

Introduction

Attention has been given by FAO to the cataloguing of genetic stocks since 1946. During the early days of the Organization a Standing Advisory Committee on Agriculture was established to assist in the planning of the Organization's program of work. One of the recommendations of that Committee, at its first meeting in Copenhagen in 1946, was that catalogues of important genetic stocks be established to facilitate the exchange of information and of breeding materials among plant and animal breeders. Obviously the approach to this problem in livestock must be different from that in the plant field. Much progress has been made in the establishment of catalogues of important genetic stocks, particularly of wheat and rice, and a substantial amount of information has already been published. With such material it is possible to describe many genetic traits in detail, and to enter the information on punch cards, thus making it possible to quickly locate stocks having any desired characteristic or characteristics.

Specific knowledge of genetics in livestock is much more limited than in important crop plants, and the nature of the breeding material is also such that it is not possible to maintain stocks without heavy costs or to exchange them as freely as is possible with plant material. However, owing to the great importance of livestock production in human welfare, it was considered desirable to make a start in this field, even though the available information is very limited.

The initial effort at assembling information on livestock, the results of which are now published, has been concentrated on the cattle of India and Pakistan; firstly, because of the over-riding importance of cattle in relation to other types of livestock, taking world agriculture as a whole; secondly, because of the particular needs of tropical and sub-tropical areas for improved cattle production; and, thirdly, because of the special characteristics of many breeds in India and Pakistan, which make them suitable for use under tropical and sub-tropical conditions.

