SECOND INTERNATIONAL SYMPOSIUM ON ONGOLE CATTLE

October, 29-31 2001
Rajendranagar, Hyderabad, INDIA

SOUVENIR

Sponsored by :

ACHARYA N.G. RANGA AGRICULTURAL UNIVERSITY
DEPARTMENT OF ANIMAL HUSBANDRY, GOVT. OF A.P.
INDIAN ONGOLE CATTLE BREEDERS' ASSOCIATION

OFFICER ON SPECIAL DUTY

President's Secretariat,
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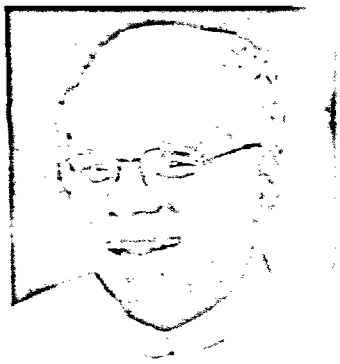
New Delhi - 110 004



MESSAGE

The President of India, Shri K.R. Narayanan, is happy to know that the Acharya N.G. Ranga Agricultural University, Hyderabad is organising an International Symposium on Ongole Breed of Cattle from 29th to 31st October, 2001.

The President extends his warm greetings and felicitations to the organisers and the participants from India and overseas and wishes the Symposium all success.

Yours Sincerely

S.N. Sahu

NARA CHANDRABABU NAIDU

CHIEF MINISTER
ANDHRA PRADESH

MESSAGE

I am happy to learn that the ANGRAU is organising the ***"Second International Symposium on Ongole Breed of Cattle"*** in Hyderabad on 29th and 30th October, 2001 and bringing out souvenir to mark the occasion.

Ongole breed cattle have high reputation in different continents around the world and there is an imperative need to conserve and imporve the prestigious variety in its homeland. R & D should be widened in the topics like conservation of germplasm, strategies for the restoration of the milk yield, reproductive efficiency, disease resistance etc. to preserve the breed as the pride of the Nation.

I hope that the deliberations, status papers as well as the interaction among the scientists and the professional experts during the symposium would decisively constitute for the development of Ongole cattle to meet the global needs in a big way.

I wish the Event all success.

(N. Chandrababu Naidu)

Dr. I.V. SUBBA RAO
VICE-CHANCELLOR

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FOREWORD

Acharya N.G. Ranga Agricultural University, which is adjudged as the Best Institution among the State Agricultural Universities, has a strong infrastructure for imparting instruction and conduct research in Veterinary Sciences and Animal Husbandry.

The University is organising the Second International Symposium on Ongole Cattle, which is sponsored by the Acharya N.G. Ranga Agricultural University, Department of Animal Husbandry, Government of Andhra Pradesh and Ongole Cattle Breeders Association. This important event will be held during 29-31 October, 2001. Ongole Breed of Cattle have spread far and wide throughout the World because of majestic stature, efficiency of feed conversion, suitability for draught and resistance to diseases and pests and sustained milk yield. Out side India, the Breed is reared for meat. Ongole breed of cattle is native to Andhra Pradesh. But due to various reasons the population of Ongole cattle has declined steeply in our Country. There is, therefore, an urgent need to take appropriate measures to conserve the breed, which is extremely useful as milch, meat and draught animal. Towards this direction, the University is organising this Symposium in collaboration with the Department of Animal Husbandry, Government of Andhra Pradesh and the Indian Ongole Cattle Breeders Association. Scientists, Cattle Breeders and farmers involved in and deeply committed to the conservation of this beautiful and useful breed of Cattle are being brought together to discuss and deliberate on various issues involved. Participants from different Countries and several regions of our Country are attending the Symposium. At the end of the deliberations of the Symposium, it is hoped that a blue print for conserving the breed and increasing its productivity will be evolved.

I compliment Dr. M.V. Shantaram, Chairperson, Convenors and Members of the Souvenir Committee for their untiring efforts in bringing out the informative Souvenir in an attractive form. My special thanks are to the authors who have contributed very informative articles. I compliment Dr. K. Pandarinatha Reddy, Principal Agricultural Information Officer for ensuring that the Souvenir is printed in a very short period of time

(I.V.Subba Rao)

ACHARYA N.G.RANGA AGRICULTURAL UNIVERSITY

SECOND INTERNATIONAL SYMPOSIUM ON ONGOLE CATTLE
29-31 OCTOBER, 2001

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1. Zilla Parishad, Guntur

2. National Bank for Agriculture and Rural Development

Contents

Ongole Breed of Cattle - The Pride of India

I.V. Subba Rao
Vice-Chancellor, ANGRAU

Ongole breed is the pride of Andhra Pradesh and India. Andhra Pradesh ranks 7th position in cattle wealth in India. The State is the home for six cattle breeds namely Ongole, Deoni, Krishna Valley, Malvi, Halliker and Punganur. The prestigious Ongole breed is on the decline and Punganur is on the verge of extinction.

The Ongole breed is also known as 'Nellore' since Ongole was once in Nellore district. It is a dual purpose breed and is also one of the ten important milch breeds of India. The breed is native to the Coastal districts of Guntur, Prakasam and Nellore of Andhra Pradesh. Animals true to Ongole type are seen in Tenali, Bellamkonda, Vinukonda and Cherukupalli mandals of Guntur district, Parchur, Inkollu, Addanki, Ulavapadu and Tripuranthakam mandals of Prakasam district and Kavali, Jaldanki, Podalakur, Muthukur, Vidavalue mandals of Nellore district.

The breed belongs to short horned group of Zebus which were brought by Aryans into India more than 4000 years ago as original stock from North West to Indus river basin and further to Indo-gangetic plains and towards south along Godavari, Krishna valley and Pennar basins. Specific breed characters emerged due to isolation and selection practiced by the cattle farmers. Ongole bull resembles 'Nandi' with broad forehead, short and stumpy horns, elliptical eyes and prominent quarters. It has a magestic gait and docile appearance. The animal recognizes the owner and shows affection to him. The original breed is now confined to the tract between Paleru and Gundla-Kamma and Godavari rivers. The present breeding tract extends all along the coast from Nellore to Vizianagaram and Chittoor, Kurnool, Cuddapah, Anantapur, Nalgonda, Mahabubnagar

and Khammam districts. About a million cattle of Ongole type, though smaller in size are maintained by tribal farmers in these areas. Out of 10.95 milion cattle in Andhra Pradesh (1993 census), 30% are Ongole type and 5% only are considered to be true Ongoles.

Brazil imported Ongoles first in 1875. During 1961-62, Brazilians purchased 107 Ongole cows and few bulls including the Karavadi bull, the show champion at the National Show. This stock produced a progeny of more than 50000 calves in Brazil and won World Champion prize. In 1885 USA imported two Nellore bulls. Again in 1890 an Ongole bull and cow were imported. Major import of 51 Zebu cattle from India was made in 1906.

Ongoles breed of cattle are our mute ambassadors to several countries. South American countries still maintain purity of Ongoles breed pure (Narendranath, 1981). USA imported Ongole but mixed it with other Indian breeds to develop 'Brahman'. The American Brahman Breeders Association (ABBA) registered over one lakh of Brahman cattle by 1973.

Ongoles are the largest in number among the nine Indian breeds introduced in other countries (Narendranath). Their hardiness, disease resistance and capacity to thrive on scanty dry fodder have been successfully exploited in improving the European stock. Ongoles have been imported by USA for beef, because of light sheath, Brazil for beef and milk, Sri Lanka, Fiji and Jamaica for draught, Australia for beef under hot conditions, Switzerland for disease resistance. They have been imported by many other countries like Argentina, Paraguay, Mexico, Columbia, Mauritius, Indonesia, Philippines and Malaysia.

The characters of the breed have been described in detail by the Indian Council of Agricultural Research and Cattle Breeders Association. The physical characters however are not uniform and change with the environment outside the tract.

The Ongole breed is noted for its draught capacity, milk yield, beef quality and overall adaptability. They can walk effortlessly upto 5 km per hour and perform a range of agricultural operations continuously for hours together even under hot conditions. The bulls are famous for stone dragging and cart pulling. As already indicated their power of resisting diseases and thriving even under harsh conditions attract the attention of cattle breeders and farmers world wide.

Ongole cows are reported to yield over 9000 pounds of milk per lactation in some countries. They are yielding around 6000 pounds with some farmers in the State. The Ongole cows are thus reputed for their milk yield of high fat, regularity in reproduction, disease resistance and utility of male calves.

An Ongole Cattle Breeders Association was formed on 27th August 1951 with 906 Breeders owning 7326 Ongoles. A total of 25899 animals were surveyed and 1490 were tattooed. The Indian Ongole Cattle Breeders Association was formed at the 1st International Seminar and Cattle Show held at Guntur during 1981. The first Ongole Cattle Show was held in 1858 and held every year till 1871. They were revived in 1904 and are being orgaized periodically.

Because of various reasons, the breed is losing ground in its own home land. The decline is in numbers, type and milk yield. Changes in cropping pattern, decline in land holding size, partial mechanization, declining pasture lands, increasing demand for buffalo milk, lack of clear breeding policy, all have contributed to this.

As a part of its efforts to reverse the trend and bring back its past glory, the ANGRAU launched a network project on genetic improvement of Ongole Cattle through the Associate Herd Testing Programme with the support of ICAR and State Animal Husbandry Department since 1986 at Lam, Guntur district with subcentiers in

Ramatheertham (Shifted to Chadalavada) in Prakasam district, Chintaladevi (Nellore district) and Mahanandi in Kurnool district. A Ongole Cattle Germplasm Centre was established at Lam Farm.

Breed extinction is an invisible and irreversible process. Concerted and coordinated efforts of the Scientists, Cattle Breeders Association, Milk Producers supported by the Government will go a long way in preventing its decline and further improving its physical features (medium size), characters and capabilities as an insurance for its conservation and regaining the lost glory of the beautiful and enduring breed of Ongole Cattle.

Nandi Sculptures of India, Objects of Worship and Their Significance

Dr. I.K. Sarma,
Former Director, Archaeological Survey of India &
Director (Rtd.) Salarjung Museum, Hyderabad

In the daily life of the humans, it is the cattle-keepers who invoked the importance and obtained enormous advantages of the cattle and cattle products. Even now these cattle keepers (Gokulas-Cattle herders) maintain their seperate identity in Rajasthan, Andhra-Karnataka and Tamilnadu and lead a pastoral life enriching the village settlements nearby. They were in fact the transmitters of culture and commerce along with their cattle wealth (Godhana). The routes and modes of communication were the river belts and closeby fertile pastures with wooden carts and animals as their means of transport. The special breed called the **ONGOLE BULL** with prodigious dewlap, large hump and stately walking now confined to Kurnool-Prakasam districts was indeed the relic of Sarasvati-Dhrishadvati Culture which influenced the Neolithic cattle keepers of the south during the 4th Millennium B.C. We shall illustrate here how the so named Ongole Bull type reached and settled in Ongole-Prakasam districts originating in the North-West India.

The Neolithic villagers of Patapadu, Pusalapadu and Ramapuram, discovered in Kurnool and Prakasam districts datable to 4th Millennium B.C., were the bead makers of steatite and like the ancient gold miners of Kolar regions supplied these decoratives to the contemporaneous urban cities of Gujarat, Rajasthan and Indus Valley. It is these cattle-keepers who invoked the importance and impressed the advantages of the cattle and cattle products, (milk, Ghee and Dung when alive; meat, bone and skin when dead), in the daily life of the humans. The picture we obtain from the Vedic description of *Gotras*, i.e., cattle pens (*Gavah trayant, yatra Gotrah*), their heads (*Rishis*), the ecological background, daily life and rituals reflect a metaphisically rich and highly refined ritual life but

materialististically poor illustrative of an agricultural life with animals. Having said these facts, we would record some distinct evidences from important archaeological sites in a chronological order.

(I). Bhimbhetka, Dt; Raisen, (M.P.), has Mesolithic paintings (PL.1) of wild as well as domestic animals on the cave-surfaces belonging to a date range of 6000 to 2000 B.C. (1). the earliest settlements of Rajasthan and Indus plains datable to 6th-4th Millennium B.C. have yielded evidence of Bulls, terracotta bulls from period-II, humped bulls with collar, painted humped bull with short tail, etc. Among the seals of Mohenjodaro sturdy Bull with long tail, long horned with decorated neck and long curly tail; Indian elephant; Water Buffalao, long horned feeding trough in front; a pair of Antelope single horned-Bull are some of the animals depicted (PL.2). The distinct **Harappan Bull** is also found on the seals from Kalibangan, (PL.3) (Rajasthan), Lothal and Dholavira from Gujarat, excavated recently. A set of solid cast bronzes were discovered from Daimabad. They reveal existence of animal drawn carts on solid wheels (PL.5). The animals are Elephant, Buffaloe, Bull and Rhinoceros and datable to **Harappan** times (PL.6). Among these, the chariot yoked to a pair of prominently humped-long horned Bulls and driven by man fronted by a Dog kept on the tight rein. Perhaps these chariots were in use for quick transport, both in peace and war. Related to this group of bronzes is another example from Kausambi (U.P). The bronze 13-cm hieght, portrays a women supported between two Bulls on whose humps her hands rest. (3) These bronzes are of **Harappan** date and in any case not later than 1500 B.C.

Among the early Neolithic sites, Piklihal (PL.4) yielded terracotta figures of Bull; Maski, the Rock bruised Bulls, long horned-humped ones are noteworthy examples. (4) At Inamgaon (dt. Poona), one finds on a chalcolithic pottery a Bullock cart incised (PL.7). The Bulls possess long horns and thick humps. (5) A theriomorphic Bull in Jorwe fabric is a noteworthy find from Chandoli. These Potters are datable to 2000 to 1500 B.C. from early agricultural habitats.

(II). Early Historical Periods :

During the early historical times the Bull is found as a sacred animal. Bull capital of the Asokan times is the royal insignia. At the Pingalesvara Mahadeva Temple, (entry of *Panchakroshi Yatra*, 12 km east of Ujjain), contained a massive Standing Bull recalling (Pl.10) the one on the Asokan capital (PL.9) of Rampurva. The one known Coin from Pushkaravati, (PL.8) modern Charsada, shows a magnificent Indian Humped Bull, stately and standing to right on one side while on the other *Ambi* of Pushkaravati is depicted (7). The portrayal of Bull to right on the obverse of the Lead issues of the early Satavahana monarchs (PL.11) is of great significance. *Varishabha* symbolised the essence of energy and stands for the great God Siva. The Bull on the issues of King Satavahana and Satakarni-I has a single horn as the animal is depicted side-wards. In the issues of Satakarni-II, the Bull has double-horns and prominent hump. Other animals that find a prominent place on the early coins are Elephant, Lion, Horse, etc. (8).

Ploughing Bulls are found depicted in the early Kushana sculpture. In a Gandhara relief from Lahore Museum we note the vertical handle and curved Yoke pole. Of the same period is a lime stone frieze from Amaravati (dt. Guntur), which depicts Bulls running and one yoked to the plough. The life-size figure of a Bull in Limestone (PL.12) obtained from *Kotadibbalu*, south-east of Amaresvara Temple is undoubtedly the creation of the Satavahana time (early 1st-2nd Centure A.D.). This stately Bull stood in attention before the tall lime stone *Linga* in the Siva temple gazing at it *"Daiva Vikashana Tatparah"* (9).

Among the later Coin issues, Bull has no place but Elephant dominates. Besides a few issues depict Horse. The Ikshvaku Coins contain only Elephant. Rarely a Hill or chaitya, Lion, Horse and Ship types continued among the later Satavahana issues right upto 2nd Century A.D.

