattle number increased over the last few decades because grazing lands in central Punjab has been sqeezed. Cattle are raised in rohi (unattended for 4-6 months) and are brought back when free grazing resources dwindle (rain dependent). Tribes have their specific body tatoos on the animals and cattle are recognized and amicably given to the owners. There is a year round system of raising cattle in South Punjab. Male calves sold at Eid are the primary output of this production system and breeding is natural. In the recent past, however, decreasing free grazing resources and marketing needs through mobile phones have helped farmers to remain stationed around cities to supply milk from the cows and sell the male calves to buyers from all over Pakistan especailly those specialized for raising bulls for sacrificial purposes. Bahawalpur and other big cities in the South Punjab have big cattle markets facilitating this economic activity. Most of the humped bulls available throughout Punjab on Eid-ul-Adha are, therefore, product of descripted (such as Sahiwal, Cholistani and Bhagnari ect) and non-descript cattle. The price of the indigenous bulls is determined by the weight, height, age and the color etc. of the animal.

Population estimates of cattle are published by federal government and last three census (1986, 1996, 2006) have breed populations listed. Current population estimates are extrapolations and have been projected to 51.5 millions (https://www.finance.gov.pk/survey/chapters_21/02-Agriculture.pdf). The 2006 census indicated that 29.6 million cattle were distributed unequally in provinces with Punjab having 49% of population (14.4 millions) followed by Sindh (23%), KPK (20%) and Balochistan (8%). Of the total population, 14.0% are bullocks, 18.2% are male young stock, 16.5% are female youngstock and 51.3% adult females. Some 30% female population is considered in milk. The census published by Livestock and Dairy Development, Government of Punjab (LDDGoPb) in 2018, however, shows a different picture. If we take cattle population estimates of federal government for 2017 and assume that 49% of these animals will be in Punjab, estimate for Punjab should be 21.8 millions but LDDGoPb's survey in 2017 indicates that population is some 14.9 millions which is 6.9 million less than the federal government estimate. Hope new surveys will reveal clearer picture to resolve these contradictions.

Cattle herd size is generally small; some 2/3rd of cattle are in a herd size of less than 10 animals and herds of cattle with more than 50 animals are 12.5% https://www.pbs.gov.pk/sites/default/files/aco/publications/pakistan-livestock-cencus2006/All%20Pakistan%20Report%20Livestock%20Census%202006%20%28PDF%29.pdf). Marketing cattle and their products is quite diverse. Most of cattle are marketed in traditional mandis. Cattle market management companies, suported by Punjab Government, have also emerged in the last decade. Beef is the main cattle product as some 50% of beef is contributed by cattle. They have a reasonable share in milk supply of the country

(https://www.finance.gov.pk/survey/chapters_21/02-Agriculture.pdf). Of the total estimated milk production of 63.7 million tonnes, 37% is contributed by cattle. However, if one looks at the estimated breed level per animal production, these estimates seem to be execgerated figures. Some 9.8 million hides are also contributed by cattle. Similar to buffaloes, cattle dung is not only used as fertilizer (and for making biofertilizer), some is used for making dung cakes and (recently) dung wood which is quite a useful economic activity for poors. Exports include cow beef and leather products etc. Most of milk (95%) is marketed unprocessed and its utilization is generally in the big cities.

Cattle Breeding Options: Breeding objectives determine the breeding strategy to improve economic traits of a breed. Among the indigenous breeds, milk yield and quality is primary breeding ojective for Sahiwal and Red Sindhi. For Cholistani, production of male calves seems to be quite important even though breed is being gradually shifted to stationary production sytem as compared to transhumant or extensive system of raising. Thari is simiar to Cholistani. For other breeds such as Bhagnari, Dajal, Kankraj, Dhanni and smaller breeds such as Achai, Gibrali, Lohani and Rojhan, beef is the primary objective. For Hissar/Hiryana, racing speed and stemina is the major breeding objective and milk is not considerd for producing future parents. Dearth of knowledge and lack of clear policy is indicative of the fact, the only one of these breeds, Sahiwal, have defined breeding objectives. So we have four options and these may not be mutually exclusive.