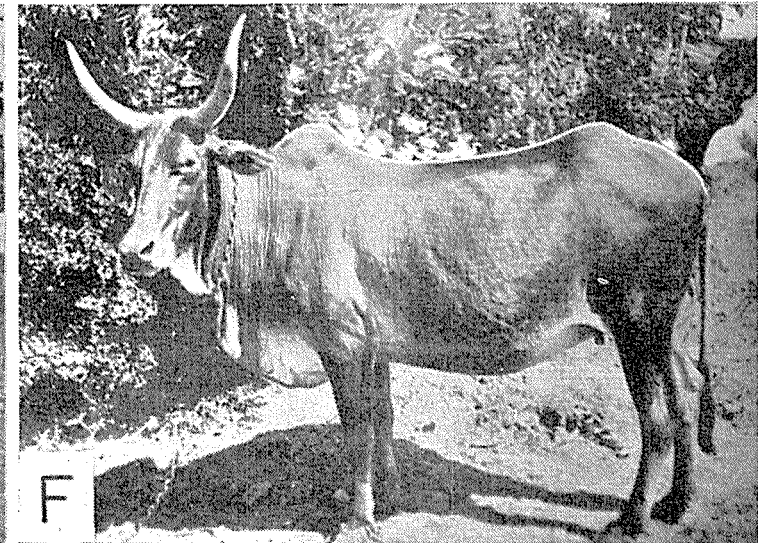
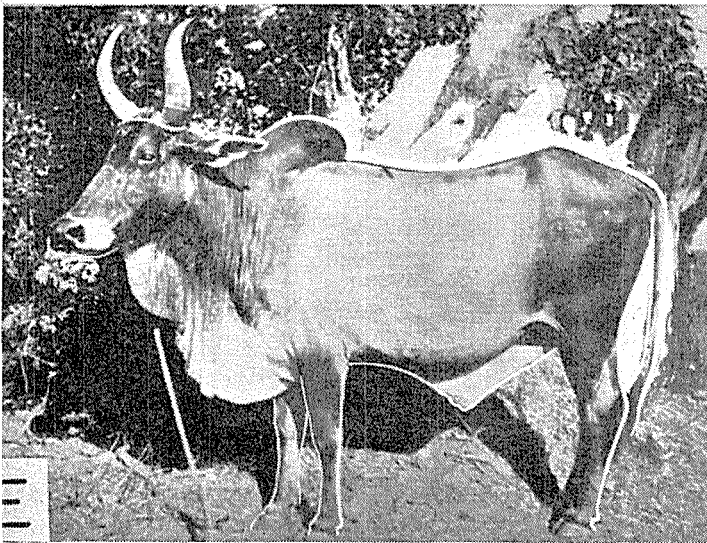
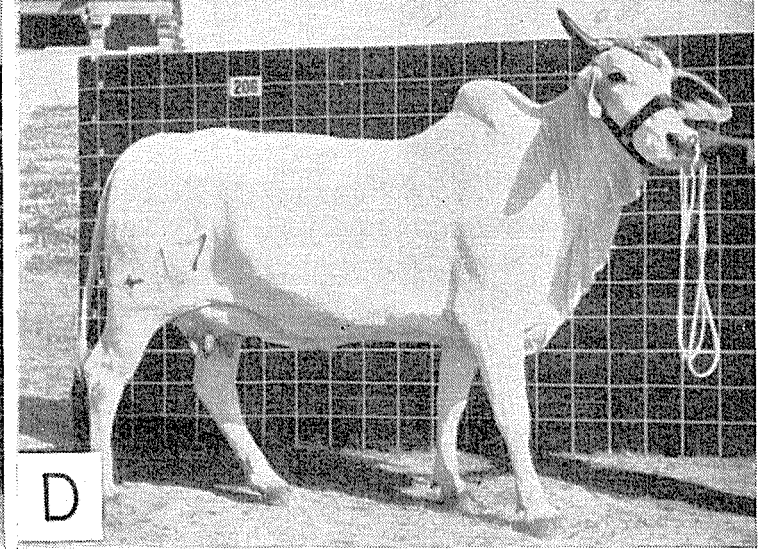
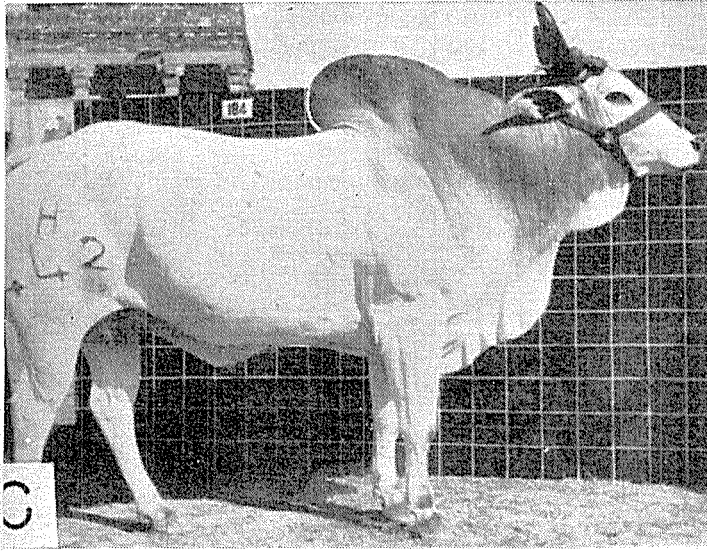
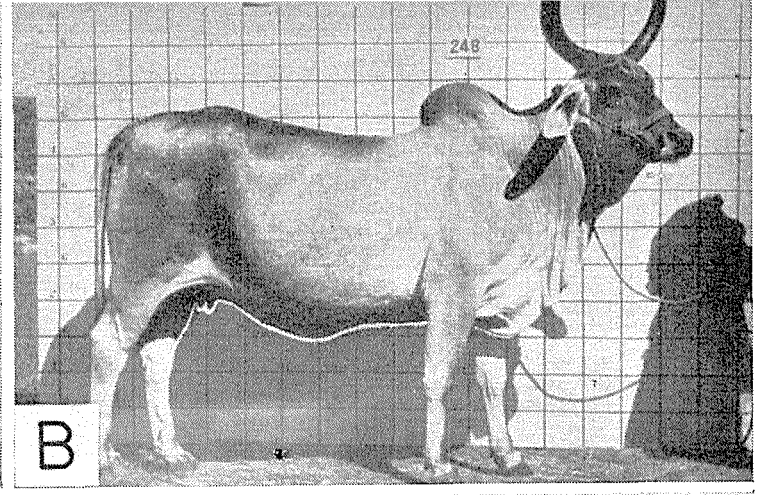
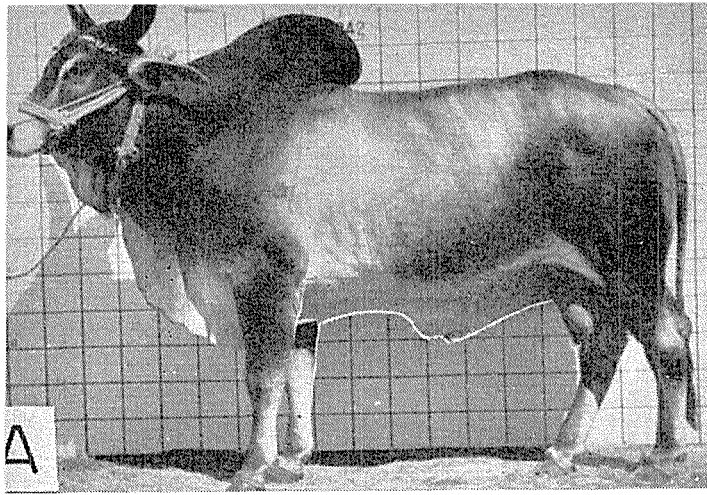
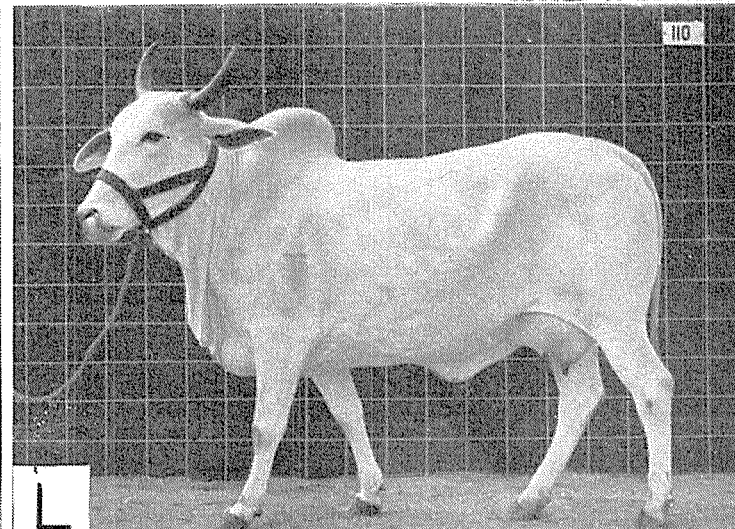
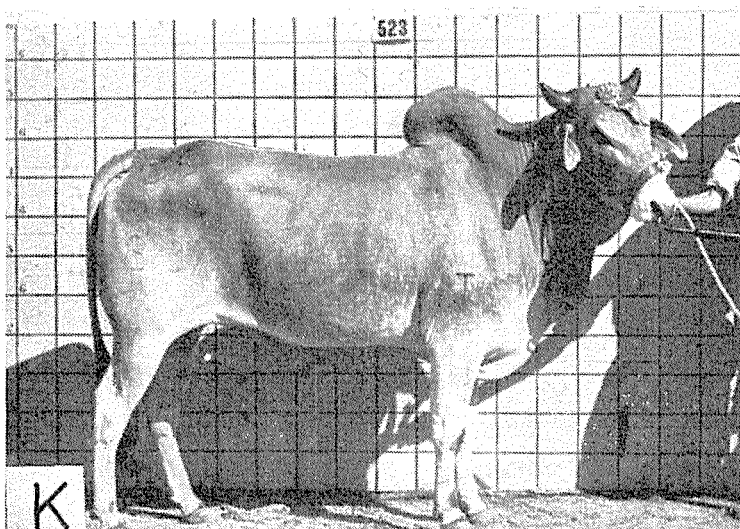
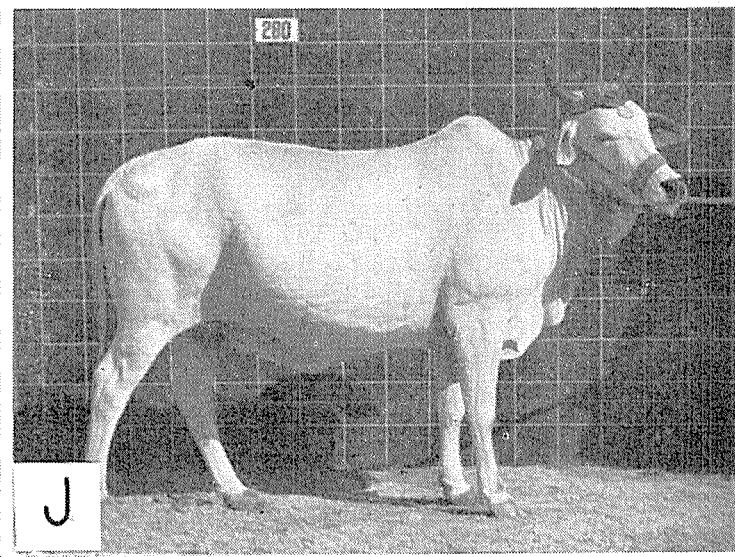
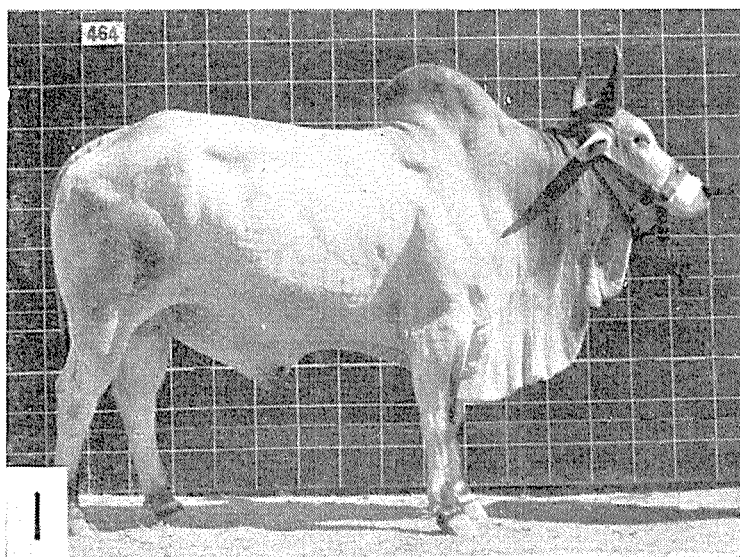
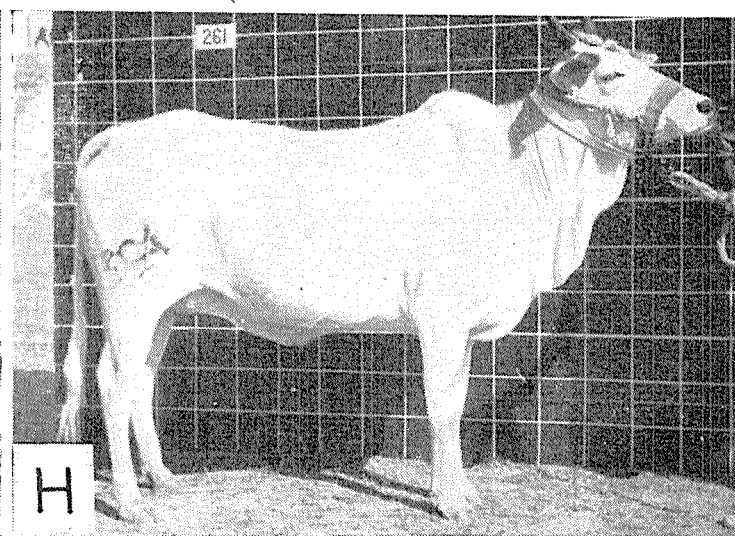
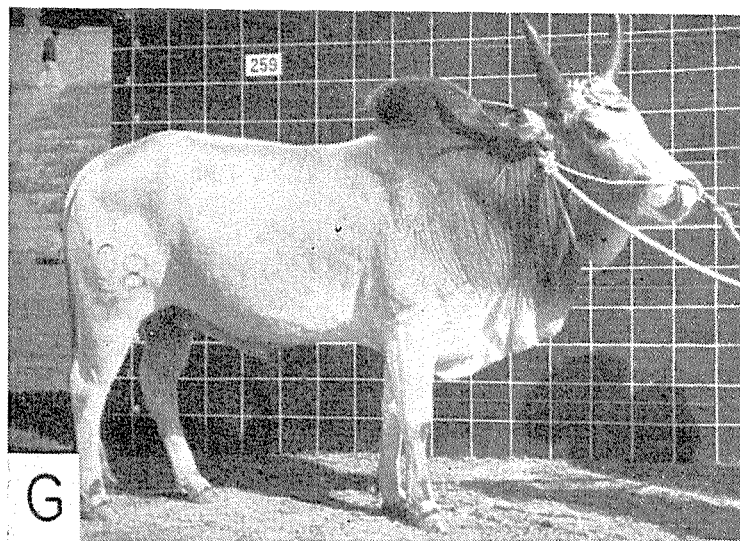