(III) ***Later Historical Periods*** : (10)

We do not find the depiction of a standing Bull from early 5th-Century onwards in any sacred place or Temples. It is the recumbant bull now that dominates in the Temples of India, more so in Andhra. However, at Mahabalipuram between Arjuna and Draupadi *rathas*, the rock-mass was cut out as a large sculpture of a recumbant Nandi, facing west while a monolithic Elephant, a massive one stood for a *Gajaprishthakara* temple. Mahanandi, in dt. Kurnool, has some special significance. though the temple is of 10th Century date within a radius of 10 km of Mahanandi, there exist Nine-Nandi temples going by the names, Padma Nandi, Naga Nandi, Vinayaka Nandi, Garuda Nandi, Brahma Nandi, Surya Nandi, Vishnu Nandi, Soma Nandi and Siva Nandi. Besides, a huge Nandi lies in front of the Lords shrine justifying the name *Maha-Nandi tirtha* to the place. (11)

Among the Kakatiya temples, a *Nandi-Mandapa* is seperately raised in front of the Siva temple. The huge recumbant Bull is placed which clearly looks the *Linga* of the main sanctum and one should look through the rear part of the Nandi, the Siva *Linga* in the centre of the sanctum. Such huge *Nandi mantapas* of the Kakatiya period (11th-13th Century) still exist at Palampet, Hanumakonda and Warangal etc. (12)

Lepakshi, 15 km east of Hindupur town has revealed a unique Nandi, 200-yards east of the Virabhadrasvami Temple. This is a colossal (PL.13) Nandi, realistic and largest in India measuring 10 metres long, 6-metres high. On one of the chains there is an insignia of the *Gandabherunda*, a double-headed eagle. (13) The temple is dated to 1490-1506 A.D. Three other large Nandis are in front of the temples; (1). Brihadisvara Temple, Tanjavur; The bull is 3.7 metre high, 6 metre long and 2.5 metres broad. It is of the Nayaka period set up within a wide *Mantapa* in front of the Brihadisvara temple. (2) The Bull in Basavannagudi, a suburb of Bangalore; (3). Chamundi Hills overlooking Mysore. The Bull is 5 metre high and 7.6 metres long set up during the time Dodda Devaraja, 1659-72, A.D. It may

PL.1

Mundigak, (Baluchistan), Cattle figurines of Terracotta circa, 5th-4th Millennium B.C;
(1) Humped Bull; (2) Humped Bull with collar;
(3) Head of a Bull; (4) Painted Humped Bull

PL.2

Mohenjodaro; Steatite Seals with animal motifs, Circa. 3rd Millennium B.C.
(1) Indian Humped Bull, (2) Elephant; (3) Water Buffalo with feeding Trough, (4) Pair of Antelope, (5) Bull of Primogenius type with manger, (6) Indian Rhinoceros, (7) Mountain Goat.

PL.3

Kalibangan, Early Phase (3rd Millennium B.C), (A) Humped bull on a seal;
(B) Terracotta, Charging Bull.

PL.4

(A) Piklihal Terracottas from the Neolithic period; (B) Maski Palimpsest of Rock Bruised Bulls.

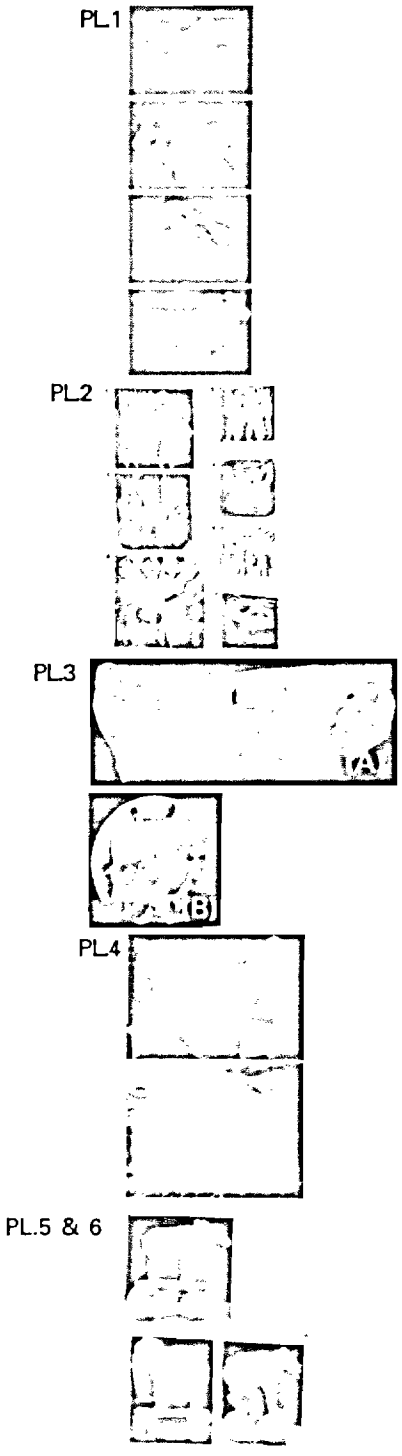
PL.5

Daimabad, Massive Bullock Chariot of Bronze with the rider

&

PL.6

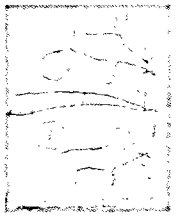
Daimabad, (A) Elephant in Bronze; (B) Rhinoceros in Bronze, (C) Buffalo on wheels in Bronze.



PL.7

Inamgoan, Dt. Poona, Bullock Cart incised on Chalcolithic Pottery, Circa. 1500 B.C.

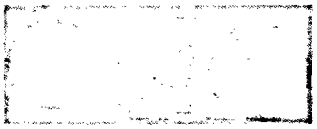
PL.7



PL.8

(A) Silver coin, *Pushkaravati Devata*, (B) Bull on the reverse early 4th Century B.C.

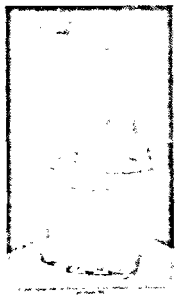
PL.8



PL.9

Rampurva, Bull Capitol from an Asokan Pillar, polished sandstone, mid 3rd Century B.C. (Horns broken)

PL.9



PL.10

Ujjain, Asokan Bull from the temple precincts of Pingalesvara Mahadeva, (mid 3rd Century B.C.)

PL.10

PL.11

Coin types of early Satavahana Kings, 2nd century B.C.

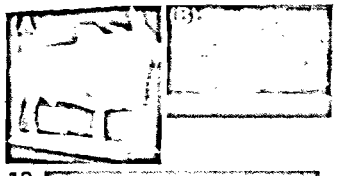
PL.11

PL.12

(A) Standing Bull in round originally stood in front of siva shrine, Amaravati, 1st-2nd Century A.D.

(B) Kushana Plough (Circa. 2nd Century A.D.), with verticle handle and curved Yoke-pole, Lahore Museum, Gandhara relief

PL.12



PL.13

Lepakshi, Monolithic Nandi

PL.13

be noted that the eight *dikpalas* have each an animal as Vahana. Thus Ram for Agni, Buffalo for Yama, Nara for Nirriti, Makara for Varuna, Deer for Vayu, Mangoose for Soma and Bull for Isana Siva.

The modern ploughs resemble the Kushana (Gandharan) and Satavahana types. The bull with hump and short horn continued to serve the villagers even now. The plough with vertical handle and curved yoke pole remained the same. Peasents take the sacred Bull with fully decorated horns and coloured clothes on the body on *Sankranti* days and *Siva-Navaratri* days and collect grains.

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Ongole The Dairy Breed

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Several hundreds of livestock breeds were evolved by man in diverse 'form and 'function' to meet his specific needs around the globe since time immemorial. Breed modification for excellence is a continuing process. Certain breeds dominate the scenario over others by their superior performance leading to their spread to new territories and consolidation in its home tract.

Ongole breed of cattle emerged as winner in its home breeding tract of Andhra Pradesh (A.P.), India for their superior draft capacity and high milk production. Its pre-eminence as a dual-purpose breed of choice continued through the early years of 20th century. This famous Ongole breed has attracted the attention of cattle breeders in several continents for high beef production under harsh environments coupled with its versatility for heat and disease tolerance and adoptability. Ongole breed has rapidly multiplied in countries like Brazil, Argentena etc. by 20th century and formed the backbone of their beef enterprise and National economy.

However, the ongole home breeding tract of AP has encountered unprecedented depletion of high milk yielding cows due to their migration in the recent times to urban centers for milk yielding cows due to their migration in the recent times to urban centers for milk supply. Simultaneously selection of breeding animals on type (form) criteria favoured increased draft and body capacity. Further the markets favoured bull-calf rearing as a viable economic proposition and caused neglect to female calf. These socio-economic factors aided selection of Ongole breeding

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stock for better "draft type" and perhaps unconsciously at the expense of high milk yield capacity. Thus, while the Ongole breed has gained excellence in draft type; the dairy type deteriorated severally over generations.

Modernization in Agriculture, improved, rural road net work, mechanization and introduction of land reforms in the last four decades have reduced the dependence of the farmers on animal draught power causing a body blow to the economic viability and patronage of Ongole breed in its home breeding tract of A.P. In the light of lower emphasis for draught animal power and increased cost of animal maintenance, the Ongole cows milking capacity as an alternate viable economic entity came into focus.

In general, majority of Ongole cows in home breeding tract lacked dairy capacity. Water buffalo and dairy cross-bred cows have emerged as viable alternatives to meet the demand of milk, replacing Ongole from its premier position. Though the approved breeding policy for a breed tract is pure-bred selective breeding, dairy cross breeding activity in practice caused some shrinkage of Ongole breeding tract due to farmers adoption to crossbreeding with Holestein Fesian / Jersey breeds.

Many of these factors have a common bearing on the decline of several indigenous Indian breeds of cattle like Ongole, Deoni, Hallikar etc. The smallest body size cattle breed of Punganur of A.P. is facing extinction. However, these prized breeds never constituted more than a small fraction of 12.4 million cattle population. These elite germplasms of cattle represent our heritage and culture in several ways. The Ongole bull is immortalized in the form of much-revered "Nandi" statues seen in the famous Lord Shiva temples of India.

Survival of Ongole breed in its home breeding tract of A.P. rests on our ability to successfully resuscitate high milk yields in the Ongole cows to facilitate their transformation into viable productive economic units. Presently a majority of these cows are owned by poor farmers and

also landless agriculture labourers. Existing low milk yields coupled with short lactation length and poor reproductive efficiency in a majority of Ongole cows are casting burden on the fragile economies of their owners.

The performance of Ongole cows need to be vastly improved from their current levels of productivity as revealed by the performance of Ongole herds in the organized herds maintained in A.P. The average age at first calving at different herds is varying from 37.3 to 61.2 months. The average lactation milk yields vary from 372.9 to 883.7 kg while the average lactation length was 86 to 242 days. The calving intervals are in the order of 14.1 to 20.7 months in these herds.

High milk yielding potential of Ongole cows maintained by farmers in well demonstrated at several livestock shows in the last one decade by their wide participation with daily milk yields of over 8 kg. The highest individual daily milk yields at different times varied from 11.8 to 16.6 kg showing the potential of Ongole breed for milk production. Central herd book for Ongole cows recorded the highest lactation milk yield of 1997 kg. The above high levels of productivity among prized ongole cows indicate the upward potential that still exist in this breed. However, the limiting factor is that these prized high performers are far too small in number to have high positive impact on the entire Ongole breed population through traditional animal breeding methods only. The need of the hour is to quickly improve the milk yield of Ongole cows to economically self supporting level of about 1000 kg / lactation with a forward moving target of 1800 kg / lactation to make them profitable to the farmers. For this purpose a long-term breeding programme supported by an adequate nutritional intervention and health management need to be implemented at the field level with farmers participation. The following steps can lead to attainment of the above objectives.

1. Survey and performance recording on age at maturity, milk yield, post-partum service period and calving interval of Ongole cows with the farmers.

2. Identification of high milk yielding Ongole cows by conducting mandal level milk yield competitions every six months and or at farmers door step by performance testing and use them for breeding as elite foundation dams.

3. Employment of MOET technology to expand the progeny from elite foundation dams.

4. Introduction of other biotechnology tools like embryo splitting, cloning and genetic engineering to maximize the impact of elite identified cows.

5. Selection of breeding bulls based on pedigree, collateral relatives and dairy type characters but not on type for draft/meat. The effort made at Ongole cattle project, Lam farm, Guntur of ANGRAU yielded a couple of proven sires with a small advantage and they can serve as foundation sires for use on identified elite foundation dams.

6. The ongoing Ongole cattle project at Lam farm need to be developed as a ful-pledged field progeny testing station for "dairy type Ongoles" by adopting "Open-nucleus breeding system (ONBS)" coupled with modern bio-technology tools. The proposed ONBS should capture the desirable dairy type Ongole germplasms available any where in the world to create a broad base.

7. Extension activities relating Ongole farmers on the scope of "dairy ongole cattle" for their economic well being, need for a change of breeding goals, and selection criteria, feeding and management etc. need to be taken up by concerned organizations. The envisaged dairy type Ongole breed in its home breeding tract serve as a catalyst for all Ongole herds around the world by bringing down the cost of rearing by improving their body growth rates and with the attendant additional benefits.

8. Urgent action is required to evolve "Dairy Ongole breed" from the existing Ongole breed. It is necessary to develop a detailed project report and implement it enlisting the support of all Ongole breeders, Governments, Breeder's Associations and animal lovers to evolve dairy Ongole. Lest the existing Ongole breed in its home breeding tract loses further ground and likely to be submerged in the sea of dairy cross-bred cattle and buffaloes in about two decades from now. Let this breed submersion not happen to our majestic and glorious breed of Ongole cattle. Let us gear up to act and evolve Ongole the dairy breed.

Ongole in Andhra Pradesh-Past, Present and Future ?

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Government of Andhra Pradesh

India has been an agriculture-based country from centuries in vew of natural water resources. The agriculture based livestock production system has been a part of rural economy of our country. Depending upon different soil and agro climatic conditions farmer has been ever since experimenting with cattle breeds to produce bulls that can serve him in his agricultural operations. Milk was fed to the growing calves and the entire selection went in favor of bullock power. Big herds were maintained by the landlords for their draught requirements. India is one of the few countries in the world having livestock with wide genetic diversity and noted for milk, draught and beef. They are also resistant against tropical diseases, high tolerance to heat and great capacity to survive and produce under harsh environments. Breeds of cattle like ongole are widely exported to several countries in east and west and have contributed immensely to the economic growth of the imported countries.

Now the ongole breed which was considered as dual-purpose breed has degenerated to an uneconomic level due to prolonged negligence and indiscriminate inbreeding. The concept of breeding for augmenting milk production became key policy in our first few five-year plans. the entire thrust was on cross breeding to upgrade the indigenous non descript cattle as efficient dairy crossbred herds. As such the dual purpose cattle breeds were categorically neglected instead of developing milch and draft strains from them.

Factors leading to decline of Ongole

* The national agriculture policy.
* Fast urbanization.

* Mechanization resulted in farmers' priorities
* Land reforms leading to shrinkage of individual land holdings.
* Domestic preference for buffalo milk in A.P.
* Preference for cross breeding
* Misconceptions among A.P. Cattle breeders and general public that cow milk is very hard to digest and it is used almost nil for human consumption.
* Non renumarative price is not offered for cow milk
* Extensive increase in areas covered by commercial crops
* Socio Economic chages in rural areas
* Migration of farmers to urban areas
* Non availability of labour
* Fall of are a under fodder cultivation

<u>Suggestive Policy Options</u>

* Effective survey in breeding tract should be conducted to know the genetic purity of the animal and actual needs of the farmer/breeder
* Preparation of GIS on ongole cattle
* Good progeny tested bulls having rich genotypic and phenotypic character may be supplied to each center of area of 5 to 8 KMs, where more number of ongoles & Ongole types are available and also A.I. facility should be made available to each and every village in breeding tract.

* Production of "True To Breed" Ongole bulls by way of nominated mating of true Ongole cows with true ongole bulls
* Ongole nuclear germ plasm centers to be installed
* Effective breeders association should be formed and coordination should be established with State and Govt. of India. This association should submit quarterly report to the concerned department.
* Milk yield and draft competition may be conducted regularly and attractive prize money should be kept
* Calf subsidy and feed subsidy should be made available to Ongole Cattle's in the breeding tract and Ongole Cow and Calf rearing programmes may be included in DRDA and NABARD driven economic upliftment programme units.
* Dairy industry should purchase cow's milk in each and every village, even in small quantity in breeding tract. Propaganda should be made that cows milk is very good for human consumption especially in children
* Maintain a herd book - to international standards. This is possible by maintaining one or two or even three subsidiary registers before admitting an animal into herd book. Normally any ongole type cow shall be registered in "A" Subsidiary register.