Purebreeding indigenous cattle: For purebreeding, Research Centre for Conservation of Sahiwal cattle was established during 2003-04 in Punjab (Renamed as Research Centre for Conservation of Indigenous Breeds in 2016), has a responsibility for breed development but still it is confined to only Sahiwal. Few hundred bulls have been progeny tested, the accuracy of breeding values is, however, low beacuse of less number of daughters. Selection intensity also needs improvement which means expansion of the program to test more bulls. This requires more registered population and more candidate bulls. Originally it was perceived that 150 bulls will be tested each year. This require some 60,000 registered population so that half of it is available for breeding every year for testing bulls. Genomic testing is not practised because of absence of reference populations and limited technical capacity of Government setup. Embryo Transfer and IVF (In vitro Fertilization) technologies are not practised either. They are at the lower end of priortity list. These technologies can have impact if we have genetically best selected bulls. Semen sexing technology is helpful for producing more heifers. However, majority of our breeds fetch major income from sale of bull calves for rearing at Eid so this technology may not be useful in this situation. The strategy to execute genetic selection within breeds can have an alternate approach too. Instead of improving the breed only, improving the production system in a holistic approach involving communites is becoming poular in African countries. It may worth attempting as ICARDA announced that community-based breeding programs have proved highly successful in Bolivia, Ethopia, Mexico, and Peru (https://www.icarda.org/research/innovations/community-based-livestock-breeding).

About half a million exotic cattle (generally Holstein Friesian) have been imported in the country. Exotic semen is routinely imported for their pure breeding. Minimum standards laid down by Livestock Breeding Services Authority (Punjab) are followed so that tainted and below average semen cannot be imported. Semen imported for these cattle is also available for non-descript and crossbred cattle as per Punjab Livestock Breeding Act 2014 (https://livestock.punjab.gov.pk/system/files/SOPs%20for%20breeding%20animals%202015.pdf0) but implementation is weak. Resultantly, indigenous purebreds such as Sahiwal and Cholistani are under a threat of depletion.

Replacement of local cattle with exotic cattle: Influx of information on social media sometime leads to believe that if our local cattle are not meeting the demand of milk and meat then these should be repalced with more productive exotics. Replaceing all cattle with exotics may be theoratically possible but practtically replacing 50 million cattle is not a feasible option. Gradual replacement is possible and it is happening with passage of time.

Importing of exotic dairy cattle in Pakistan started in early 80s when Holsteins and Jerseys from America and Europe were imported in the private sector. Government supported nucleus herds, one each in Punjab, KP and Balochistan. Main objective of these nuclei was to produce cheaper semen for upgrading indigenous breeds. Later imports in 90s and till today resulted in a mixed experience. Animals with smallholders generally failed to survive and breed further but organized farms have some success stories. At present there are about half a million imported cattle in the country and about 10000 cows are being imported every year. A million doses of exotic semen are imported for catering the need of exotic farms, for crossbreds and crossbreeding non-descripts. Performance of imported cows with private setup has been obscure. The true picture may be clear if these farms get open for research. Of the three Government nuclei, Leukosis was discovered at KP nucleus (at Harrichand near Peshawar) and new strains of FMD devasted every year at the nucleus in Punjab (at Pattoki, Kasur) and cows were ultimately

culled due to brucellosis. Information regarding productivity of Holsteins and Jerseys is variable and studies might not converge. The average lactation yield of these exotics (Holsteins) may be around 3500-4000 kg (Fig. 1) (Javed *et al*., 2004); Bilal *et al*., 2008; Usman *et al*., 2012. Male calves produced at these exotic cattle farms are generally culled for meat in the first week. Import of exotic cows is likely to continue and successes and failuers will also continue.

Fig. 1. Lactation milk yield and length of Holsteins at three Government nucleus farms.