FIGURE 2. *Cattle of Group I.* The breeds classified in this Group are lyre-horned gray animals with wide foreheads, prominent orbital arches and a flat or dished-in profile. They are deep bodied, powerful draft animals. A and B, a bull and a cow of Kankrej breed from Gujarat, Bombay, India. C and D, a bull and a cow of the Hissar breed: it is not a pure breed, Kankrej influence being very prominent, and will probably be extinct in the near future. E and F, a bull and a cow of Kenwariya or Kenkatha breed, which are powerful draft animals.

FIGURE 3. *Other breeds of Group I.* G and H, a bull and a cow of the Kherigarh breed from Uttar Pradesh, used for light draft and trotting purposes. I and J, a bull and a cow of the Malvi breed: these are powerful draft animals, but the cows are poor milkers. K and L, a bull and a cow of the Tharparkar breed bred in the desert of Thar, good for both milk and draft.



Limitations of Available Information

While practical experience has resulted in a rough and ready selection of those species, breeds and strains which "do well" in a given environment, the time has long since come when this empirical knowledge needs to be critically examined and supplemented by scientific procedures. This has been the history of progress in every sphere of life; it has been the history of progress in the improvement of plant stocks; it will form the basis for wide development of animal stocks.

Lee and Phillips (1948) have systematically reviewed the ways in which climatic elements affect the functioning of animals and have also summarized the methods of studying reactions of animals to environmental stresses. The need for climatic studies in different climatic zones of the world is emphasized. Such studies should naturally have as their objective the hastening of the slow and very expensive evolutionary process which takes place under conditions of natural selection.

It has been recognized from the outset of this work that any compilation of information on the genetic and related physiological characteristics of the cattle of India and Pakistan, or of any other area, would be incomplete in many respects. The collection of such data on livestock is an expensive process, and in many cases even the more superficial data on productivity are almost entirely lacking. The material presented in this publication is, therefore, aimed at making generally available summaries of such information as could be obtained from all known sources with regard to the productivity of cattle of India and Pakistan in their native homes and in such other places as they have been used, either in pure form or for grading-up or cross-breeding, together with related information on the conditions under which each type or breed was developed and on physical characteristics.

Recognizing the many gaps that exist in such information as is available, it is hoped that the details given here will, nevertheless, be useful to livestock breeders in tropical and sub-tropical areas and to FAO's member countries whose territories are located in these zones. On the basis of existing information, this is the best obtainable indication of the characteristics and sources of breeding stock that might be used in their livestock breeding programs wherever it is thought wise to consider the use of Zebu

cattle of any of the important types and breeds originating in India or Pakistan, provided adequate animal health safeguards are observed in such introductions. It is also hoped that this publication will stimulate further studies aimed at filling in the many gaps in existing information.

Anyone desiring to import animals of any of these breeds for breeding purposes should, of course, consult the veterinary authorities regarding the laws and rules governing such proposed importations, before initiating inquiries for breeding stock.

Importance of Adaptability to the Environment

There is ample evidence that adaptability to environment is one of the important factors to consider when deciding upon the type of stock to use in a livestock enterprise. This is true whether the environmental conditions are favorable or unfavorable. In a favorable environment, the profitable animal is one that is able to produce at a maximum level when ample feed of good quality is supplied and when other conditions of livestock production are optimum. In a less favorable environment, greater emphasis must be placed on ability to survive and less on immediate efficiency in transforming good quality feed into useable products. If environmental conditions are rigorous because of high temperature, scanty feed, feed of poor quality, severe winters, high elevation or other factors, then ability to survive and reproduce in the face of such obstacles must be given major consideration when selecting stock.