Artificial Insemination and Breed Improvement of Ongole Cattle

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Chief Executive Officer
A.P. Livestock Development Agency

Andhra Pradesh is the home tract of Ongole and Deoni breeds. The Ongole breed like other breeds of cattle in India, takens its name from the geographical area in which it is produced.

It was reported that Ongole cattle are available in Prakasam, Nellore, Guntur, Krishna, East Godawari, West Godawari, Vizag, Khammam, Nalgonda, Mahaboobnagar and Kurnool districts.

The Ongole is a recognised dual-purpose breed noted for milk and draft. The Ongole has been used as the main motive power for agricultural operations in the tract. The sturdy Ongole breed is the answer for the demands of draught needed in the heavy back soils of the tract.

Famous Ongole cattle, in the earlier period, had good milk potential and were more resistance to many of the diseases. Such breeds have undergone certain changes in their physical structure and the milking potential has also reduced. With expansion of irrigation facilities in Krishna and Godawari deltas in 19th and early 20th Centuries the white cattle population in the above districts is replaced gradually by buffalo population. With introduction of Virginia Tobacco in Guntur and Prakasam areas the Ongole population was slowly depleting and now with land reforms and extensive introduction of commercial crops like cotton, sugar cane and mechanisation the rearing of Ongole cattle has received a setback and is becoming gradually uneconomical.

In order to improve the breed characteristics of Ongole and to preserve the Germplasm, the Andhra Pradesh State Govt. has started the breeding activities through A.I. under Frozen Semen Technology. During

the survey conducted by the Andhra Pradesh Livestock Development Agency (APLDA) in the year 2000-01 it was revealed that only about 15000 pure Ongole breedable cows are available in the state in the native tract. Four Livestock farms are functioning for breed developmental activities to evolve best Germplasm to utilise the areas of the breeding tract and its surroundings. Out of these four farms, two are located at Chintaldevi and Ramatheertham, which are functioning under Animal Husbandry Department and other two are at Lam farm, Guntur and Mahanandi, Kurnool dist, which are under Acharya N.G. Ranga Agricultural University.

Majority of the work is being taken place at Lam farm for evolving best variety for milk production as well as draught. Remaining three farms are integrated to this in the breed development activity.

Due to budgetary constraint the above farms are not functioning to their rated capacity in breed developmental activity and there is a need to strengthen these farms and provide the financial assistance.

The Ongole Frozen Semen is also being produced at FSBSs Nandyal and Karimnagar, which are under APLDA. This semen is used for Artificial Insemination (AI) activity and as on today six Ongole bulls are available. Out of this, three were selected and procured from the field, which have born to the best animals those have won prize during the cattle shows conducted recently. During the year 2000-01, the APLDA has produced about 30000 doses of Ongole semen from FSBS, Nandyal. In 1700 AI Centres out of existing 4500 AI centres Ongole Semen in available for conducting AI as and when the cows are brought for Insemination.

During the year 2000-01, 68, 963 inseminations were conducted and produced 23,922 Ongole calves. The Semen utilisation and AI done particulars for the last 5 years. is given below.

S.No.	Year	AI done	Calves born
1	1995-1996	77119	22596
2	1996-1997	63274	21827
3	1997-1998	69607	21827
4	1998-1999	67171	24793
5	1999-2000	75634	26543

The above results indicate that there is a need to improve the Ongole population in an intensive manner by taking up the following measures.

1. Establishment of Ongole Development Agency/Association or Ongole Breeder's Association and sufficient financial provision is to be made to these agencies for taking up development activities.
2. Herd registration of Ongole animals has to be taken up and the registered animals should be provided with all parts of facility apart from proper nutritional care. The newborn of a good lactating cow must be procured and utilised at Livestock Farms and FSBS for future purpose.
3. Ongole cattle shows should be conducted at district/regional level and also at state level and farmers should be encouraged for breeding Ongole cattle with best pedigree.
4. ETT and AI has to be introduced for a faster development of Ongole cattle.
5. With the versatility of the Ongoles and their spread to so many countries on different continents, it would be beneficial to link up the various research activities carried out in different countries and bring them within a network coordinated by an international organization as FAO.

6. Calf rearing scheme for Ongole breed has to be introduced.

In view of the importance of breeding programmes with the above aim, the APLDA has proposed the GOI for providing financial assistance under the project NPCDB. As soon as the Scheme is approved and required amounts are released, activities of breed development in Ongole cattle will be intensified for producing the best germ plasm.

Conservation of Ongole Breed

Prof. V. Prabhakar Rao, Ph.D
Registrar (Retd)
Acharya N.G. Ranga Agricultural University

The Ongole breed also known as Nellore breed abroad, is no doubt, one of the best breeds if cattle in the country and is rightly considered to be the "Pride of Andhra". It is described as a dual purpose breed in the text books but considers its popularity abroad as one of the best meat producing animal it can be described as a triple purpose breed. However, as of to-day, many of us may not agree that the ONGOLE cows could be categorised as milch cows but you will be surprised to know that until the popularisation of A.I. and cross breeding, bulk of the milch animals in Madras belonged to Ongole breed from Andhra. Unfortuantely many of them would have been sold to butchers after completion of the lactation. That is how the valuable germplasm of the state was lost forever. When the Chintaladevi farm was established in the year 1918, by collecting the Ongole cows from the breeding tract, the foundation stock had recorded a peak daily yeidl of 14.1 lt. In the year 1936 the average daily peak yield of the chintaladevi herd was 25.1 lt. Is it not enough to suggest that the ongole cows are good milch cows. But if we look at the average lactational yield and peak yield of the Ongoles in the germ plasm unit of the network project on ongole cattle at Lam farm, Guntur respectively we can understand the gravity of the problem. Who are responsible for this sorry state of affairs ?

Both the breeders i.e. the farmers and the policy makers i.e. the scientists and the govt. have to share the blame for the present day state of ongole and for that matter, other indigeous breeds elsewhere in the country. Traditionally the farmershave been laying emphasis on phenotypic characters i.e. size and appearence while selecting the breeding bulls resulting in the loss of milk producing genes from ongole breed. Moreover, the farmers in the breeding tract have been increasingly depending on buffaloes for meeting their requirements of milk for two reasons; (1) due

to the high price commanded by buffalo milk and (2) their preference for high fat milk and milk products.

The policy makers must be blamed for inconsistant breeding policies which have been changed too frequently. For example, one of the best herds of ongole cattle which was assiduously built by the earlier breeders was dismantled in 1972 under the ageis of ICAR by introducing cross breeding in this farm. In that process a 500 strong herd of pure Ongoles with the best genetic make up was lost forever. I myself have recorded the peak yield of 10 kg per day in this herd in the year 1973. Where have such cons have gone now ? No body knows.

After having lost such a wonderful germ plasm, again we started scouting for purebred ongoles in the breeding tract in 1984. It was a herculian task for the scientists of ANGRAU and officials of the A.H. dept. of procure 500 pure bred ongole cows from the breeding tract which could be aptly described as searching for a needle in the hay stack. But all is not lost yet. The just prize winning ongole cows in All India Cattle shows held in 1994 (for ongole) and 1999, have recorded around 15 kg. milk per day which indicates that there is light at the end of the tunnel. All the well meaning persons with a genuine concern for this world famous breed must, therefore, act without much loss of time to retrieve the milking genes in Ongole's for which the tools of modern science viz., biotechnology could be put to use effectively. This state has the will and car take up this task earnestly. This is the only way to rekindlle interest in the farmers', towards 'Ongole'.

The Ongole catle lost the patronage and support of the farmers in the breeding tract gradually from 1970 onwards when the farmers started to switch over, gradually, to cultivate commercial crops like tobacco, cotton and chillies from the traditional fodder rich cereal crops. Fortunately, with the reversal of this trend, of late, the farmers have started showing interest in social forestry and livestock rearing but their interest has been diverted towords MURRAH and graded murrah buffaloes. Hence it enjoins upon the

policy makers, planners and scientists to attract the attention of the farmers in the breeding tract to switch over to Ongole cattle breeding not only to restore its lost lost glory but also to prepare the farmers to withstand the onslaught of the WTO as the ongoles have the needed attributes for export in a bigway.

Though the ongoles were not bred for meat production in this country, their size coupled with their excellent abilities to thrive under harsh and adverse environmental conditions and to convert the coarse roughages into lean meat found favour with many countries abroad, especially those in tropical and sub-tropical zones, which imported large number of ongole cattle. Though there countries imported other Yelru breeds like Gir and Kankrej along with ongole they were more facinated by ongole which had distinct advantages over other yelru breeds. Since the ongole herds in countries like 'BRAZIL' in South America have been maintained as closed herds for a long time they have been encountering certain problems in these herds perhaps due to inbreeding. Therefore, the breeders associations of these countries have been evoncing greater interest in ongoles from its native breeding tract i.e. Andhra Pradesh.

There is, therefore, an imperative and urgent need to conserve this valuable tropical germplasm, both by IN-SITU and EX-SITU methods, not only for historic reasons but also for socio-economic reasons. The country has a fund of scientific manpower and technology but there are certain grey areas in the implementation of the technology. Foremost in this area is the communication gap between the scientists, planners, policy makers and end users. It is here the role of NGOs, more specifically, the breeders associations and local self govt. agencies assumes importance. It is for this purpose this international conference has been organised and has come at the right time when the Indian farmer is at the cross roads in the light of the challenges posed by WTO. I wish this conference addresses these issues in right perspective and comes up with practicable, sensible and realistic recommendations to conserve, consolidate and improve the performance of this wonderful breed.

Origin of Ongole Bull in Archaeological Context

Dr. P.R.K. Prasad

Tatpurushaya vidmahe

Chakra tundaya Dhimahi

Tanno Nandih Prachodayaat !!

Nandisvara means king among Bulls. He is venerated as vehicle **(Vahana)** of Lord **Maheswara.** Without his sanction the Lord cannot be approached. In temples he is seen opposite the Linga always starring at him. The tradition is that one should not pass across obstructing his view in the temples. The above mentioned ***Vedic Mantra*** is intended for invoking his grace. Since **Maheswara** is the protector of the Universe, his vehicle (Vahana) seems to have shared his responsibility in producing food grains by being a friend of the farmer.

In modern times inspite of great development, mechanization and utility of other cattle in the field of agriculture, the importance of Bull has not lessened and will not be too. Bull belongs to Bovine family. Every Indian considers scared the Bovine cattle. Cow-milk is considered as complete food and almost every house holder daily prays for the welfare of the Bovine cattle.

Andhra region being fertile with perennial water source from the rivers since ages opted for agriculture. With the advent of Iron age (Circa 100 BC) when the iron implements and improved plough shares were introduced, agricultural operations grew far and wide with new region being brought under cultivation. In this task Bull stood by the side of the farmer in food production for the man kind while consuming its by - product, grass, as his feed.

Ever since he realised the importance of the Bull, man made several efforts to produce the best species. Even to this day every house holder on certain occasion considers it a meritorious deed to

perform a ceremony called ***"Vrishotsarjana"*** in which he selects an young and energetic Bull of good breed and sets free for the benefit of the community. Nobody obstructs its free movements and this serves as **Breeding Bull** to the Bovine cattle.

These efforts and experiments resulted in the survival of the best species known as **"Ongole Cattle"**. Today this breed is seen with excellent physic, proportionate limbs, high and prominent hump, short horns, wide dewlap, long tail with tasselled end, bright in colour, with majestic look attracting the viewers. This is a vegetarian and easily domesticated by man.

Being renowned as the best species not only in Andhra but also in other neighboring states as well in the North, when we look into its antiquity, interestingly we come accross certain evidences tracing the origin into the Proto-Historic times. Ever since, **zebu** stands as a symbol for Agriculture.

During the early centuries before and after the Christ the **Satavahanas** were the overlords of South India. We know from the literary sources like ***Gatha Saptasati, Bruhatkatha*** and other works of the period that several regions in the Central Deccan were brought under cultivation with new methods and machines for water supply in farming. Attlesting this fact the early rulers of the line following their immediate predecessors depicted a humped Bull as prime symbol on their coins. Following them, their contemporary rulers, the **Mahatalavaras**, ruling in the coastal region in Ongole and Bapatla issued similar **"Bull type"** coins **(PL :1)**.

In this connection, it is interesting to note that the **Ikashvakus** of Vijayapuri (present day **Nagarjunakonda region** in Dist. Guntur) announced with pride in their lithic records indicating that theyencouraged agriculture and brought new lands under cultivation, by free distribution of Bovine cattle and ploughs in thousands together with money to the public. ***"Hiramnakoti, go satasahasa, hala***

satasahasa". These cattle must be the best breed then available in the country.

In this regard, we may appreciate the lithic representation of a standing Bull in life size that was installed as ***Nandisvara*** facing the linga in the temple of **Lord Amareswara**, in the city of **Sri Dhanyakataka** (Modern Amaravathi in Guntur Dist.) the capital of the ruling families in the coastal region from 4th C.BC. to medieval times. This is now exhibited in the Archaeological Museum in Amaravati **(PL : 2)**. This is undoubtedly a true representation of the then available best breed, (CIC.AD) since no artist or sculptor would carve any specimen out of his imagination but from th model with which he is familir. This representation resembles the aforesaid breed.

When we still look into the past, on the Silver Punch Marked coins of the country we find a standing Bull with short horns and prominent hump depicted in outline. However, Emperor Ashoka Mourya (3rd C.BC) who is supposed to have issued thelast series of the above coins, installed several Monolithic Pillars in the country and one among them found at Rampurva in Bihar State contains a standing Bull on the capital which reminds us of the best specimen **(PL : 4)**. (3rd millennium BC).

The Indus civilization produced evidence of Terracotta toys and cult objects which include a range of birds, animals and cattle including both humped and humpless Bulls. Similar is the case with the representation of Bulls on seals and sealings found at Mohanjo-daro, Harappa and other centres **(PL : 5)**.

Among them the **Zebu** (humped variety) with prominent hump, wide dewlap almost touching the ground, long horns and tail is opined by the scholars (Ibid. P 259) to have descended form ***Bos namadicus***, a wild cattle which occurs through out the Indian Pleistocene and in this case it is possible that the centre of its domestication may have been south Asia. Thus the origin of this species may be traced to South Asia and in particular to South India.

However the scanty representation of this variety in the above centres when compared with the humpless variety both in terracotta objectc and on seals indicate that this breed though known, was not much popular in the community. As such it appears to have been later introduced into the dominion from outside possibly from South.

It is interesting to note that the Neolithic people of the south from Karnataka and Andhra had cultural and trade contact with the centres of the Indus culture in the North. Much of the Indus gold is of light colour, indicating a high silver content or rather that it is **"Unrefined Electrum"**. This suggests that it originated from the Kolar gold fields of Mysore and Ananthapur in Andhra and nowhere else. (Taxila - II, Sir John Marshall - Cambridge 1951, P-620). This possibility is certainly not discouraged by the number of Neolithic settlements which are reported from Mysore, particularly clustering around the Hatti Gold bands. Therefore scholars are of the opinion that the gold diggers of the Southern gold fields may have introduced this humped Bull into the North in course of their trade and transport to that distant land.

All these evidences and depictions make it clear that the best breed of the humped Bull resembling the present day **"Ongole Bull"** originated on Indian soil and in particular Southern centres and the Agricultural community as well Royal families encouraged and developed this breed for Agricultural purposes, As **Nandisvara**, vehicle of Siva, Bull is venerated and some of the Royal families depicted Siva with Bull behind ontheir coins indicating their faith towards ***Saivism***.

During the medieval centuries Bull was sculptured in round in more than life size in majestic postures and installed in the Siva temples, as we see in Tanjavur in Tamilnadu, Chamundesvara temple in Mysore and Lepakshi in Andhra Pradesh. In some cases ***Nandi*** alone was hewen out of natural outcrop of rock as we seen in ***Basavanna Gudi*** and on the slopes of Chamundi hill in Mysore and other sites. This indicates ***"Basavaradhana"*** worship by ***Nandi*** introduced by **Basavesvara**.