Crossbreeding with exotic cattle: Crossbreeding is a very popular option to improve productivity of cattle. We inherited legacy of crossbreeding at the time of independence in 1947. During colonial time, improved cattle utilization efforts are available in literature. Reports of distribution of Dajal (inhabitant of South Punjab) and Dhanni (inhabitant of North Punjab) bulls to support farmers by the Britishers are available. Dhanni breed was also promoted for production of milk in the potohar region before independence. Crossbreeding of local cattle with exotics also was attempted and this involded Ayrshire, Shorthorn and Friesian breeds (https://dspace.gipe.ac.in/xmlui/handle/10973/24422) in the later part of 19th and early part of 20th century.

Artificial insemination in Pakistan (using frozen semen) started in early 70s and semen of Holstein and Jersey breeds was imported to test various crossbreeding options. In the beginning, there was no clear policy and initial testing promoted crossbreeding and brought Sahiwal (and other purebreds) under a lot of pressure bacause it was used for such studies. This not only happened in Pakistan, but most of developing countries were sold/donated semen by European, Americans and Australians. FAO has provided a review of these crossbreeding attempts (https://www.fao.org/3/t0095e/t0095e00.htm). It was established that crossing local cattle with exotics showed an improvement in almost all traits of eonomic importance up to the 50% level of exotic inheritance, but further grading towards the taurus breeds gave variable and often disappointing results. The average values reported for lactation yield were 2052 kg for F1 and 1538 kg for F2. Native cattle averaged 1049 kg and purebred exotic 2150 kg. Calving interval in F1 and F2 was 422 and 438 days, respectively, for F2; and for native and purebred exotic it was 450 days. The F2 were reported inferior to F1 in all the traits in more than 50 datasets analyzed. Heterosis was reported important for all traits except lactation length. In proportion to midparent mean it amounted to about -14% for age at first calving, 28% for milk yield and -6% for calving interval. (Fig. 2)

The summary of native, exotic and crossbreds from around the world is slightly different from Pakistan. Organized studies involving non-descripts and exotics under similar management are not available; however, comparatively organized studies with Sahiwal indicate similar trend. In a study conducted at University of New Southwales at Armidale (Australia), it was reported that (Fig. 3) average lactation yield in Sahiwal (1770 kg) was lowere than F1 (2735 kg) and F2 (2026 kg) Holsteins. These statistics may be considered for a medium-high input system and are not representative of low input system, majority of cattle are raised in Pakistan. Other studies under similar production setups may give slightly different results. Upgradation of native/non-descripts using Sahiwal may show better results. Intresteing observations of a professor of agriculture and rural economoy from University of Edinburgh (in 1888) were published some 135 years ago and it looks some of these findings are still true today.

"*In no case have the efforts to establish European blood, either in its pure form or crossed with native cattle, met with that success which would warrant those who have gained experience in the matter to continue their efforts on anything but what we might term a "hobby" scale. Some of the reasons why European*

cattle do not succeed have already been pointed out. English cattle live and even thrive if properly cared for and sheltered, but they must be pronounced a failure when left to the natural influences of climate, such as the native cattle are enabled to withstand. In saying they thrive it is not implied that they retain all their good qualities, as when kept in the best possible way European cows cannot be got to yield anything like the quantity of milk that they give at home, and their crosses, which are only middling milkers at the best, unless highly fed and carefully nurtured, are very poor indeed. Imported cattle seem to succumb more readily to disease than native cattle; and on account of this, much unnecessary loss has been entailed through high-priced animals being selected in place of lower-priced well-bred ones of ordinary appearance." ... Indian village or local breeds, "many of which are not sufficiently important to be specially named, are the representatives and remains of the ancient aboriginal breed or breeds that inhabited the country before the waves of importation, which periodically flowed over the land, had come. They have been driven into country villages or into remote corners, such as mountainous or inferior districts, where, by dint of lengthened association with often adverse influences, the breeds, though often set down as miserable and unprofitable, are generally extremely well suited to their surroundings in the points of essential importance, i.e., soil, climate, and food. To attempt to cross them with larger animals of finer build would undoubtedly end in disaster, unless the treatment and general circumstances were altered to suit the new forms. The only method of improvement which will end successfully is that of selection, combined with greater attention and better treatment. With these, time only is required to accomplish almost any common object in breeding." https://wellcomecollection.org/works/f4ktjg59/items