Man has frequently tried to transplant improved cattle, and particularly specialized dairy stock, to areas where the environment differs materially from that in their native home, or from the environment in other places where they have performed satisfactorily. The results have often been unsatisfactory, sometimes disastrous. This has been true particularly in the areas of lower altitude in the tropics, which are generally characterized by high temperatures, high rainfall, coarse roughage of low nutritional value, limited or no grain feeding and conditions favorable to parasitic infestation.

Improvement of environmental conditions should be an objective of every livestock producer, but in many areas limitations are laid down by nature, so that the producer can move within

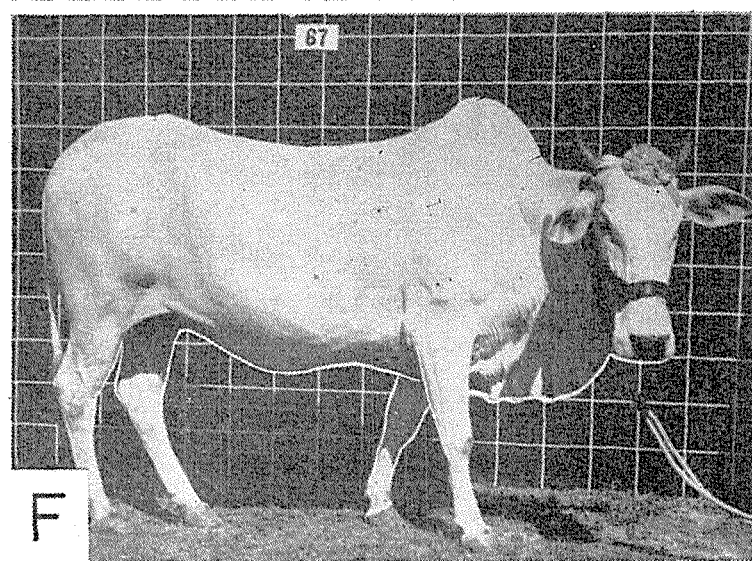
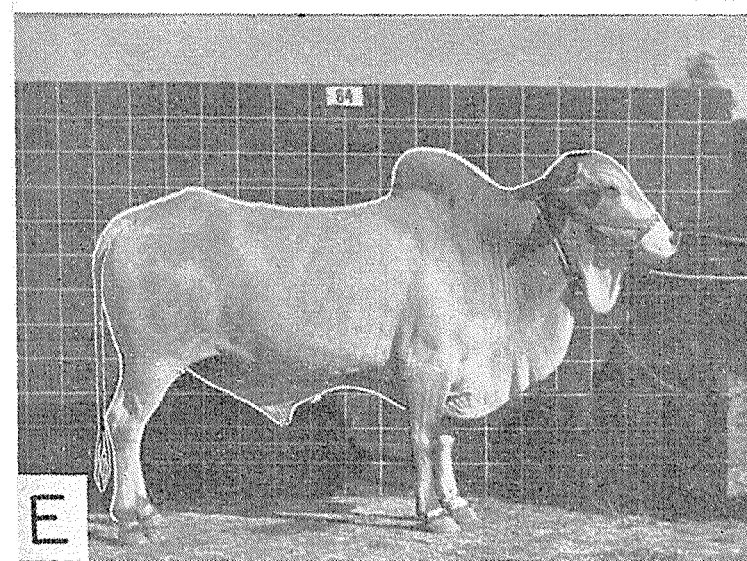
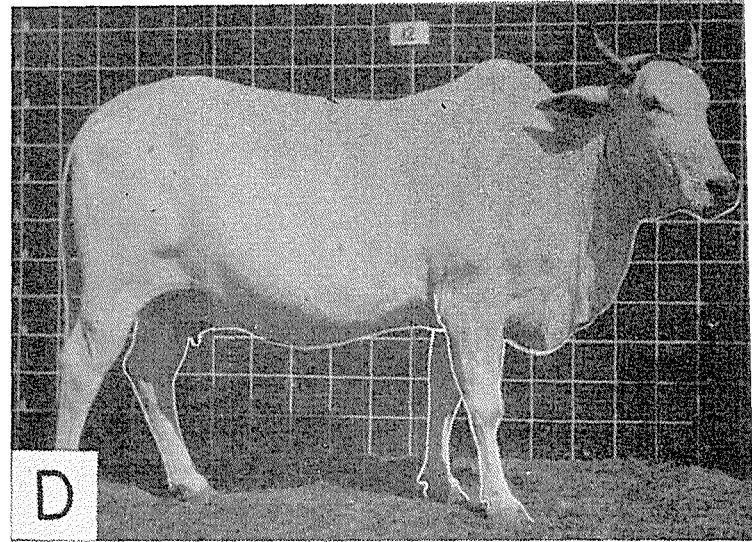
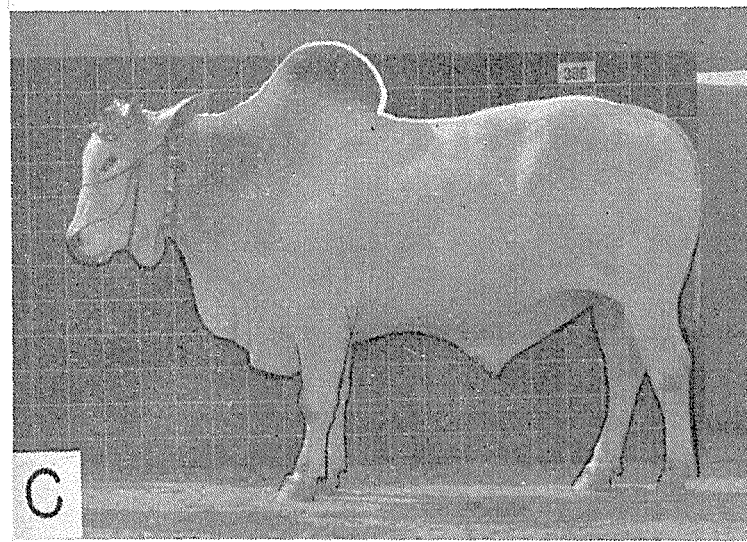
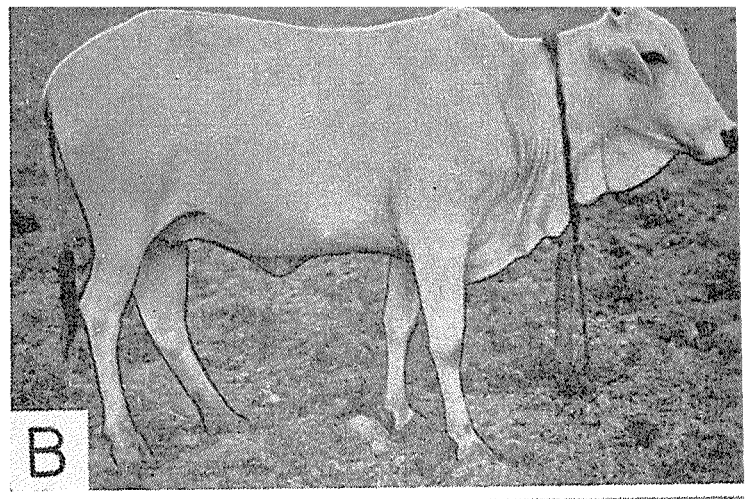
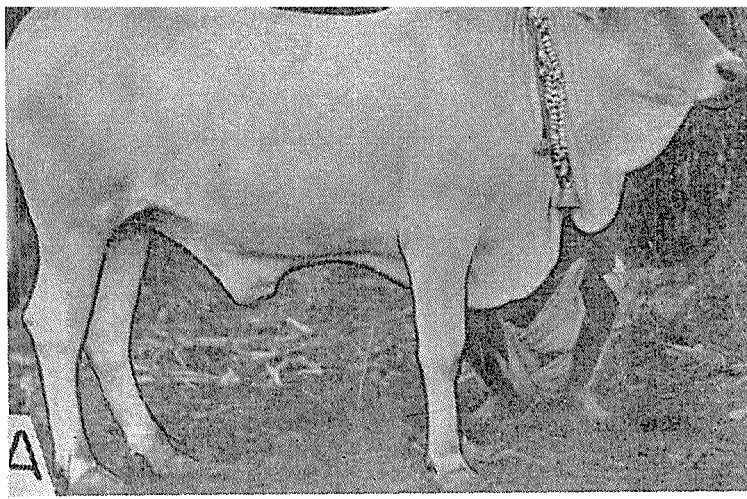