Basavesvara was an ardent devotee of Siva hailing from Karnataka during 12th C.AD. He stands as an outstanding personality in ***Veerasaivism***. His life and teachings have been a source of inspiration to millions of people in South India and Karnataka in particular. **Basavesvara** enunciated philosophy of ***"Kayaka"*** as part of social revolution. He pleaded that a man should be respected irrespective of the vocation he followed either high or low. It is opposed to man leading an idle life. Work should be done for its own sake not with an eye on its results or fruit. It should be a ***Nishakama karm***. The believer of ***Kayaka*** philosophy does not hanker after fruit. Bull stands as a symbol for this doctrine. Reminding the man to follow this principle, Bulls at several places were installed independently.

Thus the Indian Bull is considered to be the best breed available in the country as well as the world over. Particularly in Brazil this species is known as ***"Brahmin Bull"*** indicating its supremacy among the Bovine cattle.

Every Indian even today prays for its welfare.

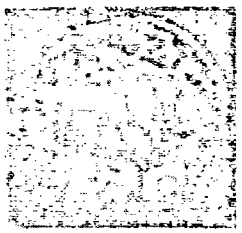

Fig.1 : MAHA TALAVARA'S COIN
BAPATLA (100 BC)

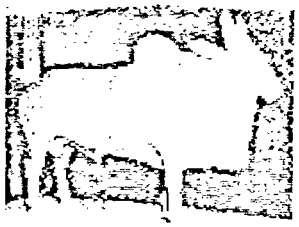

Fig. 2 : NANDI IN AMARESWARALAM
(100 AD)

Fig. 3 : ASHOKA'S RAMPURVA
CAPITAL BULLOCK
(300 BC)

Fig 4 : INDUS CIVILIZATION
STEATITE SEAL
(400 BC)

PLATES

Plate 1 : Bull on Mahatalavara Coin
From Bapatla (A.P)
Circa 1st C.BC.

Plate 2 : Nandi form Temple of Amaresvara
Archaeological Museum, Amaravati (A.P)
1st C.AD.

Plate 3 : Bull Capital on Ashoka Pillar
Ramapurva, Bihar
3rd C.BC.

Plate 4 : Rock Bruised Bulls - Maski
Karnataka
Circa 3rd Millenium BC.

Plate 5 : Bull on Seals
Mohanjo-Daro
Circa 3 - 4 Millenium BC.

Ongole Cattle - Present Status, Revival and Reinvigoration

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India is rich reservior of a vast biodiversity in plants, animals and microorganisms. The demostic animal biodiversity is generally documented in terms of breeds/strains or lines/variants which have been developed over thousands of years, largely through survival of fittest and natural selection suited to the local environmental conditions and need of the farmers. The competition presented by the introduction of exotic brteeds, difficulties associated with low productivity of indigenous breeds, absence of breeding plans and sharp changes in farming system have resulted in steady decline in the number of purebred animals or in genetic dilution. Under such circumstances it is of utmost importance to prevent, stop and reverse this trend of erosion of diversity. This becomes even more important in the present context when more and more countries of the world are going for patenting of their genetic wealth and also when indiscriminate and non-sustainable exploitation of the genetic resources is leading to thier endangerment and extinction. The Animal Genetic Resources in India need to be re-evaluated on the basis of their physical conformation and production traits related to growth, reproduction and milk production, meat production and efficiency of utilization. Precise and unambiguous characterization and discrimination among the breeds is an essential pre-requisite for conservation and optimal exploitation. Recent advances in molecular genetics particularly the DNA fingerprinting have emerged as powerful tools in characterization. The characterization and conservation including improvement collectively can lead to sustainable utilization of animal genetic resources. Conservation is not only simply preservation of those breeds currently in use but also encompasses the monitoring characterization, sustainable management and development and utilization over time of gene pool of each species.

Despite great economic value and significant contribution of domesticated animals to the extent of 30-40% in terms of total value of global food, precise inventories and description of all the diverse breeds do not exist. It is now held that over 30% breeds among the major domesticated species have not been documented. It is a matter of great concern that nearly 40% of the global animal genetic resources are currently at high risk of extinction[1].

In umpteen cases the endangered populations are having less than 1000 breeding females and less than 20 breeding males. Few rare and archaic breeds now exist only in conservation centres and zoos.

The biological diversity is also under pressure from manifold increase in human population and economic pressures have accelerated the pace of change in traditional agricultural systems. The development of Artificial Insemination and other Biotechnological tools that facilitate easy transfer of genetic material from one geographical region to another have helped in widespread crossbreeding of local stocks. The crossbreeding has been carried out without evaluation of indigenous breeds, absence of any plan for their improvement and simultaneously with contemporary comparison with crossbred under field conditions.

Present Plans

It has been realized that native Indian animals also posses certain favourable genetic traits like tolerance to tropical climatic stress, conversion ability of the poor quality and inadequate water and roughage, better tolerance to drought and disease. In the VIII Five Year Plan, the Network Project on Animal Genetic Resources was started as model programmes for genetic characterization of the breeds of livestock and poultry through sample survey under famer's conditions. The objectives of Network Project are :

1. To characterize the breed in terms of both qualitative and quantitative traits.

2. To study the molecular genetic characteristics of the breed

3. To develop breed descriptors

4. To conserve the germplasm of elite/unique animals

Technical Programme

In the Network Project information is collected through systematic surveys so that the breed descriptors have the common objectives as a model project for developing the norms for each breed. The precise information so generated would facilitate in planning the future breeding strategies and programmes. The programme is implemented through the coordinating agencies like State Animal Husbandry Departments, Indian Council of Agricultural Research, State Agricultural Universities and Non-Government Organisations etc. with NBAGR functioning as nodal agency for coordinating and monitoring these programmes.

The general outline of the programme is that for each breed the survey work would be completed in 2.5-3.0 years using 5 sets of questionnaries for which the computer programme for data entry is demonstrated to each survey unit. The demographic and geographic dsistribution of the breed in its home tract is studied including the population dynamics with respect to age and sex. The information on production system used, availability of input, socio-economic conditions of the farming communities and performance of the animals is also collected. The stratified random sample survey is carried out in the 3 districts of the main home tract of the breed. Under each district 4 strata and 5 villages in each stratum are earmarked. One enumerator in each stratum carries out the survey work in 5 villages and each district covering 60 villages in all. The data on managemental practices, socio-economic status of the farmers is envisaged to be completed in first 3 months of the survey during which households and animals for detailed data recording are identified. For data recording on physical characters, a sample of minimum 100 animals in each category of age and sex groups is covered. Growth,

production and reproduction parameters are recorded on at least 200 animals for each category in each district. A minimum of 30 males from elite dams is envisaged for raising and collecting seman for conservation. At least 25 pairs of microsatellite markets. The survey work is monitored through evaluating the progress at quarterly, half-yearly and at 12 monthly intervals. The progress of the survey units and core labs is discussed in annual workshops in addition to field visits The information generated through survey will help to develop data banks on farm livestock and poultry. The survey programme will also help in planning breed improvement and developmental programmes and to develop breed descriptiors. This will fill the lecunae in our village and reveal the status of breed vis-a vis its economic importance alongwith identification of animals of the superior germplasm with potential of higher production and reproduction. The animal types which are declining or are at the verge of extinction are to be identified through comprehensive surveys. The surveys will reveal the extent of genetic variability including rare variants which can be protected and conserved.

Initially under the NetWork scheme, the breeds of cattle (Deoni, Ongole, Umblachery & Gir), buffalo (Jaffarabadi) Goat (Osmanabadi, Barbari) and Poultry (Aseel) were taken up in VIII plant. The survey work on Umblachery cattle, jaffarabadi buffalo, Osmanabadi goat and Aseel poultry has been completed and for remaining breeds, the work is nearing completion. In 9th plan the survey work on 4 breeds of cattle (Bachaur, Bangi, Red Kandhari, Gaolao), 2 breeds of buffaloes (Nagpuri, Surti), 3 breeds of goat (Gaddi, Chegu and Kodiandu) and one breed each of Mithum (Arunachali), sheep (Madras Red), Poultry (Kadaknath) and camel (Kutchi) are proposed. Besides this conservation units on cattle (Nagauri, Rathi, Kangyam) buffalo (Pandharpuri, Nili Ravi, Bhadawari) goat (Beetal, Jamunapari) and sheep (Pugal, magra) breeds are also proposed to be initiated from October, 1999.

Status of Ongole cattle

Andhra Pradesh ranks 7th in cattle population in India. The state is the home for six cattle breeds namely Ongole, Deoni, Krishna Valley, Malvi, Hallikar and Punganur. Ongole is on the decline and Punganur is on the verge of extinction. The Ongole breed of cattle is a dual purpose breed and also known by the name "Nellore". It is native of coastal districts of Guntur, Prakasam and Nellore of Andhra Pradesh. As revealed by survey, animals true to type are seen in Tenali, Bellamkonda, Sattenapali, Vinukonda and Cherukupalli x mandals of Guntur district; Parchur, Inkollu, Addanki, Ulavapadu and Tripuranthakem mandals of Prakasam district; and Kavali, Jaldanki, Podalkur, Muthukur, Vidavalue mandals of Nellore district.

Origin of Ongole cattle

Ongole belongs to short horned group of Zebus which were brought by Aryans into India more than 4000 years ago as origianal stock from north west to Indus river basin and further to Indo-Gangetic plains and towards South along Godavari, Krishna Valley and Pennar basins. Specific breed characters emerged due to isolation and selection. People followed the migration routes of cattle and settled alongwith them. Ongole bull resembles Nandi in broad forehead, short and stumpy horns, elliptical eyes and prominent quarters.

The original breed is now confined to the tract between Paleru and Gundle-Kamma rivers in Prakasm district though the major breeding tract extends between Pennar and Godavari rivers. The present breeding tract extends all along the coast from Nellore to Vizianagaram and Chittoor, Kurnool, Cuddapah, Anantpur, Naganda, Mahaboobnagar and Khammam districts.

About 30 years ago, the average ryot used to maintain 4 to 8 cows but it is only 1 or 2 at the present time. Almost every villager had one or two excellent ongole bulls. In a survey on Ongole cattle in 1927-

28, it was found that there were 93000 Ongole cows and 789 breeding bulls. Out of 10.95 million cattle in Andhra Pradesh, 30% are of Ongole type and 5% (farming over 5 lakhs) are Ongoles.

Special features of Ongoles

The Ongole is an efficient dual purpose breed and is the main source of power for agricultural operations. The bullocks are very powerful and suitable for heavy ploughing and cart pulling. As per Singh (1981), studies on blood group profiles and biochemical polymorphism of Ongole and other breeds indicated close genetic relationship among short horned gery cattle breeds viz. Ongole, Hariana and Tharparkar except Kankrej which was different. Coloured breeds like Red Sindhi and Sahiwal formed another group.

The adaptablity of Ongoles to heat stress is due to the development of large dewlap froming into folds, large sheath area, skin having sweat pores and covered by snow-white, shining, short, smooth and silky hair thereby functionally facilitating radiation of heat through larger surface area, perspiration and reflection of sunrays. Ongoles are adapted to grazing during the hot part of the day even at 40°C. Slow rate of consumption of fodder over an extended period of hours also produces a more even rumen fermentation and lower peak of heat increment. They are also considered to have relatively lower basal metabolic rate. Ongole has thus, developed the mechanism of heat tolerance over centuries of rigorous selection by man and nature.

The skin of Ongole is both loose and elastic with developed paniculus carnosus musele facilitating twitching movements of skin to ward off flies and insects. The sebacious glands secrete an odourous oil which acts as a fly repellant. Thus Ongoles have resistance to ectoparasites like ticks and diseases transmitted by them.

Ongoles have the ability of acclimatisation and adaptation to adverse conditions. They withstand hot and humid summers, cold winters,

high and low rainfall, and poor quality and scanty feed and fodder. Ongole cows have good mothering ability and protect their young ones. they are intelligent in watching the surroundings. They recognise the owners even after a gap of several years and show affection towards them. An Ongole animal is considered as the farmer's best friend.

Ongole abroad

Ongole bulls were reportedly first imported by Brazil in 1875 and the United States in 1885 for development of meatly beef breeds. The Ongole cattle have also been imported by other countries like Australia for development of breeds for beef, milk and draught purpose due to their hardiness, resistance to ticks/ diseases, adaptation to hot climate and capacity to thrive on scanty and dry fooder. Of the nine Indian breeds namely Sindhi, Sahiwal, Gir, Kankrej, Ongole, Hallikar, Kangyam, Hissar and Krishna Valley introduced in other countries, Ongoles were in largest numbers and are the most widely distributed (Narendranath, 1993).

Ongoles have been imported by USA for beef, Brazil for beef and milk, Sri Lanka, Fiji and Jamaica for draught, Australia for heat tolerance and beef and Switzerland for disease resistance. Ongoles have also been imported by many other countries like Argentina, Paraguay, Mexico, Columbia, Mauritius, Indonesia, Philippines and Malaysia.

Performance of Ongole

General information

The survey on Ongole cattle under Network Project of NBAGR as collected informantion on 5691 animals belonging to 1209 households. The average number of cattle reared by each farmer is 4.7 in a family of average size 5.0 and literacy percentage of 34.15. The survey also revealed that in Guntur district the Ongole cattle were mostly reared by farmers with an annual income of Rs. 10,000/- whereas in Prakasam and Nellore districts, the average income of farmers was above Rs. 10,000/- per annum. It was also observed that majority of the animals were kept under

open type housing and the animals were let out for grazing for 8 hours per day. Very few animals were supplemented with green fodder and concenterate.

Growth

The recent survey conducted revealed that the average body length, height at withers and chest girth of fully matured adults were 151.5 @5.07, 165.9@32.45 and 171.4 @5.04 cm in males and 119.4@2.06, 159.5 @12.08 and 167.10@ 1.0 cm in females in Guntur district. Naiduf *et al.* (1981) reported the averages as 133, 134 and 166 cm and Rao *et al.*(1981) observed 171, 152 and 204 cm in the above order.

Philips (1953) reported the body weight of Ongole males and females to be 30.6 and 27.5 kg at birth, 219 and 226 kg at one year, 350 and 280 kg at 2 years and 577 and 411 kg at maturity respectively.

Milk production

At one time the Ongole cows were reported to be the main milk producer in Madras city. Tiruvathur was the main trading centre for them. Cows with male calves used to be retained by the farmers and cows with female calves used to be sold in Madras city for milk production. The Herd Book standard for lactation milk yield in Ongole cows for registration is 681 kg as against 454 kg for Kangyam and 908 kg for Hariana. The recent survey by the Bureau showed that the average daily milk yield was 4.38 @ 0.13 kg with significant differences between morning (2.33 @ 0.64 kg) and evening (1.87 @0.072 kg) milkings. The fat and SNF contants were 3.82 @ 0.10 and 8.33 @ 0.12 per cent respectively. Rao *et al*(1981) observed that lactation milk yield of Ongole cows with calves weaned to be 595 kg and those of cows with unweaned calves as 1044 kg.

The milk production potential of Ongole cows is evident from the following records of prize winning cows at cattle shows:

Average daily milk yield of prize winning cows at Cattle shows

Year	Kg/day	Year	Kg/day
1969-70	14.4	1977-78	16.2
1970-71	15.1	1978-79	15.4
1971-72	11.8	1979-80	16.3
1972-73	14.6	1980-81	17.8
1973-74	16.0	1981-82	16.2
1974-75	17.6	1982-83	14.2
1975-76	14.4	1983-84	15.2
1976-77	15.0	1993-94	14.8

As per Khurody (1975), the Ongole cows at Agricultural College Dairy, Coimbatore produced an average lactation yield of 2309 kg. Ravikiran *et al.*(1995) reported the mean lactation yield of 1079 kg in a field study of Ongole cows in the Krishna District. Rao et al (1981) reported the peak yield of 6.0 kg attained by 29th day at Chintal devei farm and 32nd day at Mahanandi farm Ravikiran et al(1995) reported the peak yield of 5.5 kg in Ongole cows under field conditions in Krishna district. As per ICAR (1990), an average yield of 1000 kg of milk for lactation was common in Ongole while good specimen gave upto 1500 kg. Ravikiran *et al.*(1995) reported fat of 4.2% in Ongole cows under field conditions.