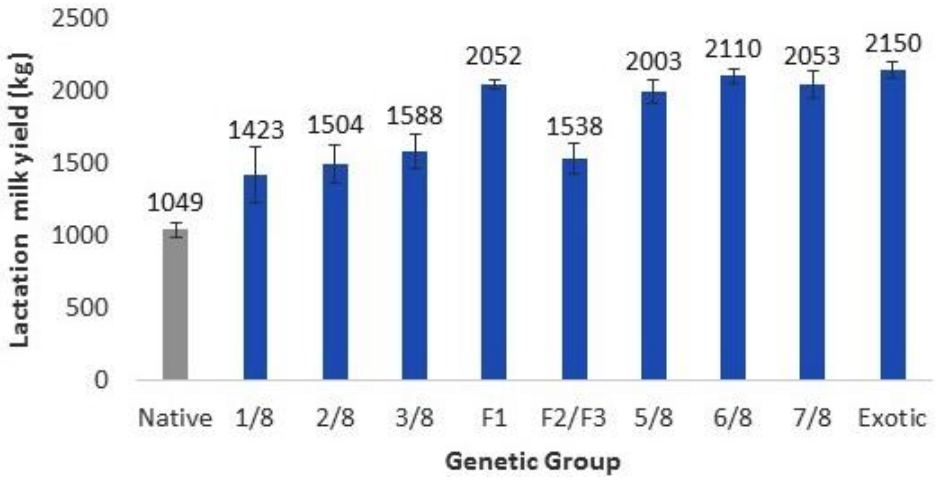

Fig. 2. Milk yield in native, crossbred (level of exotic inheritance indicated) and exotic cattle (https://www.fao.org/3/t0095e/T0095E06.htm#ch5.7)

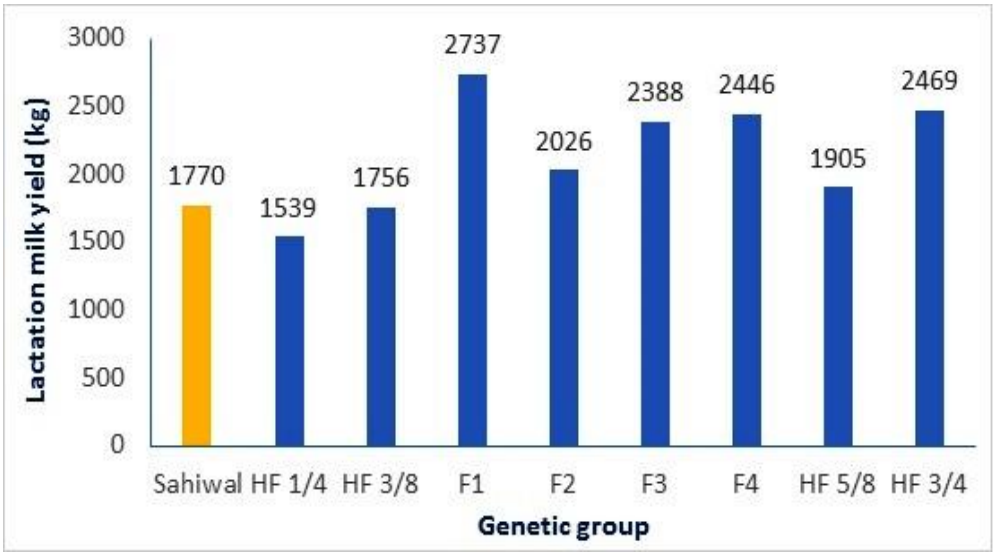

Fig. 3. Milk yield in Sahiwal and Holstein crosses in Pakistan (Ahmad etbal., 2001))

Upgradation of non-descripts: The fourth option for cattle breeding in Pakistan is to upgrade 'non-descripts'. One option was crossbreeding with exotic cattle such as Holsteins (or Jerseys) with a suitable level of exotic inheritance (50-75%) as discussed above. The other option is to upgrade them with locally available high producing breeds such as Sahiwal or Red Sindhi etc as per requirement and availability of the breed in a hometract. Before discussing this option, first issue is to understand how many non-descript cattle are there in Pakistan. The breed wise cenus data are available for the last thee livestock census i.e 1986, 1996 and 2006. The term used for non-descript cattle is "others". Crossbreds and exotics are pooled together as well. Non-descripts are 43% of the total cattle population (Fig 4.).