FIGURE 4. *Cattle of Group II.* The breeds classified in this Group are short-horned, white or light gray in color with long coffin-shaped skulls. The face is slightly convex in profile. A and B, Bachaur bull and cow, a draft breed from Bihar State. C and D, Bhagnari bull and cow, a draft breed from Baluchistan. E and F, Gaolao bull and cow, a light draft breed from Madyha Pradesh, bearing a close similarity to the Ongole breed.

economic limits only to a certain point in improving the supply and quality of feed and other environmental factors. In tropical and sub-tropical areas many of the conditions under which cattle must be produced are determined by nature, and if a producer's cattle are to perform profitably he must select and breed animals that are adapted to the environment.

The most productive types of livestock, as measured by yardsticks such as milk, butter fat and meat yields, have been developed in regions where ample feed is produced and where temperate climatic conditions prevail. Generally, these regions also happen to be those in which the economic status of the people is best and where considerable emphasis has been placed on research and its application. Livestock producers have actively tried to improve their animals and the conditions under which they are produced, through co-operative efforts and through programs sponsored by governments. In many of the less productive regions, the limitations laid down by nature have often prevented development by the livestock producer of animals highly specialized for meat, milk or wool production or work purposes. Generally, poorer economic conditions have also hindered the development of highly competent research and extension services to assist the livestock owner.

It is not surprising that livestock producers and agricultural leaders in less developed regions have, in many instances, obtained stock from more highly developed areas to use in improving the animals native to their own regions, or to replace them. The animal that has been developed to a highly specialized degree for beef, milk, or wool production or work purposes under favorable environmental conditions, stands in sharp contrast to many types native to underdeveloped areas, when only individual merit in the usual sense is considered.

But the contrast is often as marked in the apposite direction when the "improved" animal from a favorable environment must meet the tests of surviving and reproducing itself in the tropics, in semi-arid areas, or in other areas to which it is not adapted. To illustrate this point Bonsma (1952) cites an example of a South African ranch where over a 22-year period a total of 404 head of temperate zone purebred cattle was bought, but 279 or 69.1 percent died before being on the ranch for more than one year. Over this period the average calving percentage was 39 percent