Breeding season

Ongole cows are reported to breed throughout the year. Hussaini *et al.*(1981) reported the distribution of calvings as 30% in winter (December-February), 24% in summer (March-May), 20% in early monsoon (June-August) and 16% late monsoon(September-November).

Lactation period

Ravikiran et al(1995) reported the average lactation period of 325

days in Ongole cattle in Krishna district. Earlier reports found the average length of laction ranging from 196 days to 280 days (Rao *et al.* 1981). Venkateshwarlu et al (1973) observed a lactation period of 279 days and Hussaini et al (1981) reported a lactation length of 281 days.

Age at first calving

The survey conducted under Network Project on Animal Genetic Resources revealed the average age at first calving of Ongole cattle as 44.48± 1.64 months. The various reports in the literature revealed the average age at first calving ranging from 36.9 months (Venkateswishu 1972a) to 43.8 months (Ravikiran *et al.,* 1995). As per ICAR (1990) the age at first calving of Ongole cattle ranged from 38 to 45 months. Earlier authors observed age at first calving as 39.9 months (Rao *et al.,* 1969), 41.5 months (Sreeramulu, 1981), and 40.5 months (Jayaramakrishna (1981).

Service Period

Ravikiran *et al.*(1995) observed the mean service period in Ongole cows to be 218 days whereas other reported results on service period by various research workers varied from 163 to 24`1 days (Rao, 1981). The service periods of 210 days (Rao, 1966), 181 days (Rao and Reddy, 1967), 281 days (Hussaini *et al.* 19821), 235 days (Sreeramulu, 1981) and 229 days (Acharya and Bhat, 1984) were also reported by various research workers.

Dry period

The dry period observed by various workers showed the range from 154 days (Rao and Taylor, 1991) and 366 days (Acharya and Bhat, 1984). Other authors reported avarage dry period of 213 days (Sreeramulu, 1981) 248 days (Rao, 1981) and 243 days (Hussaini *et al.,* 1981).

Calving interval

The average intercalving period of Ongole cattle was 324.11±1.49

days as per survey conducted by the Network Project on Animal Genetic REsources. The average calving intervals reported for Ongole cows were 480 days (Joshi and Phillips, 1953), 531 days (Rao, 1966), 525 days (Sreeramulu, 19812) 548 days (Rao, 1981), 535 days (Hussaini et al, 1981) abd 521 dats (Acharya & Bhat, 1984). According to ICAR (1990), the average intercalving period of Ongole cows was 470 days.

Draught

Ongole bullocks are used for heavy ploughing in black cotton soils and heavy transport, bullock cart as a means of transport is being used in India since Vedic times. About 90% of farm holdings are less than two hactares each and the small and marginal farmers depend on bullocks for various agricultural operations and transport. Bullock cart is the old granny of the road. Other vehicles may come and go but the bullock cart remains for ever.

Ongole bulls and bullocks are known to draw heavy loads. According to Reghavacharya (1941), besides in agricultural operations and transport, they were used for game purposes like stone pulling competitions. A pair of bullocks are made to drag stones of different sizes on earthen pitch. Even today, they are a fancy in Prakasam, Guntur and Kurnool districts. According to Rao (1981), a hard granite stone measuring 11 ' x 2' 3' x1' 10' weighting about 3093 kg was being used for stone dragging competitions at Mahanandi in Kurnool district for the past 60 years. The distance dragged in 30 minutes in considered for awarding prizes. Cart pulling in sand for a time of 6 minutes is also followed with cart weels moving as well as skidding by locking the wheels. As per the height of bulls or bullocks in different categories, sand bags are loaded on the carts.

Draught Studies

At the IV Scientists Meet held at Mannuthy on August 29-30, 1995, it was resolved that immediate steps be taken to undertake studies

on the quantification of draught and to get observations on draught and its relationship with associated characters like milk yield without much loss of time. The following is the methodology to study draught (Thomas, 1995).

Carting and ploughing are the two principal forms of work done by draft animals and any programme for genetic improvement of draft ability should aim at improving their capacity for both.

Test of carting ability (A)

1. This will be carried out on a sunny cloudless summer day with maximum ambient temperature of 30-35^0 C. work will start in the morning immediately when the mercury touches 27^{0}C.
2. The work will be carried out on level asphalt roads.
3. Single animals carts of specified design will be employed.
4. The animals will carry a total load (including the cart) opf 200% of its body weight over a distance of 10 km

After allowing a war-up period of 5 minutes, the time taken to cover one km in the initial stage will be noted. Similarly, the time taken to cover the final 1 km will be noted. the measurements will be repeated 6 times and will be averaged. Ability for draft with reference to carting (A) will be calculated as

$$A = \frac{\text{Increase in time for final km}}{\text{Time taken for initial km}} \times 100$$

Test for ploughing ability (B)

1. This will be carried out on a sunny cloudless summer day as in the previous case. Here also work will start in the morining as soon as the air temperature is 27^{0}C.

2. To carry out this test, a 200 m levelled eliptical ploughing tract should be laid with approximatey 50% sand and 50% clay. By adding sand or clay powder to the existing soil, the tract can be laid to conform to a standard soil type. The tract should be already ploughed into a fine powder and allowed to dry.

3. The animal under test (using single animal harness and plough) should be made to plough on the same tract for 2 hours continuously.

4. After allowing 5 minutes warm-up, time taken to complete one lap of the tract will be noted. Similar measurement of time will be taken towards the end of 2 hours. Both in the initial stage and towards. close, the measurement will be repeated 6 times and the average taken.

5. Ability for draught with respect to to ploughing (B) will be estimated as follows :

$$B = \frac{\text{Increase in time to cover one lap in closing stages}}{\text{Time taken to cover one lap in initial states}} \times 100$$

In this case also, the parameter is a measure of overall ability of the animal for speedy and sustained work (Ploughing) under thermal stress.

The overall draft ability (ODA) of an animal may be assessed as follows :

$$ODA = 100 - \frac{A+B}{2}$$

The above mentioned test has the advantage of simplicity and objectivity. Making use of this, a large number of animals can be covered, thus making it advangtageous for genetic research. The parameters are easily and accurately measurable with simple instruments. The test has

the advantage of evaluating them for the tasks for which improvement is requirecd. Attempts have also been made to take the conditions of the test as standard as possible within the limitations of a field test.

The main limitation for the test is that it has not been field tested. Only after testing it widely and the genetic parameters on it worked out and selection based on it carried out, one wil be able to assess its full utility.

Draft studies may be made on 5 young bulls of about 2 years of age per sire. The Project Directorate may coordinate action to standardize cart harness and plough and procure them for all the centres.

Farms maintaining Ongole cows

The Agricultural College Dairy at Coimbatone maintained Ongole cows till 1924-25. Ongole cows were maintained till 1933-34 at Hosur farm which was established in 1919. Ongole cows were also kept at Chintaladevi farm which was started in 1918. The cows were shifted to Lam Farm in 1928. Lam Farm which was established in 1926 had Ongoles initially for some time and again during 1964-75. Mahanandi farm was started with Ongole cows in 1954. An Ongole cattle breeding farm was established at Ramatheertham in 1980. A composite livestock farm with Ongole cows and Nellore sheep was started at Chintaladevi in 1986 by the Animal Husgandry Department by taking back part of the land and buldings of the Livestock Research Station from Agricultural University. Ongole cattle Germ plasm centre was established by the Agricultural University at Lam Farm in 1986. Ongole cattle were also maintained at Visakahpatnam and Kakinada farms earlier. The Handbook of Animal Husbandry of ICAR (1990) listed the farms at Banavasi, Kakinada, Kampasagar, Mahanandi, Ramatheertham, Visakhapatnam and Lam as maintaining Ongole breed of cattle.

BREEDERS' ASSOCIATION

Ongole Cattle Breeders' Association was formed on 27.8 1951 (Murari, 1956). There were 906 breeders owning 7326 Ongoles on the rolls. A total of 25899 animals were surveyed and 1490 were tattooed and registered. The Indian Ongole Cattle Breeders' Association was formed at the International Seminar and Show on Ongole cattle held at Guntur during 1981. Resolutions were passed to farm an Ongole breed development society, to request the Government of Andhra Pradesh for Ongole calf rearing subsidy scheme on the lines of crossbred calf rearing scheme, to breed for medium size Ongole cattle of dual purpose i.e., milk and draught and to get the census of Ongole breed collected.

There is a Central herd registration scheme functioning at Ongole since 1978 with the objectives of survey of breeding tract, location of milk recording units, registration of animals, milk recording incentives and formation of breeders' association. A special first day postal cover in honour of Ongole breed of cattle was released in 1993. A rural development trust started functioning at Hyderabad with 43 purchased Ongole cattle including 11 bulls. Thie centre produced frozen semen and exported it to Latin American and other countries.

Decline of Ongole Breed

It has been reported that the Ongole breed of cattle which won laurels all over the world has of late shown decline in its own homeland . The decline was in numbers, type and milk production. The causes for the decline were many like expansion of irrigation facilities, cultivation of irrigated crops like rice, follower crops like pulses and commercial crops like tobacco, cotton, chillies, sugarcane, land reforms, reduction in land holdings, mechanisation, industrilization and urbanization, expansion of housing, shortage and increased cost of labour, social forestry, horticulture, allotment of grazing areas to weaker sections, cross-breeding in cattle, consumers' preference for buffalo milk, lack of proper marketing for cow

milk, withdrawal of calf rearing subsidies, lack of clear breeding policy and grazing lands being utilized for cultivation.

Rationale for Conservation

In order to preserve the special adaptive traits and the genetic variability including the decline in population, the conservation of such a livestock is important mainly because of economic imparatives for ensuring flexibility in future animal production, the scientific value of genetic material and human heritage interest.

Existing Breeding Policy

The national breeding policy in cattle includes genetic improvement of important indigenous breeds by selective breeding for milk and draught in home tracts. The recognized breeds of cattle are to be purebred and not crossbred. As per the breeding policy formulated in the state in 1979, Ongoles should be purebred in Ongole breeding tract. An expert committee constituted by the Director of Animal Husbandry in 1993 suggested pure breeding of Ongole and Ongole type cows using Ongole in the coastal districts from Nellore to East Godavari and Kurnool. The committee estimated the requirement of progeny tested Ongole bulls as 10 by 2000 AD and afterwards four every year. The Committee suggested that A.I. coverage should be increased to 33% by 2000 AD and that only proven bulls be used in frozen semen bull stations. The Committee recommended that state livelstock farms should act as bull mother farms. There should be provision for distribution of surplus stock to IRDP beneficiaries and needy farmers. Bull calves from high-yielding animals of farmers may also be purchased and reared for progeny testing.

Future Plans

Ongole heifers mature by about two years of age and calve for the first time at about 3 years of age and thereafter regularly once every 14 months. They yield about 4 kg of milk per day on average. One year

old Ongole male sells for Rs. 5,000 - 10,000/-. A cow in general gives an income of about Rs. 3,000/- per year. A family owning about 10 Ongole cows can easily make a good living. The inputs required for feeding, management and health cover are less. They can easily be maintained by weaker sections, small and marginal farmers and landless labourers. Enterpreneurs, unemployed youth and women can take up Ongole cattle rearing as a profitable venture. There is need for banks and other financial institutions to support such programmes. This is all the more necessary as large and medium farmers are moving away from dairying and milk belts are shifting from rich delta areas to backward, drought prone areas. Dairy farming with Ongole cattle is labour intensive and crop residue and by-product based.

There are central cattle breeding farms for Red Sindhi at Chiplima in orissa, Tharparkar at Suratgarh in Rajasthan, Murrah at Avadi near Madras, Surti at Dharmed in Gujarat, Holstein Friesian at Andesh Nagar near Lakhmipur Kheri in Uttar Pradesh and Hessarghatta near Bangalore and jorscy at Similigada in Orissa. There is need to establish a central cattle breeding farm for Ongole cattle in Andhra Pradesh cansidering the importance of the breed.

As per the national breeding policy, recognised breeds of cattle have to be purebred and not crossbred. Ongole is an international breed the purity of which needs to be maintained. The advantages of Ongole cattle include high fat percentage in milk, regularity in reproduction, disease resistance and utility of male calves. There is also need to educate the consumers on the nutritive and health value of cow milk.

The state Dairy federation and the agencies implementing poverty alleviation and and employment programmes like DRDA, ITDA, DPAP, JRY and PMRY are concentrating only on the distribution of buffaloes and crossbred cows. There is need to encourage Ongole cows on par with buffaloes and crossbred cows. There is also need to provide subsidies for Ongole calf rearing.

There is need to stress on milk yield competetions in cattle shows. Male calves of high yielding cows identified in cattle shows may be transferred to the University Germ Plasm Centre, reared for two to three years and returned to the owner after collection and freezing of sufficient doses of frozen semen. Such cows may also be inseminated using frozen semen of superior sires for getting male calves for putting to test in future, there is also need to take advantage of the National Bull Production Programme for producing progeny tested bulls in Ongole breed.

The Herd Registration Scheme at Ongole registers cows yielding more than 681 kg. So far, about 800 cows have beend registered in Prakasam and Guntur districts. It is necessary to publish the summeries on the performance of the cows registered regularly.

There is an Ongole Cattle Breeders' Association in the state. There is need for enrollment of all the farmers owning Ongole cows, registration of the cow and recording of their performance with the assistance of the State Animal Husbandry Department.

Ongole cattle used to be purchased by foreigners like Brazilians at high cost. This has been banned later with the result breeders have lost interest in investing large amounts in Ongole cattle greeding. There is need to permit export of Ongole cattle as it will act as an incentive. There is need to have disease free zones for breeding Ongoles for export purposes.

Germplasm resources are invaluable as they constitute the most important foundation for animal improvement (Rao, 1995). They were passed on to us by our ancestors and we must conserve them for posterity. Once lost, for ever. Breed extinction is an invisible and irreversible process. There is no doubt that in the present socio-economic context, only love and interest in a breed are not enough. The breed must pay for the farmers who maintain it. Ongole breed has transformed itself from a large to medium size and this is to be welcomed in view of the limited freed and fodder resources. A daily milk yield of 4 kg in Ongole cows is profitable

as they return income through production of milk calves. In the world environment summit held at Rio in 1992, it was resolved that indigenous breeds needs to be conserved. In times to come, environmental degradation and energy depletion thereaten the mankind and there is no alternative to turn to breeds like Ongole for sustainable development. Cultivation of dual purpose varieties of cereals and millets that yield more crop residues along with grains and recycling greens as farm yard manure instead of compost or green manure will increase the fodder resources. The performance of the breed under low inputs enables small and marginal farmers to maintain it. These farmers consisting 70% owning only 30% of land but 80% of livestock and form the backbone of ongole breed conservation, in the breeding tract. But for their traditional methods, the breed would have become extinct. However, the performance of the breed needs to be constantly improved which the best is insurance for its conservation (insitu as well as ex-situ) in the home tract. There is thus a bright future for Ongole breed and the time is not far off when the majestic Ongole will get back its past glory.

Associate Herd Testing Programme

With a view to stem the decline in Ongole breed of cattle, the Andhra Pradesh Agricultural University has launched a network project on genetic improvement through associate herd testing in Ongole breed with the cooperation of the State Animal Husbandry Department and with financial support of the Indian Council of Agricultural Research. The Project started on 1.7.1996 and is coordinated by the Project Director on Cattle, Meerut (Kaushik, 1989).

Objectives:

1. To study the genetic and phenotypic variances in milk and covariances among milk and draught and associated economic characteristics such as growth, reporduction and survival with a view to develop suitable selection criteria for improving draught/draught and milk.

2. To undertake testing and selection of bulls for bringing about genetic improvement in the population involved.

3. To provide superior germplasm for utilisation in development programmes for improving draught/draught and milk production

Technical Programme

An Ongole cattle germ plasm unit was started at Lam Farm with a bull rearing, semen freezing and data processing centre. The Ongole cattle breeding farms of Animal Husbandry Department at Ramatheertham in Prakasam district and Chintaladevi in Nellore district and University farm at Mahanadi in Kurnool district became associate herds. A University farm associate herd and a farmers field associate herd were added at Lam Farm in 1994 (Annual Progress Report, 1995).