Last census is 15 years old but if these figures are extrapolated linearly, the expected number of non-descripts at present should be 27% of the cattle population (Fig 5.). The conservation programs of cattle started almost at the same time when last census was conducted. At present non-descripts are expected to be one-fouth of the cattle population. The next livestock census will improve the reliability of these estimates. As a policy option if we want to reduce the number of non-descripts, we must improve efforts to describe animals to breeds or strains. These non-descripts are surviving because they supply the male calves required for annual sacrifical event. In the areas where feed and fodder supply is better, the non-descript should be upgraded. Two options are there: first option is that they should be upgraded with exotic dairy/beef cattle and second option is that they may be upgraded with better indigenous dairy cattle such as Sahiwal. Advantage of this option would be no adaptability issues, no increment in disease incidence and there would not be any issue of deterioration in performance in F2. This will save foreign exchange as well.

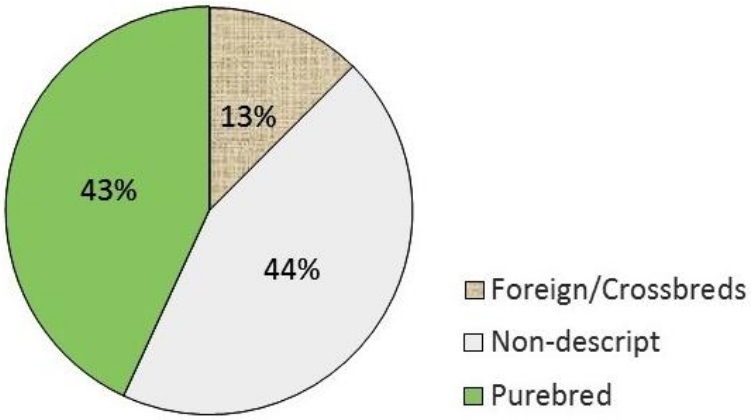

Fig. 4. Cattle population reported in 2006 livestock census of Pakistan.