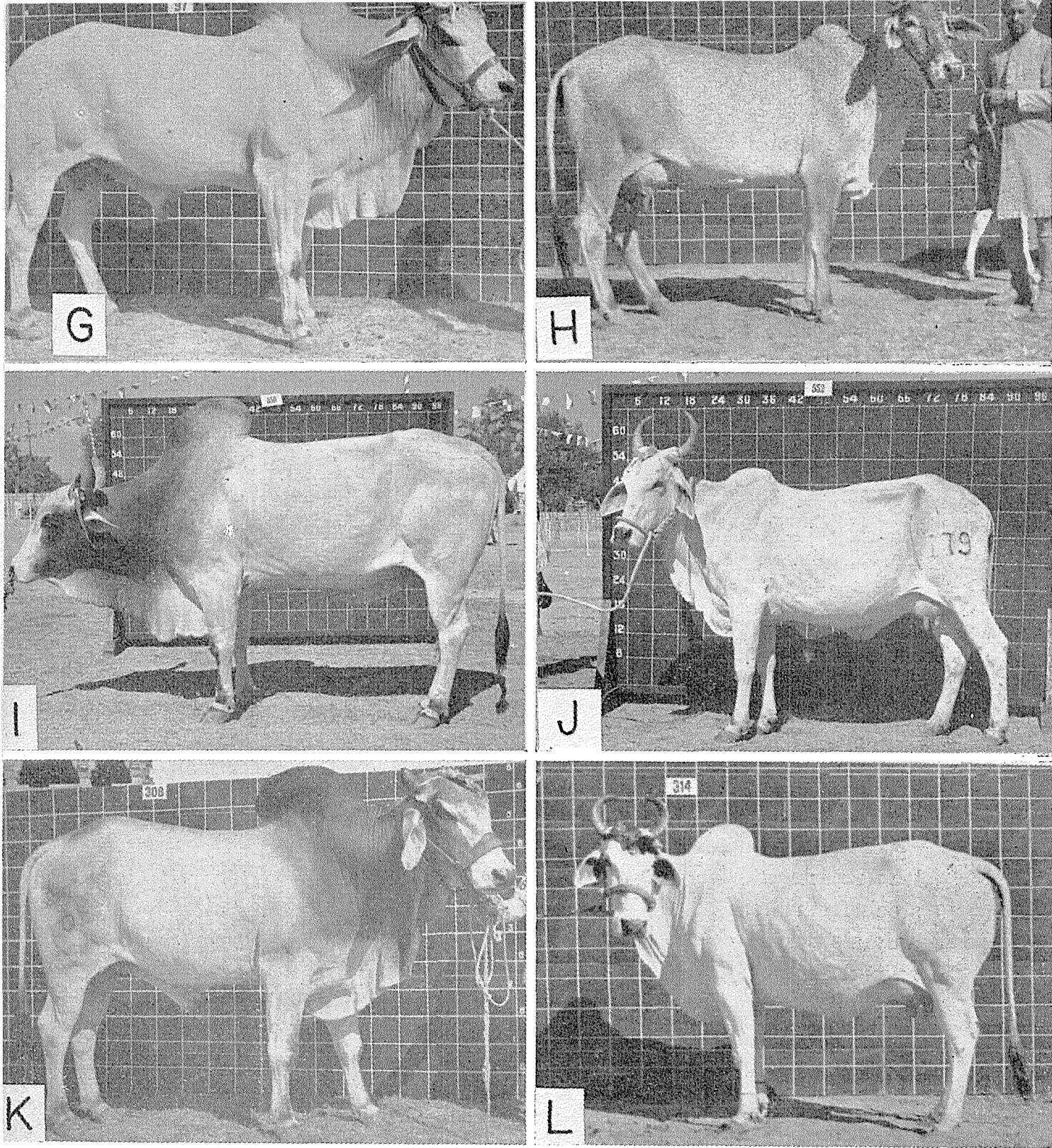
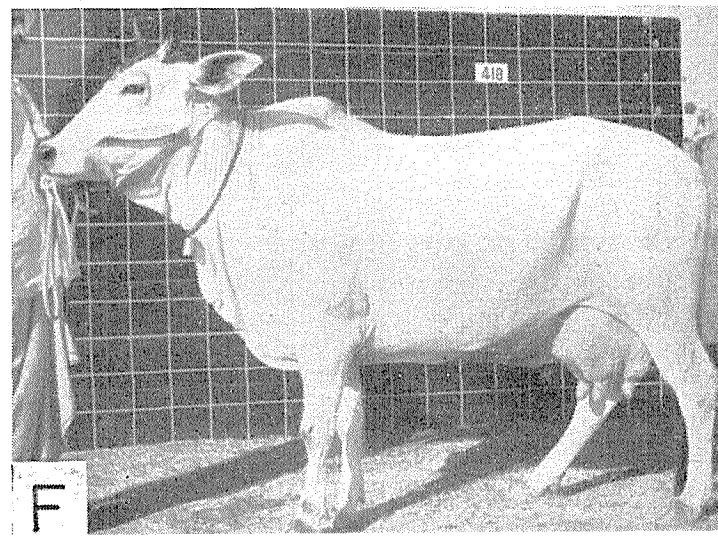
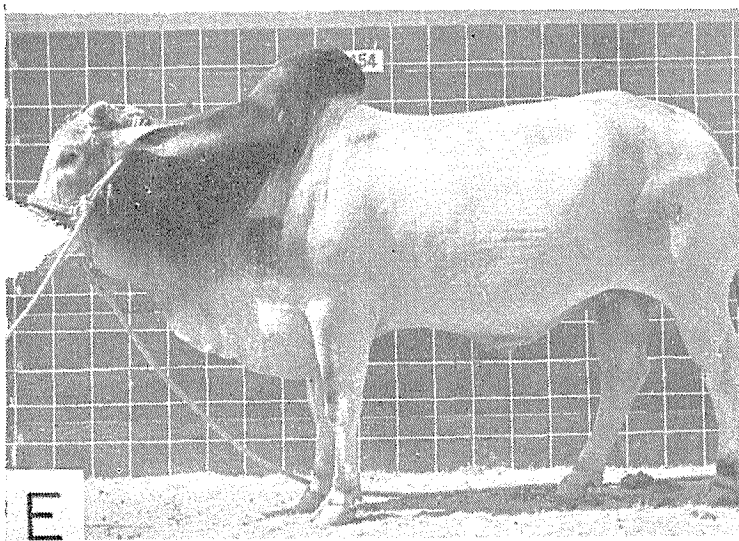
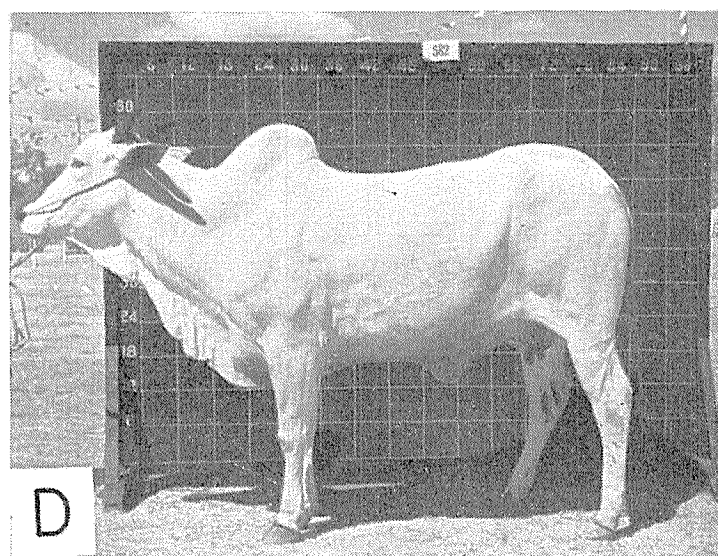
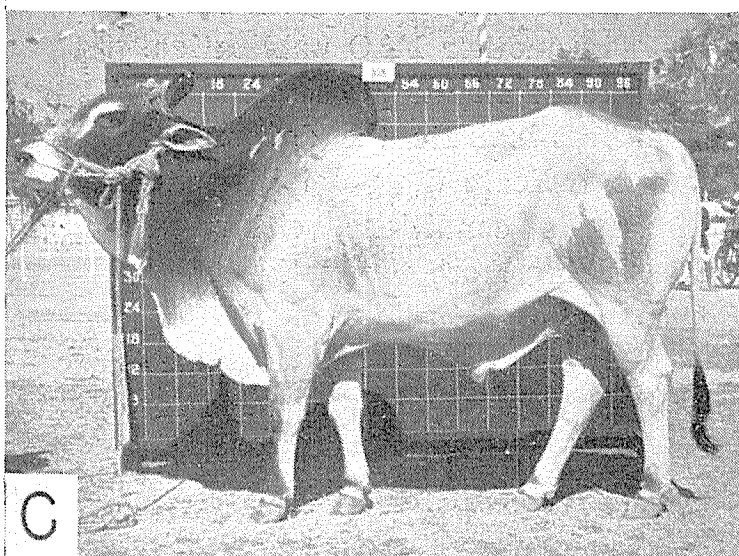
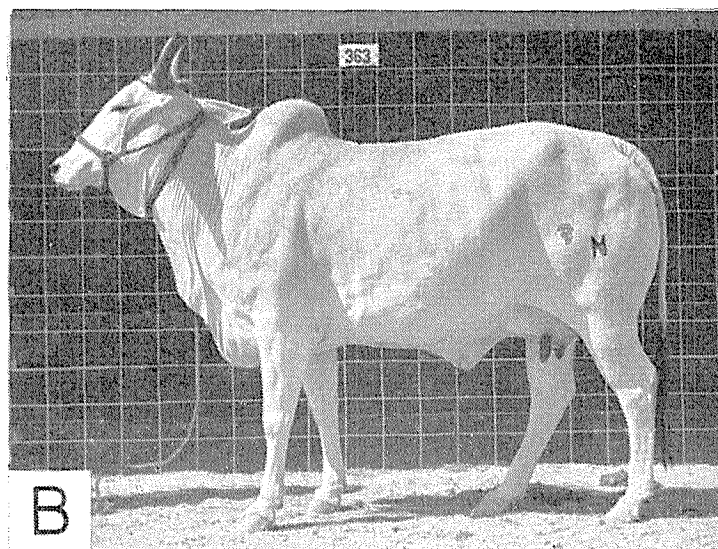
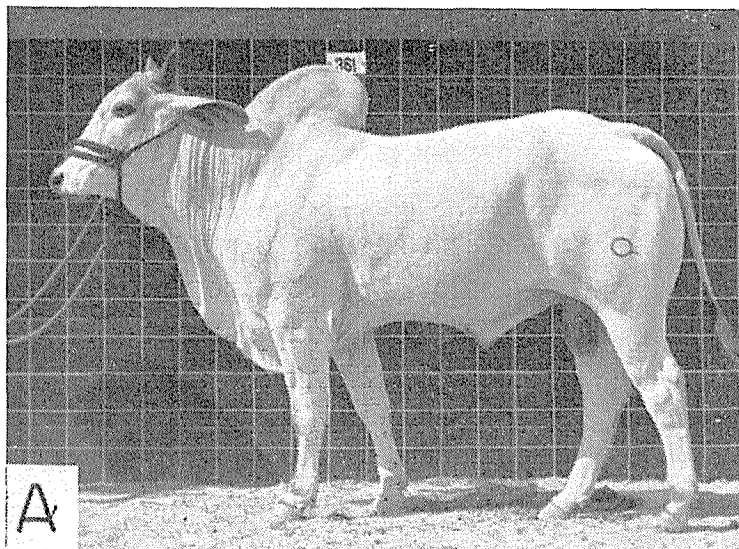