Herd Strength

The herd strength proposed to be maintained at germ plasm unit is as follows :

S.No.	Category	No.
1.	Breeding females	75
	a) Lactating	35
	b) Advanced prefgency	15
	c) Dry	25
2.	Breeding bulls	15
3.	Followers (All males & females)	110
	a) Birth to 6 months age	30
	b) Six months to 1 yr age	20
	c) One to 3 yrs of age	25
	d) Above 3 yrs	35
	Total	200

The herd strength was decided keeping in vies the following criteria:

a) Age at first calving : 45 months

b) Calving interval : 18 months

c) Breeding efficiency : 60%

d) Mortality upto age at first calving : 10%

e) Losses upto compilation of Ist lactation record : 20%

The test herd strength should be minimum of 750 breedable females to enable the testing of 10 bulls/set in one and half year's period.

For elite herd, the minimum standard for lactation yield in 305 days suggested for Ongoles is 800 kg.

Sequential Selection of Bulls

Out of the elite progeny produced, 30 bulls should be reared annually, at the germ plasm centre for future breeding purposes. Sequential selection is followed to finally select bulls for use in the progeny test. Phenotype with conformation and milk yield of the dam shall be used as criteria for selection of bulls. In the beginning, the bulls shall be procured from organised farms so as to have required information for selection.

Parameters to be Recorded

i) Growth : Body weight at birth and 1, 3, 6, 12, 18 and 24 months and at age at first calving. Body measurements viz. height at withers, heart girth and body length will be recorded at birht and 1, 3, 6, 12,18 months of age.

ii) Reproduction : Females : Age at first service, age at first calving, number of services per conception, service period, gestation period and calving interval.

Males : Age at first ejaculation, semen quality, post thaw semen quality, bullwise conception rate, development of genitalia and libido

iii) Production : Females : Lactation milk yield, 300 days or less milk yield, fat percentage, lactation length and dry period

Males : Age at training for draught, DAP generated, faligue index, speed per unit of work, changes in physiological parameters in rest and work cycle.

iv) Health Status :

a) Mortality : Percentage mortality from birth to 3 months, 3 to 6 months, 6 to 12 months and above 12 months of age sexwise.

b) Measures for health control

c) Incidence of diseases.

SUGGESTION FOR REVIVAL AND REINVIGORATION OF CATTLE TO PAST GLORY

Ongole being the famous dual purpose breed in India and is also used for meat purpose abroad. Of late Ongole breed of cattle has shown signs of decline in numbers as well as in type and milk production. From the foregoing information on its performance status and potential, there is serious need for its revival and reinvigoration. Following suggerstions may help in restoring and maintaing the important germplasm of Ongole cattle.

- There is need for banks and other financial institutions to support the programmes dealing with Ongole cattle such as weaker sections, small and marginal farmers, landless labours, enterpreneurs, unemployed youth and women. The financial help for feeding, management and health cover can prove as a prifitable venture for the Ongole breeders.
- There is need to educate the consumers on the nutritive and health value of the cow milk vis-a-vis buffaloes since Ongole cow is also reputed for high milk fat, regularity in reproduction, disease resistance and utility of male calves.

- There is need to encourage Ongole cows at par with buffaloes and crossbred cows by the agencies implementing the poverty alleviation and employment programmes like DRDP, DPAD etc.
- There is also need to provide subsidies for Ongole calf rearing and male calves of high yielding cows may be reared at the germplasm centre where facilities exist for proper rearing.
- There is also need to take advantage of National Bull Production Programmes for producing progeny tested bulls of Ongole cattle.
- It is also necessary to publish the summaries on the performance of cows registered with Herd Registration Scheme.
- There is need for enrolment of all the farmers owning Ongole cows, registration and recording of performance by the Ongole Cattle Breeders' Association.
- There is need to permit export of Ongole cattle to act as an incentive as it used to be imported by other countries beofre imposing ban on its export.
- Breed extinction is an invisible and irrversible process. Transformation of Ongole from large to medium size and breed must be frofitable.
- But for traditional methods the breed would have become as extinct. The performance of the breed needs to be constantly improved because it is the best insurance for its conservation in the home tract.
- There is thus a bright future for the Ongole breed and the time will not be far off when it regains its glory.

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Crossbreeding - Boon or Bane

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Cross breeding is the mating of two individuals, both being purebreds but belonging to two different breeds. Generally criss-crossing, rotational crossing and mating of a purebred individual of one breed to a high grade female of another is also included under this type of mating.

Although crossbreeding tends to lower the breeding value of the individuals by making them more heterozygous and applying selection among crossbreds less effective, it promotes individual merit on account of general dominance of genes which favour growth, vigour, fertiligy and production.

Crossbreeding is most profitable in cases where fertility is highest and the percentage of replacements necessary to keep up the female herd is lowest. For this reason cross-breding is a breeding system for commercial production and has found wider application in species like pigs and poultry as compared to cattle. Recetly, however, for production of suitable dairy cattle for the tropics, this mating system has gained momentum.

Genetic basis of crossbreeding

The genetic basis of the consequences of crossbreeding stem from the fact that at least a small proportion of the genes in purebreds including some undesirable too get fixed in the homozygous form in some but not in all the breeds. Crossing of breeds would, therefore, cover undesirable recessives and increase heterozygosity. The increased performance will be most marked in those traits which are most depressed by inbreeding. Highest increase in performance would be expected on crossing of most diversified breeds.

Crossbreeding may not always result in dominants in all traits. Very often the crossbreds are more desirable by virtue of possessing a near optimum combination of the desired characters than either of the parental breeds.

Crossbreeding with European breeds

For certain apprehensions about its consequences, the cross-breeding was earlier taken up in India only on a very limited scale in the hilly and heavy rainfall areas where no purebreds were found,Jersey being the only breed used amongst the Europeans. The sole objective in each case was to find the potentialities of the crossbreds and to determine the maximum percentage of exotic inheritance that could be introduced in local non-descripts.

There were at least two possible ideals that necessitated the adoption of cross-breeding between the Indian and the European cattle :

i) Evolution of an animal intermediate in all characters between the animals of European and Indian breeds;

ii) Synthesis of an animal constituting a mosaic of all the characters (each at a desirable level) of both the European and the Indian breeds.

The latter ideal being the most difficult one to achieve.

The very single basis for attaining more rapid progress through crossbreeding even in subsequent generations under selection than would be possible with the purebred indigenous populations, is that by crossbreeding the gene frequencies are brought closer to 0.5 to 0 or to 1.

Crossbreeding in retrospect :

According to Henderson (1927) crossing of Indian cattle with temperate breeds began as early as 1875 when the Taylor breed of cattle was said to have originated in the Bihar State as a result of using either Kerry or Shorthorn bulls on native cows. Some of the first reports on the performance of various crossbreds were those by Foreman (1927), Kartha

(1934) and McGukin (1937). Other high profile and high milk yielding crossbred cows synthesized in India include Sunandini, Karan Fries, Karan Swiss, Jersind, Brownsind and Frieswal, etc. The exotic inheritance in these newly synthesized breeds/strains varies between 50-75 percent.

Sunandini, a cross of Brown Swiss bulls with local non-descript cows of Kerala, was developed by KLDB in 1963 at its Mattupatty centre. The half-bred Sunandini had 1914$\pm$27.8 kg first lactation yield in 274.3$\pm$1.97 lactation days.

Karan Fries has been synthesized at NDRI, Karnal by crossing Holstein Friesian males with Tharparkar cows and Karan Swiss by crossing Brown Swiss males with Sahiwal and Red Sindhi Cows. The first lactation 305 days' yield of these cows was around 2, 895 kg.

The most extensive crossbreeding in India has been done at the Military dairy farms since the turn of the century. At these farms a number of temperate breeds such as Holstein Friesian, Ayrshire and Jersey were crossed with Sahiwal, the Indian zebu. Amble and Jain (1966, 1967) and Naidu and Desai (1965) in recent past have reported on the milk production of Holstein Friesian - Sahiwal crossbreds in enormous number at the Military dairy farms. That crossing of Indian Dairy Cattle Breeds with temperate dairy breeds is esential for in increasing milk production is ultimately fully realised and adopted by dairy breeders, government and private cattle developmental agencies in India. Much of the experience gained through various crossbreeding experiments conducted in India resulted due to production of animals with (between 50 and 75 per cent) exotic blood to perform better in terms of milk, growth rate and reproduction under good conditions of management and feeding.

With a veiw to assist the GOI in implementation of its current cattle breeding policies and take advantage of achievements made in All India Coordinated Research Project on cattle and earlier crossbreeding experiments both at organised farms as well as under field conditions in

Kerala, Maharashtra, Punjab, Karnataka, Haryana and heavy rainfall areas, a Project Directorate on Cattle was established on 3rd November 1987 by the India Council of Agricultural Research (I.C.A.R.) New Delhi, India in the VII Five year Plan by upgrading the status of the erstwhile All India Coordinated Reserch Project on cattle with the mandate *"To evolve a new breed of cattle "Frieswal" (Friesian-Sahiwal) and other crossbred genotypes for high milk yield under orgzanized and farmers' herds and to undertake programmes on genetic improvement of Indigenous breeds of cattle for milk and draught through progeny testing".*

(i) The new breed "Frieswal" expectedly should yield 4,000 kg. milk in a mature lactation of 300 days, containing 4.0 per cent butter fat test. This is being done through a collaborative project by stabilising Holstein inheritance between 62.5 to 68.75 per cent (5/8, 11/16, 22/32, 44/64 and 88/128) in the large crossbred population available at 45 Military Farms located in different agro-ecological regions of the country.

(ii) Crossbreeding On Non-descript

An enormous number of cattle (>80 per cent) in the country are non-descript being at the minimum productivity level, but endowed with qualities of heat tolerance, disease resistance and ability to thrive under extreme nutritional and harsh conditions. Undoubtedly, their number should go down so as to spare feed/fodder and other inputs to their counter parts, but a good number of them offers a wonderful opportunity for the country to protect livelihood of their owners and to enormously contribute to milk production as a hybrid stock by crossing them with highly productive exotic breeds of cattle viz. Jersey and Holstein Friesian. It is, however, essential to limit the exotic inheritance in the hybrids to half in suuccessive generations by inter se mating among the half breds, using selected crossbreds so as to perpetuate the desired traits of both the parents.

Crossbreeding - a boon:

Livestock developmental strategies in the form of Key Village Scheme, Intensive Cattle Development Projects, Crossbreeding and Operation Flood, etc. adopted by the country till early 1970s brought perceptible improvement in milk production, especially in the last 8 successive five year plans.

By virtue of its highest milk production to the extent of 80 mmt, India ranks first in the world after USA with 71 mmt milk. This is significantly being contributed (45 per cent) by its largest and most diversified cattle wealth (209 million) constituting 15.6 per cent of the world cattle population (1,333.62 million). This enormous milk production has been able to sustain the current availability of 200 gm milk per capita per day at the current annual growth rate of 4.5 per cent per annum after the base year 1982. This growth rate needs to be enhanced to 5 per cent so as to meet out the requirement of 150 mmt, by 2020, of the burgeoning population of India.

Crossbreeding Implications (BANE)

Unfortunately, crossbreeding programmes in the country have not run in a systematic and scientific manner, rather at some places, haphazardly and arbitrarily. As per the laid down policy, crossbreeding was to be undertaken involving non-descript cows with exotic males, but unfortunately, this has not happened and has partially resulted into loss of some well-defined indigenous breeds.

As a result of large scale crossbreeding of Indigenous cattle with exotics, the proportion of adult female increased to 63 per cent in desi and 61 per cent in crossbreds, i.e. a gradual but steady decline in the proportion of desi cows and phenomenal growth in the number of crossbred cows. Total crossbred numbers grew from 8.80m in 1982 to 11.59 m in 1987 (31.70 per cent) and to 15.22 m (31.32 per cent) in 1992.

There is, however, considerable variation in the degree of these

changes between regions as well as States. In the Northern region the desi cow population has declined substantially and the region now accounts for 40 per cent of all crossbred cattle in the country.

The South has the second largest population of crossbred cattle - 34 per cent followed by the West-some 15 per cent of the crossbreds (1992-95 census).

Eastern region presents the picture of the traditional rain fed agriculture still largely dependent on DAP and therfore, with the highest proportion of desi cows and lowest per cent of crossbreds (11 per cent).

Among the States, UP, Tamil Nadu, Maharashtra, Kerala and Punjab have the largest number of crossbred cattle and together they accounted for nearly 65 per cent (9.50m) of all cross-bred cattle (15.22m) in the country in 1992.

Semen from only 45.09 per cent Frieswal bulls was found freezable satisfactorily, indicating thereby a high rejection rate in crossbred bulls on account of freezability at this Directorate. Preliminary studies on effects of vaccination, revealed that the FMD virus severely affected the semen quality of Frieswal bulls, resulting into drastic reduction in the motility of spermatozoa making the ejaculate unfit for preservation for 2-3 months. That is why retaining of surplus/culled bulls for a longer time in the herd is a gross financial loss.

Increased number of cases of reduction in reproductive efficiency in females come across.

There is always depression in disease resistance towards endemic/ epidemic diseases and loss of viability at least in higher crosses (animals with more than 75% exotic inheritance). Extra precaution towards prophylactic measures increases the cost of raising crossbreds.

Application Of Crossbreeding In Future

Although milk production in improved crosses/strains are economic

and optimum under high level of feeding and managemental regime, the increase in crossbred population in future will necessitate finding answers to the differential response of these type of cattle under varied agro-climatic and socio-economic conditions. There is need to evaluate the various new developing crossbred populations for the effects of physical environment, levels of management and the presence of genetic variability for adaptation, disease resistance under different indices of hot humid, hot dry climates prevailing in the different parts of the country. (ii) It is presumed that currently there are more than 7 million breedable crossbred cattle. Taking a calving interval of 16 months and number of services/ conception as 4, about 20 million doses of frozen semen are required per year for their breeding, assuming 100 per cent A.I. Considering collection of 10,000 doses of semen/year from a cattle bull, about 2000 crossbred bulls are required for 100 per cent A.I. Therefore, the production and evaluation of superior bulls is of utmost importance to improve the genotype/genetic potential of our animals for higher milk production, a stupendous work to be done indeed.

iii) To-day nearly half a million crossbred cows(less than 10per cent of milking cows) are contributing some 11 mmt of milk (over 30 per cent) of the total 35 mmt of total cow milk produced in the country. If the pre-requisites (inputs) discussed are arranged, the crossbred cow population will progressively grow to some 25m and contribute an incremental 70 mmt of cow milk by 2020.

The current requirement is to increase the number of breedable cows/heifers under A.I. cover for crossbreeding with exotics from 20 to atleast 30 per cent over next 5 years.

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Ongole (Nellore) - A Global Breed of Cattle

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Ongole is a world-famous breed of cattle noted for milk and draught in India and meat, milk and draught in about 30 countries in the five continents of the world, especially Brazil and United States. Small numbers of Zebu cattle were taken to Brazil during the 16th to 18th centuries and were crossed with Brazilian cattle of Iberian origin. From 1850 to 1890, several small additional importations took place. During this latter period, small importations of Zebu cattle into the US also took place. In both Brazil and US, animals of the early importations and their crossbred descendants aroused the interest of cattlemen. This interest led to later importations on a large scale. Many of the early Indian cattle that were taken to Brazil were of Mysore type. In the years shortly after 1900, many Nellore cattle were imported. Later large number of Guzerat (Kankrej) cattle were imported and from 1918 to 1921, large number of Gir cattle were imported. In the early 1900's few Brazilian cattle men were familiar with the characteristics of the various Zebu breeds of India and therefore there was little effort to maintain pure herds of these breeds. Size of ears and presence of excessive skin on the dewlap and underline and a large hump were widely use to indicate purity of Zebu blood. Brazilians were then known in India as 'purchasers of cattle ears'. This preference for large ears led to the popularity of Guzerat and Gir at the expense of Nellore at some stage. Originally stocked with Portuguese cattle which also developed into a Criollo type, today most Brazilian cattle herds are zebu or zebu-related types. The only real exceptions are the dairy herds near the population centres which are generally European breeds. Brazil maintained purity of breeds from the original Indian stock of Nellore, Gir and Guzerat. A fourth distinctive breed developed in Brazil is the Indu-

Brazil which was created by combining these three breeds. An important use of Zebu was as a work animal in the beginning of its history in Brazil. During the world wars (1914-1918 and 1939-1945), Zebu consolidated its importance as beef cattle. A beginning of selection of zebuines adding some production of milk and meat started in as far back as 1880 in Rio de Janeiro.