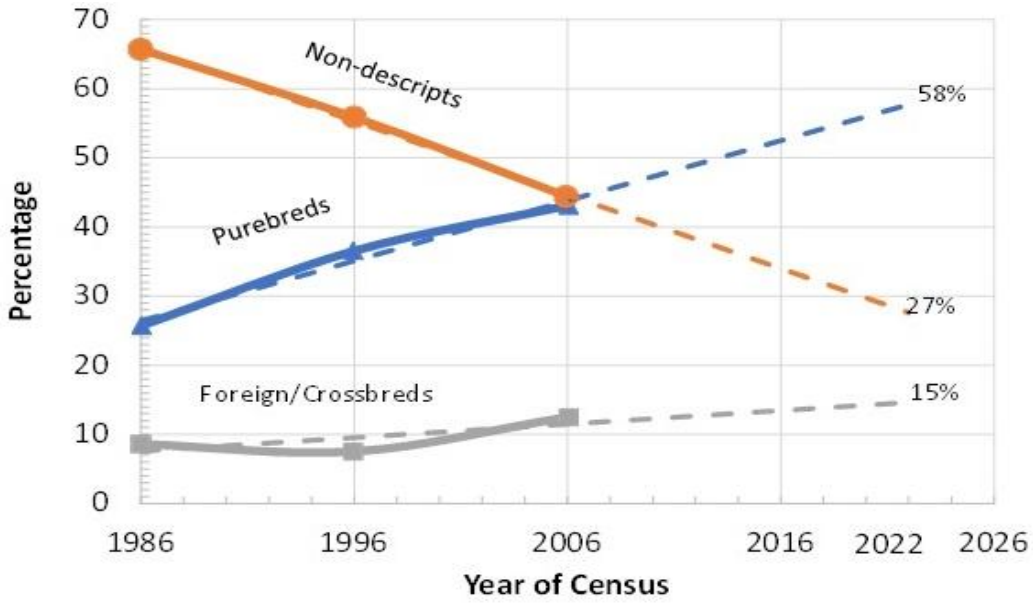

Fig. 5. Purebred, crossbred and non-descript cattle population in Pakistan

Conclusions

1. Breed concept may be a western concept but to move forward we have to accept it and redefine our indigenous breeds so that ownership can be developed through organizng groups of breeders who can take care of breed issues and breed development becomes a reality. Western breed associations were not developed in a day. Many are more than 100 years old. Hard work of centuries has made their breeds international.
2. To better utilize our non-descript cattle, we need to describe them and group them as separate strains or part of already established breeds. Breed definitions may be modified to ground realities and graded animals be included in the previously established breed. This will widen the base of breeds allowing better selection intensity. Upgrading with local breeds is already a recommended strategy in the Punjab Livestock Breeding Act 2014.
3. Already established breed societies should be facilitated so that slowly and gradually they can take up pedigree and performance recording tasks.
4. Low producers in the non-descript category may be upgraded to exotics such as Jersey (or Holsteins where forage resources are reasonable). However, this should be avoided in the areas where main source of feed/fodder is communal grazing and crossbreds are less likely to survive (e.g in Cholistan). In such areas, producing of male calves is the primary output of cattle breeding. If absolutely necessary, instead of a dairy breeds, a dual purpose breeds (milk and beef) may be considered for crossing.
5. Definition of breeding objectives will follow the description of non-descripts and formation of societies. This can help initiate community based breed imrovement as reported for developing countries in cattle and small ruminants.
6. To improve service delivery, AI technicians are needed. At present there estimated number is around 6000. Doubling this number should take care of needs of next 5 years. Livestock Breeding Services Authorty (LBSA) has a mojor role to play for quality technicians. It should be clarified however, that collecting semen and freezing it for inserting artificially into cow does not bring genetic improvement. It is the genetic ability of the bull that can bring genetic improvement.
7. Crossbreeding non-descript blindly will bring mistery only. Unless production system is favourable for genes to express themselves, modifying genetics will be wastage of resources. Once an animal becomes crossbred, it takes more than six generations to reconvert to a purebred. Claiming that non-descripts can be converted to American Holsteins in one generation is unrealistic.
8. Performance recording of already estbalished breeds must continue, and the onging programs should be expanded so that genetics of best bulls can be spread through artifical insemination technique. Embryo transfer and in vitro fertilziation technologies are good to speed up breed improvement efforts but as a stand alone activity cannot bring any major change in the genetic improvement of a breed.
9. Present veterinary dominated setup of Livestock Departments in all provinces also needs to be transformed keeping in view our national priorities. Unless genetics and genticists are given the role of changing the genetic structure of indigeous breeds to shift from more animals to less animals with better productivity, we will be forced to increase livestock population for supplying animal products. Increased livestock population is not possible to be supported with existing feed, forage and land resources of the country.
10. Genomics can help in speeding up the genetic progress but that requires recording and identification of parents of future generations.

REFERENCES

Ahmad, M., J. H. J. van der Werf and K. Javed. (2001) Cross breeding effects in crossbred dairy cattle. Pakistan Vety J. 21 (4): 180-183.

Bilal, M., M. Younas, M. E. Babar and M. Younas (2008). Productive performance of Holstein Friesian kept in Balochistan. Pakistan J. Agri. Sci., 45(2):254-258.

Javed, K., M. Afzal, A. Sattar and R. H. Mirza, (2004). Environmental Factors Affecting Milk Yield in Friesian Cows. Pakistan Vet. J. 24 (2): 58-61

Usman, T., G. Guo, S. M. Ahmad, S. Ahmad, L. Qiaoxiang, M. S. Qureshi and Y. Wang (2012). Performance traits study of Holstien Friesian cattle under in subtropical conditions. J. Anim. Plant Sci., 22 (2 Suppl):92-95.