FIGURE 5. *Other breeds of Group II.* G and H, Hariana bull and cow: this is supposed to be one of the better dual-purpose (draft and milk) breeds. I and J, Krishna Valley bull and cow; good for slow, heavy draft: the breed is of recent origin. K and L, Mewati bull and cow: this breed is similar to Hariana with a trace of Gir blood.

FIGURE 6. *Other breeds of Group II.* A and B, Nagori bull and cow: this is a famous trotting breed in India. C and D, Ongole bull and cow, a powerful draft breed with fair milking capacity. E and F, Rath bull and cow, a breed similar to the Harijana.



and the calf mortality rate was 18 percent. This illustrates how national assets could be wasted through a wrong introduction.

Obviously, the lessons to be learned from previous efforts to introduce improved stock from the temperate zones into regions having less favorable environments should be considered in further attempts to improve livestock in the less developed areas. Those planning such work should also study the results of experimental breeding projects that have been carried out in various countries to develop types of animals adapted to special conditions. This is particularly important, since conditions that prevail on a large portion of the world's land area are not favorable to production of highly specialized beef or dairy cattle, large draft horses or other highly specialized types of livestock.

In many of these less favorable areas, production of livestock adapted to the local conditions is the only way in which the land may be utilized effectively. In others, particularly in the tropics and sub-tropics, there is need for milk and meat to supplement the human diet which is obtained largely from plant sources, and, animals from temperate regions often have not proved well adapted to conditions that prevail generally in these regions.

Much of the available information having a bearing on the breeding of livestock adapted to unfavorable environments has been summarized by Phillips (1949) in another FAO publication. It was not possible to collect and present all the pertinent facts, but sufficient examples were given to illustrate the dangers of introducing unadapted types, and to indicate the possibilities of improving livestock under unfavorable conditions, either by selecting within native types, introducing more productive types from other regions where similar conditions prevail, or developing new types adapted to specific sets of conditions. Hence, such details will not be repeated here. An example of the successful introduction of one type of cattle into a region other than its native home is shown in Figure 1.

Adaptability of Zebu Cattle to Tropical and Sub-tropical Conditions

In any discussion on the cattle of Southern Asia, cattle from the sub-continent of India and Pakistan naturally take the leading role, since this is the area in which the most productive types of

cattle, among those native to Southern Asia, have been evolved. Cattle in India and Pakistan belonging mainly to the species *Bos indicus* are also well-known as Zebus. In the Americas, these cattle have been known as Brahmans; however, this is a local term which cannot be applied to the *Bos indicus* species, but only to the particular type of Zebu which has been evolved in the southern United States by amalgamating several Indian breeds.

During the eighteenth and nineteenth centuries when new areas of the world were being colonized by Europeans, it was early noticed by the colonists that in regions having hot, arid or humid climates and short growing seasons of pastures or long intermittent spells of droughts, the cattle introduced from temperate zones could not easily withstand either the climatic stress or the rigors imposed by the fluctuations and nature of the feed supply. Together with the introduction of indented labor in some of these colonized areas from India in the nineteenth century, cattle from India also were introduced in the various European Colonial territories. The ability of Zebu cattle to thrive under vigorous conditions attracted the attention of the settlers, and attempts were made in various regions to breed these cattle pure or to use them for cross-breeding purposes.

In India itself (as constituted before the partition into India and Pakistan), owing to the great importance of cattle in the economy of the country, it was natural that much attention was paid to cattle breeding in past centuries. Organized effort to improve the cattle is, however, of more recent origin. Owing to the vastness of the country, difficulties in transportation, peculiar topography, soil and climatic conditions, breeds and types peculiar to various localities were evolved. Circumstances enumerated above also helped in the preservation of the purity of these evolved breeds and types.

At the same time, trade in cattle by itinerant cattle dealers, annual movement of cattle in search of grazing, and indiscriminate and uncontrolled breeding caused mixing of types, often to the detriment of the specific types. In spite of these unfavorable crosscurrents, and the lack of concrete breeding policies until recent times, India and Pakistan possess several diverse types of cattle, and many breeds with distinctive characteristics are recognizable within some of these types.