Taking the number registered and number exhibited in shows in various years as indices, there were major shifts in the popularity of Zebu breeds in Brazil since 1940. Until 1940, Indu-Brazil was more numerous. During 1940's both Gir and Nellore increased in popularity in comparison to Indu-Brazil, with the number of Gir increasing much more than that of Nellore. The Gir reached its maximum popularity by about 1955, but Nellore continued to increase in popularity in comparison to the other Brazilian breeds. The tight sheath of Nellore bulls and the small teats of Nellore cows were largely responsible for this increased popularity of Nellore as a beef animal. In 1970, Colonial grass became popular for Nellore cattle. The time up to 1910 was considered as the time of Guzerat and Angola grass and the time up to 1955 was the time of Indu-Brazil and Gir and Jaragua and Pangola grasses. The later time is considered as that of Nellore and the grasses Bracharia and Colonial.

It was in Brazil that some authors started using the word Nellore (Nelore in Portuguese) as a synonym for Ongole as the place Ongole then formed a part of Nellore district of Madras Presidency in India. Brazil is the largest breeder of Nellore and from there the breed was exported to Argentina, Paraguay, Venezuela, Central America Mexico, US and other countries. In all those places, the contribution of Nellore was remarkable as purebred or in crosses with other local breeds. In 1962, the last and most recent purchase of live animals from India authorized by the Brazilian Government took place. The principal breedig lines like Karavadi, Godavari, Taj Mahal, Golias, Rastan, Akasamu and Padhu played decisive role in the

great expansion of Brazilian herd in the 30 years from 56 millions in 1965 to 160 millions in 1995, 100 millions of which were Nellores. Nellore is certainly considered as the best alternative for economic beef production in the tropics. The number of purebred registered Nellores in Brazil is about 5 millions. Sales of Nellore semen represent 65% of AI market of all beef breeds in Brazil. Efforts are also being made to multiply the genetic potential of Nellore dams through the use of embryo transfer. With more than 50000 embryos transferred per year, a great part of which are Nellores, Brazil is the third country in this technology after US and France. Work is also under way with forzen embryos, embryo splitting and in vitro fertilization in Nellore.

Over 80% of Zebu cattle that were imported into US came either directly or indirectly from Brazil. Gir, Nellore, Indu-Brazil and Guzerat cattle are being imported from Brazil into US through Mexico. Currently, the American Red Brahman and the American Gray Brahman are distinctly different types of cattle. The Gray Brahman is primarily a mixture of Guzerat and Nellore with some influence from other Zebu breeds. The Red Brahman is primarily a mixture of Gir and Indu-Brazil with some Guzerat influence.

In the US, purebred Zebu cattle are found in greatest numbers in Texas, Florida and Louisiana. However, Zebu cattle expanded into other states in the South and Southwest. Early Indian cattle were brought by animal shows, many of which that found their way to American breeders being Nellores. The American Brahman Breeders' Association formed in 1924 currently maintains a single herd book though earlier it had six divisions for american Red/Gray Brahman, american Gir, American Indu-Brazil, American Nellore, american Guzerat and American Tabapuan. Now the Pan American Zebu Association has separate herd books for Zebu breeds. Zebu cattle are used effectively in crossing for commercial beef production. Ongole is one of the most numerous breeds of cattle in the world and is a mute ambassador to several countries.

The history of development of Ongole (Nellore) in Brazil :

The phase of 1584-1850

1813 : A couple of bovines came off the coast of Malabar or Coromandel to Bahia

1822 : A ship out of its route left in Salvador a couple of Nellore cattle which were to be a present to Queen Victoria but were sold at the end by the English representative's order in Bahia.

1827 : Entrance of zebuines i.e., Nellore into Bahia.

1836 : A bull from India arrived in Rio and was sold in public auction.

The phase of 1850-1890

Cattle were brought from Malabar coast or Coromandel to Rio de Janeiro, then capital of Brazil.

1868 : Another group of Indian cattle arrived in Brazil and a couple of Nellores disembarked inSalvador.

1875 : The Baron of Parana Geraldino Rodrigues da Cunha visited London zoo in 1873 and got a Zebu couple from India which were given as present of a Rajah to Queen Victoria when she had been proclaimed Indian Empress. They were bought and brought to Brazil. Nellore breed reached Uberaba, later considered to be the Zebu capital in Brazil.

1878 : In this trip to Europe, Manoel ubelhart Lemgruber, a breeder from Rio de Janeiro visited Hamburg zoo and was attracted by Nellore cattle and brought them to Brazil.

1880 : By this year, there were about 1000 zebuines in Uberaba. Lemgruber received another lot of Nellores directly from India including the bull Nero. The Animal Show(Circus) firm Haggenbeck in Germany close to Hamburg was responsible for introduction of zebus in Brazil especially Nellore.

1883 : Third lot of Nellores imported by Lemgruber including the bull Castor arrived in Brazil.

1888 : The end of slavery coincided with the arrival of Zebu in Brazil. The Zebu arrived in Triangulo Mineiro before 1890.

The Phase of 1980-1925

From 1890 to 1921, over 5000 zebu cattle were brought into Brazil from India. Over two-thirds of the animals entered Brazil during the later of the 31-year period i.e., during and after world war I, because of higher meat prices which increased the buying power of Brazilian cattlemen. More than 200 cattle were introduced into Brazil by the Haggenbeck company. The Baron of Parana was considred as the Brazilian Bakewell. The bulls imported included the Nellores, Tango and Paxa.

1890 : Nellore cattle were sent from Uberaba to other parts of Brazil

1891 : Militar, a Nellore bull was imported

1906 : the Agricultural Minister of Bahia visited Madras and purchased Nellores which included the Nellore bulls Piron, pan, Shanghai, Pretoria, Vitoria and Kalifa.

1921 : Because of a rinderpest outbreak in Brazil in 1921, the Brazilian Government prohibited the importation of Indian cattle from 1921 until 1930.

1923-1924 : A breed register was established in 1923 primarily for registering cattle that were sent to Mexico in 1924 and many of these cattle entered US from Mexico. Cattle from which the American Gray Brahman descended left Brazil during 1920's.

The phase of 1925-1945:

1928 : Brazil with 34.27 million cattle was the fifth largest in the world after India with 119 millions, United States with 66 millions, Russia with 38.7 millions and Argentina with 37.7 millions.

1930 : Brazil imported 192 animals from India including Gir, Guzerat and Nellore and some Sindhi. Pedro Nunes received Raja, Maraja and Sheik of Nellore. Lemgruber and Pedro Nunes in Rio de Janeiro, Octavio Machado in Bahia, Vicente Rodrigues da Cunha and Rodolfo Machado Borges became famous names for Nelloe breeding. Modern herds of Gir, Guzerat and Nellore cattle in Brazil came largely from cattle imported into Brazil in 1930 and afterwards. After 1930, the Brazilian Government again prohibited import of cattle from India. Since 1930's when Brazilian breeders took interest in maintaining pure breeds of Zebu cattle in Brazil, selection for features or breed characteristics received attention. Classes for the various Zebu breeds were established in Brazilian livestock shows during the 1930's.

1934 : Uberaba became the capital of Zebu when the SRTM (Rural Society of Triangulo Mineiro) was founded for the development of Zebu breeds.

1936 : Lemgruber cattle were the typical cattle of 1880, 1890 and up to 1900 when the imports by Brazilians began. Rio de Janeiro breeders bought the cattle from German companies and they chose in India the cattle according to very few books of the time by Wallace, Isa Tweed and John Short - books of 1885 and 1887.

1937 : Colonial grass was introduced in Brazil.

1938 : Nellore herd book was opened and the breed standards were defined in Uberaba. Nellores formed 11% of the Geneological Register (Herd Book).

1939 : Pedro Nunes owned the largest and best Nellore herd in Brazil. Lemgruber and the Baron of Parana were the pioneers of Nellore breding in Brazil, Pedro Nunes and Octavio Machado the consolidators and Vicente Rodrigues da Cunha followed up.

1941 : Torres Homem Rodrigues da Cunha, son of Vicente also followed up Nellore cattle breeding.

The phase of 1945-1965 :

1950 : Nellore reached 22.2% of Geneological Register.

1955 : It was recognized that Nellore calf is the only Zebu offspring that does not need human help since the first moments.

1959-1961 : In India, the initial lot of 118 head gathered at Madhavaram near Madras in 1959 were shipped to Brazil in 1960. While 16 died, 102 reached Parana. Of them, 70 were Gir, 20 Nellore and 12 Guzerat. Arjun, Tenali and padrao bulls were among Nellores. Torres Homem and Jose Silva (Dico) purchased Karavadi bull, the all India Livestock show Champion at Delhi, for Rs. 25000 from Polavarapu Hanumaiah of Karavadi village in Ongole district of Andhra Pradesh. It was born in 1951 and sold in 1961. Bhima, rastan and Brahmine were theother Nellore bulls in the purchase.

1962-1963 : another group of Rubens Carvalho and Nene Costa bought 12 Nellore bulls and 30 cows at Chintaladevi and Kakinada farms. Among the 168 animals imported in 1963, there were 12 Nellore bulls and 25 cows and 1 Punganur bull and 3 females.

Nellore bulls akasamu and Padhu came into use. Celso Garcia Cid came back to India in 1962 when Dico and others were there. He bought 60 animals.

1964 : Imports into Brazil were prohibited.

The phase of 1965-2000.

1965 : The first laboratory semen collection exclusively for zebuines was started in Cachoeira Farm of Celso Garcia Cid in Parana.

1967 : The SRTM became ABCZ (Association of Brazilian Zebu Cattle breeders). Karavadi bred by Torres Homem, Taj Mahal by Nene

Costa, Godavari by Rubens Carvalho and Golias were having their impact.

1968 : Nellore surpassed Gir in Uberaba reaching 51.7% of animals recorded in the Geneological Register.

1968-72 : Semen collection from the sire Karavadi was inaugurated. The bull was already 11 years old when it arrived from India. Karavadi was embalmed and exhibited even today just as Krishna of Gir.

1969 : Brazil exported cattle to Venezuela, Bolivia and Colombia.

1970 : Cattle were exported to Venezuela. The value of Nellore increased not just for beauty but functionality and economy. Total zebus imported by this year were 6262.

1971 : Brazil exported 904 Nellore cattle to angola. Peru imported 700 cattle. October 14 is observed as the National Day of Cattle Breeding.

1978 : A Nellore bull reached the weight of 1212 kg at 72 months. It was the first zebuine bull to surpass 1200 kg mark.

1979 : The national programme of export of bovines and semen of Indian origin was launched. A quarantine station was established in the island of Cozumel in Mexico. Colombia liberalized the import of Brazilian bovine semen.

1980 : the first official export to US of a total of 60 calves including 31 Gir and 29 Indu-Brazil to Fleming Key quarantine station in Florida took place. Nellore recorded 80.43% in the Geneological register with Gir 8.28%, Guzerat 3.83% and Indu-Brazil 3.71%.

1978-83 : The great 5-year drought wiped out all cattle except Zebus among whom Nellore was found to be the most rustic. This was a 100-year malediction in North-Eastern Brazil.

1984 : The Museum of Zebu was inaugurated in Uberaba. The ABCZ organized the first International Seminar on Zebu with the presence of delegates from Mexico, Argentina, Uruguay, United States, Peru, Colombia, Venezuela, Australia and South Africa. Fresh land settlement through Nellore cattle breeding took place. The ABCZ started registering Nellore cattle of Red and Yellow coat as well as speckled Black. Nellore in Brazil and perhaps in the world is the breed that registered the largest number of varieties.

1985 : ABCZ aimed to facilitate import of Zebuines from India. Nellore dominated the Brazilian cattle industry. It was the largest herd reaching the fantastic figure of 2.8 million registered heads.

1986 : First official export of semen to US of six Gir, one Nellore (Pakar) and one Guzerat took place.

1988 : With the good offices of M. Narendranath, it was decided that EMBRAPA in Brazil would participate in the Ongole breed improvement project at Lam together with ICAR. Cattle judge Pylades visited India. He observed that no Zebuine breed was as glorious as Nellore in Brazil. He felt that some good animals could be gathered here.

1989 : Gir, Hornless Gir, Guzerat, Indu-Brazil, Nellore, Hornless Nellore and Tabapuan were the main Zebu breeds. The DEP's (Expected Progeny Diffiences) were calculated for body weights at 205, 365 and 550 days.

1992 : A Nellore bull conquered the world record reaching the weight of 1308 kg at 72 months. It was the first Brazilian Zebu to surpass 1300 kg mark. During the year, the publishers of Agropecuaria Tropical organized a study tour to India to the areas of Ongole, Gir and Guzerat. The visitors to the area of Ongole noticed that the Ongole cattle would last long in India.

1993 : Brazil recognized Gir for milk, Nellore for meat and Guzerat for meat and milk.

1994 : The book 'Nellore - the Brazilian Victory' was published. American Brahman was officially approved for entry into Brazil after many years of refusal by ABCZ.

1996 : The President of ABCZ visited India along with the President of Brazil aiming to affirm exchange of genetic material. A document was prepared and the final agreement was to be signed.

1997 : A Nellore calf broke the world record reaching 645 kg at 12 months. A Nellore cow broke the world reocrd for the breed reaching 858 kg at 39 months. A Nellore bull conquered the world record reaching 1325 kg at 52 months. During this year, the ministry approved a new rule for importing genetic material from india with validity until December, 2000. It will open a special imported genetic material booK.

2000 : A Brazilian delegation visited India and expressed interest in importing Ongole cattle embryos, in view of the restrictions on import of cattle and frozen semen.

The history of development of Ongole (Nellore) in the United States :

1800's: During the later half of 1800's, a small number of Zebu cattle entered US. They aroused the interest of cattlemen and led to further importations.

1835 : The earliest date assigned to North American Indian cattle importations appears to be 1835 when two Indian bulls and four cows came to South Carolina from Egypt.

1849 : Dr. J.B. Davis of Fairfield country, south Carolina made an import of Zebu cattle. Davis imported an Indian bull and a cow from the Royal Gardens in London. They were of Mysore type. Davis

served as the agricultural Adviser to the sultan of Turkey and he received them as gift from the Sultan.

1854 : Richard Barrow of Louisiana received two Bos indicus bulls from British Government in appreciation for instructing a Crown representative in the art of sugarcane and cotton cultivation. These bulls were shipped directly from India to be used as drought animals but were bred so extensively that their descendants came to be known as Barrow Grade cattle.

1878 : Four Bos indicus bulls and one cow were unloaded from a Dutch ship in Texas. Captain John N. Keeran and the legendary Shanghai Pierce bought the five animals.

1884 : The Federal law made it impossible to bring cattle from India.

1885 : Two more Indian bulls were imported by J.M. Frost and Albert Montgomery of Houston, Texas. By mating these two bulls to the Barrow Grade cattle, the first attempt to concentrate the blood of Bos indicus cattle in the US was undertaken. One weighed about 450 kg and another about 820 kg. Both were Nellores. The Influence of this importation was said to be permanent and the development and widespread distribution of Brahman cattle for breeding purposes may be said to have begun with this importation.

1895 : Peter Hahn of Columbus, Texas purchased a Zebu bull from an Animal Show while it was playing in Columbus.

1904 : A few animals were imported by circus organizations from time to time, some of the more desirable ones being purchased by farmers and ranchers. One of the more famous of such purchases was a cow and a light red bull Price acquired by A.M. McFaddin of Victoria, Texas from the Haggenbeck animal show. While the cow died before calving, the bull was considered the father of Red Brahmans in the US.

Another was the sale of about 12 head of Indian cattle by Haggenbeck, these finally being acquired by Dr. Williams States Jacobs of Houston.