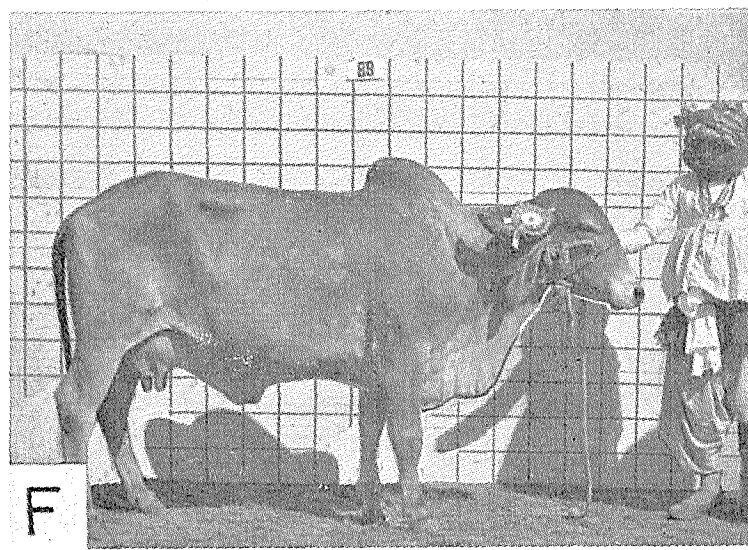
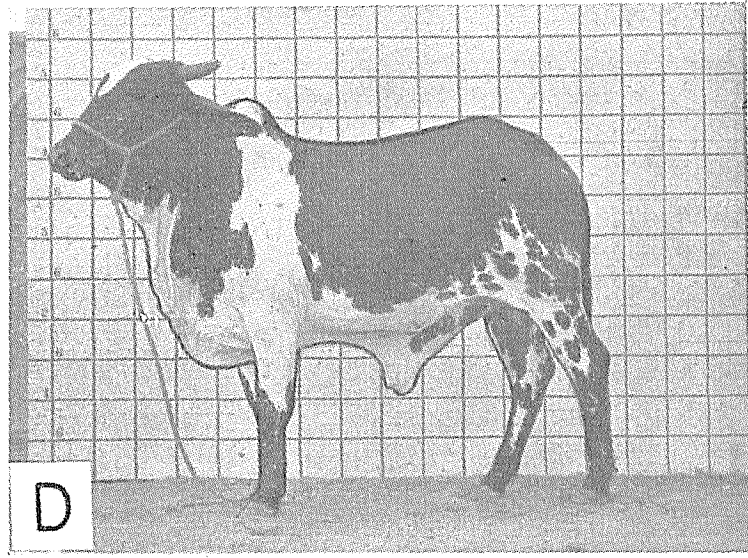
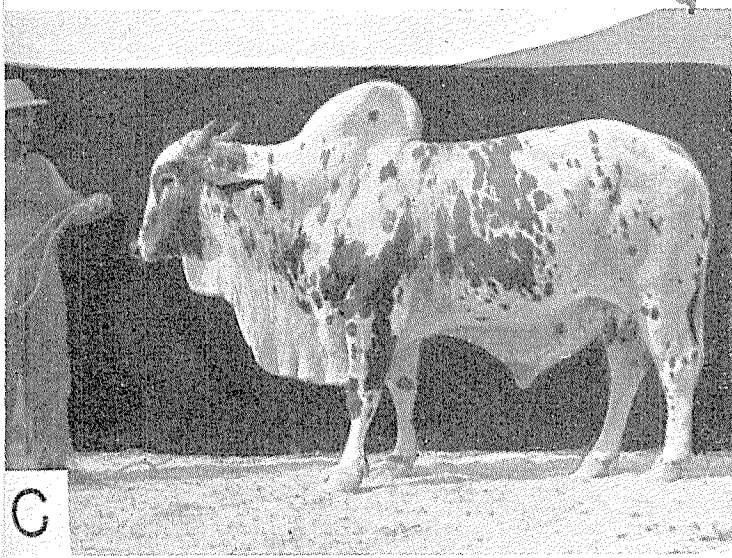
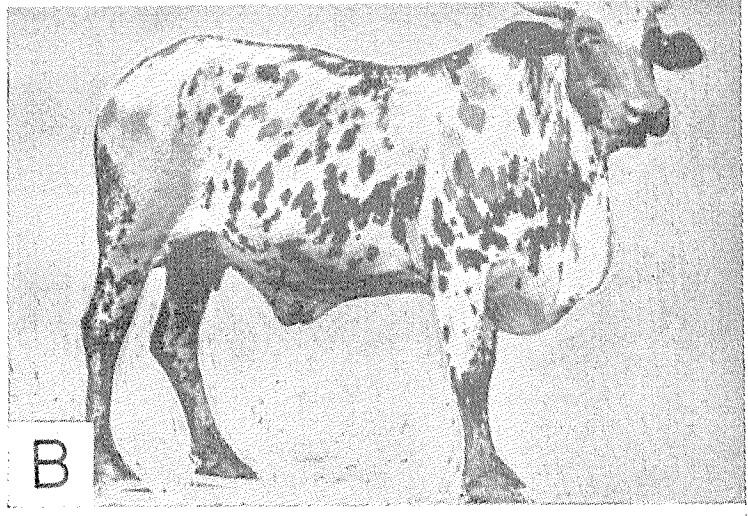
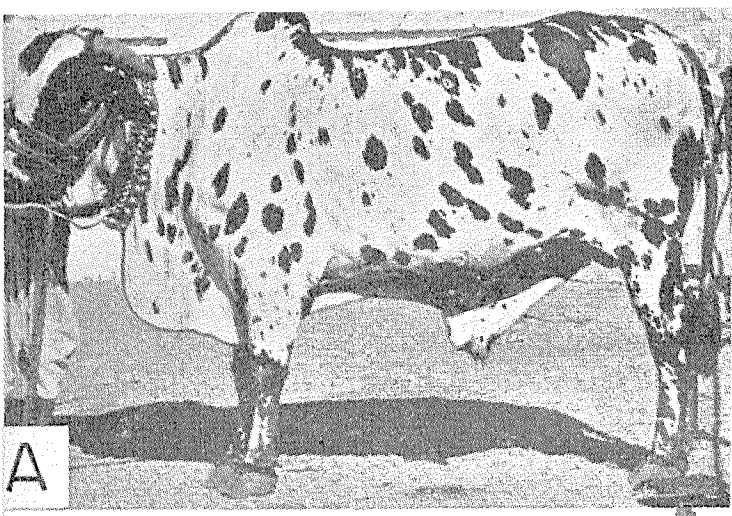


FIGURE 7. *Cattle of Group III.* Breeds classified in this Group are more ponderous in build and have pendulous dewlaps and sheaths. They often have lateral and curled horns, and usually red or some shade of red color, being occasionally spotted: the best dairy breeds among Zebus are found in this Group. A and B, Danhi bull and cow: the males are good workers but the cows produce little milk. C and D, Deoni bull and cow, resembling the Gir breed in many respects, but also carrying some Dangi blood. E and F, Gir bull and cow: they are famous for their massive size; cows are good milk producers, bullocks are powerful but slow at work.

FIGURE 8. *Other breeds of Group III.* G and H, Nimari bull and cow: this is a powerful draft breed evolved by crossing Gir and Khillari cattle. I and J, Red Sindhi bull and cow: the breed is famous for its milk production and reputed adaptability to various climatic conditions. K and L, Sahiwal bull and cow: this is an important milk breed in the Central Punjab; the bullocks are slow workers.