1906 : Borden - O'Connor importation. The early major importation of Zebu cattle in the US directly from India was made in 1906 by Abel P. Borden, the nephew of Pierce with financial assistance from J.M.O'Connor of Victoria, Texas. From Pierce's acquisition of 1878 and purchases from descendants of other importations, Pierce ranch was already in possession of some Zebu type cattle when in 1905, US Secretary of Agriculture James Wilson visited the ranch. He observed the cattle and helped Borden obtain a commission to go to India to purchase cattle. Borden brought 51 head and held in quarantine in Simonson's island in New York harbour. While in quarantine, 16 of the animals were claimed to have surra disease and they were killed and burnt. With the intervention of President Theodore Roosevelt, Borden was able to get the remaining 35 head released from quarantine. While 16 bulls and one cow were taken by the Pierce Estate, 16 bulls and two heifers were taken by O'Connor. The Pierce estate later acquired all the O'Connor females of pure Indian descent. The three females and six of the bulls of 1906 importation were of Nellore breed while others included 22 Krishna Valley, nine Guzerat and at least one Gir bull. These Nellores played an important role in the formation of American Brahman.

1910 : Carl Haggenbeck imported a Nellore cow and a bull for his Animal Show (Circus) and a dozen head of descendant were born over the years.

1910-1920 : Many cattle of the south-western part of Texas and the coastal country along the Gulf of Mexico showed considerable

evidence of Bos indicus breeding. Many of the bulls that were used were the result of crosses with other breeds while some attempted to keep the stocks pure.

1920's : The largest importation of Zebu cattle into the US was from Brazil through Mexico in the 1920's.

1923 : Brazil exported 82 head of Nellore and Guzerat bulls to Mexico.

1924 : Ruffier - Martin Importation of 90 Bos indicus bulls from Brazil via Mexico and creation of the American Brahman Breeders' Association at Houston, Texas occurred during this year. Dr. Ferdinand Ruffier of Brazil was the manager of Zebu Herd Book Association of Brazil organized specifically for registering Bos indicus cattle to be sent to Mexico. Martin owned a ranch in Texas and acquired the cattle from Ruffier in Mexico. Martin imported three lots of 30 bulls each. These included Guzerat, gir and Nellore breeds.

1925 : Morias - Jacobs importation. Brazilian cattleman Morias shipped 120 Zebu bulls and 18 heifers into Mexico from Brazil. In November, 1924, Dr. Jacobs bought the heifers and 22 of the bulls from Morias. Later Jacobs helped Morias bring the other bulls into Texas. All the 18 heifers were full blood Guzerat. Most of the bulls of the 1924 and 1925 importations were of Guzerat breed. Nellore and Gir were also included in the importations. There was also at least one Krishna Valley bull.

1946 : the next importation of Zebu cattle into the US took place in 1946 when 18 Brazilian bulls were brought in through Mexico. Among them Carijo was a Nellore. Others were Guzerat, Gir and Indu-Brazil. The 1946 importation was made by Garcia brothers of Texas. The 18 bulls brought into US in 1946 were part of importation was made by Garcia brothers of Texas. The 18 bulls

brought into US in 1946 were part of importation of 120 bulls from Brazil into Mexico. From the bulls that remained in Mexico, some Zebu herds of various breeds were developed. The Pan American Zebu Association was formed in 1946 primarily for registering and promoting Zebu and Indu-Brazil cattle. After 1946, imports of all cattle from Brazil to US were prohibited by the US Government because of the danger of foot and mouth disease.

1979 : A quarantine station was established at Harry S. Truman Animal Import Center at Fleming Key, Florida.

1980 : Starting from this year, cattle of Nellore and other Zebu breeds were imported into US from Brazil through the Harry S. Truman Import Center at Fleming Key, Florida. They included 52 head of pure Nellore bulls. Gir and Indu-Brazil were also imported.

1981 : Bos indicus cattle numbering 81 were imported from Brazil. Of these, 57, were Nellore. Some Mexican Bos indicus cattle also came into US.

Ongoles in other Countries :

In Australia, there is an Australian Zebu Association for the promotion of Zebu breeds. Australia imported a number of Indian cattle like Ongole, Gir, Kankrej, Red Sindhi and Sahiwal from India during the early days of colonization. Later imports made to Northern Territory in 1843 and to Essington and Darwin districts in 1872 became the basis for a few crossbred herds. A large number of descendants of these cattle are seen today in Darwin area of Northern Australia. United Kingdom was one of the earliest importers of Ongole cattle. Switzerland also imported Ongole cattle for their disease resistance.

By 1870, Brazil imported sizable number of Indian cattle. Descendants of these cattle as well as those of subsequent imports were

soon dispersed in other South American as well as Central American countries like Mexico, Colombia, Bolivia, Peru, Argentina, Uruguay, Paraguay, Chile, Ecuador, Jamaica, West Indies, Costa Rica and Nicaragua. Ongole cattle were exported to South Africa and Angola.

Ongole cattle were imported from India by several Asian countries like Indonesia, Philippines, Thaliand, Malaysia, Mauritius, Cambodia, Laos and Sri Lanka. In Indonesia, a large number of Ongoles are used for draught, milk and meat. The bullocks are used for ploughing and carting. The breed was also exported to Fiji.

Breeds derived from Ongole

Beef Master (US) : Recognized in 1954. It is 1/2 Brahman, 1/4 Hereford and 1/4 Shorthorn.

Santa Gertrudis (US) : Recognized in 1940. It is 3/8 Shorthorn and 5/8 Brahman. Developed at King Ranch of Kingsville, Texas.

Brangus (US) : 3/8 Brahman and 5/8 Aberdeen Angus.

Braford (US) : 3/8 Brahman and 5/8 Hereford.

Charbray (US) : 3/8 Brahman and 5/8 Charolais.

Drought Master (Australia) : 3/8 Brahman and 5/8 Shorthorn.

Jamaica Brahman (Jamaica) : Originated from Nellore, Hissar and Mysore Zebus.

Ocampo (Venezuela) : Friesian x (Nellore x local Criollo)

Simbrah (Brazil) : 3/8 Brahman and 5/8 Simmental.

Ibage (Brazil) : Originated in 1955. It has 3/8 Nellore and 5/8 Aberdeen Angus.

Canchim (Brazil) : 3/8 Brahman and 5/8 Shorthorn.

Nelore Mocho (Brazil) : Polled Nellore developed in 1950. Herd book was opened in 1969.

Nelore Malhado de Preto (Brazil) : Nellore Spotted Black.

Nelore Amarelo (Brazil) : Nellore Yellow.

Nelore Vermelho (Brazil) : Nellore Red.

Nelore Pintado de Preto (Brazil) : Nellore Speckled Black.

Tabapuan (Brazil) :Nellore predominant with Guzerat inheritance. Earlier known as Hornless Zebu, the name was changed to Tabapuan, a city in Sao Paulo state.

Indubrasil or Indu-Brazil (Brazil) : The Indu-Brazil was developed in 1920's, when imports from India were prohibited, from a crossbred base that involved primarily Gir, Guzerat and Nellore. Indu-Brazils are characterized by large size and large ears. While in the early years, both red and gray animals were common, presently most animals are gray, showing predominance of Nellore.

American Brahman (US) : The breed was developed using Guzerat, Nellore, Gir and Krishna Valley which arrived in US between 1854 and 1946. Until mid-1920's, most of the Zebu cattle in the US were of Nellore type. Therefore, Nellore females contributed greatly to the American Brahman, although few pure Nellore bulls were used in the major Brahmin herds after 1925. The modern American Gray Brahman is over 1/8 to 1/4 Nellore. The US is said to have exported American Brahmans to more than 60 countries.

Characters of Ongole breed

Ongole breed has the characters of hardiness, heat tolerance, disease and insect resistance, metabolic efficiency, meat quality, reproductive efficiency and maternal instinct. Calves are alert with active behaviour, standing up and suckling soon after they are born without any

need for human intervention. They thrive under harsh climatic, nutritional and sanitary conditions. They are hardy with good rustling ability and surpass others in drought and tropics. They have loose skin with sweat glands that are twice as big and 30% more numerous than those of European breeds. Ongole's black skin covered with white or light gray coat helps in filtering and reflecting harmful sun rays. Their low level of metabolism also contributes to heat tolerance. Ongole feeds less often, generating less internal heat. They are efficient converters of poor quality forages into milk and meat and can withstand long periods without water. Ongoles possess natural resistance to various insects as its skin has a dense texture, making it difficult for blood sucking insects to penetrate. They have a well -developed subcutaneous muscle layer which enables them to remove the insects simply by shaking their coat. There is no excessive marbling or intra-muscular fat and the fat is enough for the meat to be highly palatable. Ongole matches the recent shift in the beef industry towards low calorie leaner meat diet without compromising taste. In Ongole, cows have small udders and short teats and bulls have short sheaths. Ongole dams have a long and prolific reproductive life, pronounced mothering ability and plenty of milk for their calves. Ongole cows calve easily due to their greater frame, wide pelvic opening and larger birth canal. Ongole dams lick their new born, put them to suckle and look for a safe place to hide them from predators. Ongole cattle like affection and quickly respond to kind handling methods, becoming extremely docile.

Reproductive Performance of Ongole Cattle

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For any programme designed to improve Livestock Productivity, it should be ensured that the reproductive capacity of both sexes male and female Livestock be improved. The ideal situation is that the cow should calve once a year and sustain the reproductive capacity over a number of calvings. Hence the present study was under taken to report the reproductive performance of Ongole cattle both for male and females.

Materials and Methods :

The data pertaining to the records of 22 Ongole bulls and 215 Ongole Cows were subjected to statistical analysis as per the methods of Snedecor and Cocharn (1967). The data was collected from the records maintained at Cattle Project, Lamfarm, guntur, over a period of 12 years from 1986 to 1998. The data on the animals which have reproductive problems were excluded while calculating the means of various reproductive characteristics. The animals were maintained under optimum feeding and managemental conditions.

Results and Discussion :

Age, body weight, scrotal circumference and semen characteristics at puberty and maturity of Ongole bulls were presented in table-1.

The avaerage age, body weight, and scrotal circumference of young bulls at puberty in the present study were 27.18 $\pm$0.82 months, 267.63$\pm$4.79 Kg and 26.86$\pm$0.22 cm respectively. The earliest donatin of semen was observed at the age of 20 months with a body weight of 220 kg and scrotal circumference of 25 cm, but the quality of semen was very poor. The present values were lower than earlier reports in Ongole bulls (Kotayya *et.al.* 1972). The average mature age, body weight and

scrotal circumference observed in the present study were 38.58 ±1.82 months, 385.50±4.13 kg and 31.91 ± 0.30 cm respectively.

The average ejaculate volume of semen, individual motility, sperm concentration and live sperm count at puberty were 2.39±0.13 ml 68.40±1.33 per cent, 497.04±22.37 x 10^6 per ml and 74.86± 1.65 per cent respectively. The corresponding values at maturity were 4.06 ± 0.12 ml 76.12 ± 6.45 per cent, 919.30 ± 12.52 x 10^6 per ml and 81.90 ± 0.47 per cent respectively. Similar values were reported by Rao and Rao (1978) in Ongole adult bulls of similar age.

The average sperm abnormalities of tail, head and protoplasmic droplets observed at puberty were 9.31 ± 0.34 /7.59 ± 0.46 and 14.54 ± 0.89 per cent respectively. The corresponding values at maturity were 5.72 ± 0.42 2.45 ± 0.29 and 5.31 ± 0.26 per cent respectively.

The observations in the present study indicate that the quality of semen improved gradually with advancement of age and attained normal quality semen, 12 months after the puberty of the bulls. All characters observed in the present study were significant at 5% level between puberty and maturity.

The mean values of various reproductive parameters in Ongole Cows were presented in table-2.

The average age, body weight at puberty in Ongole Cows in the present study were 744.80 ± 11.06 days and 257.05 ± 11.54 Kg respectively. These observations were lower than the other Indian Breeds, (Joshi and Phillips, 1953). The average age at first conception was 780.57 ± 11.54 days and number of services required per conception was 1.52± 0.5 in heifers and 1.53± 0.03 in cows.

The average age at first calving was 1063± 11.70 days, which was lower than earlier reports made on Ongole Cattle by Krishna Rao

(1966) and Rama Mohan Rao et. al (1969) and other Indian breeds by Joshi and Phillips (1953) and Venkayya and Anantha Krishna (1956).

The average gestation length was 287.24± 0.28 days in heifers and 289.22± 0.41 days in cows and the difference was non-significant. Similar values were reported in Ongole Cattle by Rao and Taylor (1971) and Rajulu and Rama Mohana Rao (1966).

The average first service period and subsequent service periods were 148.54± 4.49 and 113.75± 2.02 days respectively and the difference between them was significant (P 0.01). These values were very much lower than the report published by Rama Mohana Rao et. al (1969) and Sharma (1981) in Ongole Cows and other Indian Breeds of Cattle by Venkayya and Anantha Krishna (1956). The longer calving interval in first clavers in the present study might be due to lactational stress resulted by the early maturity of the animals.

The observations in the present study indicate that the reproductive performance of Ongole Cattle is on par with milch breeds and crossbred cattle and better when compared to other Indian breeds.

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Table-1 : Age, Body weight, Scrotal Circumference and Semen characerstics in Ongole Bulls

S.No.	Particulars	At Puberty	At Maturity
1.	No. of Bulls	22	22
2.	Age (Months)	27.18±0.82	38.58±1.82
3.	Body Weight (Kg)	267.63±4.79	385.50±4.13
4.	Scrotal circumference (cm)	26.86±0.22	31.91±0.30
5.	Ejaculate Volume (ml)	2.39±0.13	4.06±0.12
6.	Individual motility (Per cent)	68.40±1.33	76.13±0.45
7.	Sprem concentration per ML ($X10^6$)	497.04±22.37	919.30±12.52
8.	Live spermatozoa (Per cent)	74.86±1.65	81.90±0.47
9.	Tail abnormalities (Per cent)	9.31±0.74	5.72±0.42
10.	Head abnormalities (Per cent)	7.59±0.46	2.45±0.29
11.	Proximal proto plasamic Droplets (Per cent)	14.54±0.89	5.31±0.26

The differences observed in all the above parameters are found to be significant at 5% level.

Table-2 : Reproductive Parameters in Ongole Females

		Average	Standard Error	No. Observations
1.	Age at puberty (days)	744.86	11.06	135
2.	Body weight at Puberty (Kgs)	257.05	2.65	135
3.	Age at first conception (days)	780.57	11.54	135
4.	No. of Services per ceonception in heifers.	1.52	0.05	135
5.	Age at first calving (days)	1063.70	11.70	135
6.	Gestation period in heifers (days)	287.24	0.28	135
7.	First service period (days)	148.54*	4.49	129
8.	First intercalving period (days)	442.14*	7.54	129
9.	Postpartum service period in pluripara (days)	113.35*	2.02	787
10.	No. of services or conception in pluripara	1.53	0.03	787
11.	Gestation period in pluripara (days)	289.22	0.41	764
12.	Intercalving period in Pluripara	407.79*	2.38	764

* P 0.01

Embryo Transfer - A Tool to Exploit Potential Female

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Introduction :

India's livestock wealth is undoubtedly one of the richest in the world. We have about 201 million cattle and 85 million buffaloes. However, the average estimated milk production continues to be a paltry 400-800 litres per lactation. Nevertheless a small percentage of this vast livestock base has got the potential to yield an average of 2500-3500 litres of milk per lactation. There is a great scope to exploit this small population for an overall improvement of livestock prodcutivity.

The state of Andhra Pradesh has got a rich heritage of livestock wealth. There are about 12 million cattle and 9 million buffaloes in our state. Ongole breed of cattle is our pride. It has proven it's worth not only in the dry, arid uplands of the state as a draft and milch animal but has also become a global partner in producing some of the best beef breeds. There is a great need to protect this invaluable germplasm from the brink of extinction. The coastal district of AP houses some of the high yielding buffaloes with a peek lactation of about 15 ltrs. per day. If Artificial Insemination has showed us the way for maximum utilisation of best available male germplasm, a newly heralded technique called Embryo Transfer (ET) provides an opportunity for faster multiplication of elite female germplasm. It is a well-established fact that the antenatal female individual possesses more than one lakh potential oocytes in her ovary. But the long gestation period and short life span are two major constraints, enabling her to produce not more than ten offspring in her lifetime. Thus, there was a colossal wastage of gametes in the female. The long cherished dream of biologists to develop a technique that ensures better utilisation of potential females has come true in the form of ET.

What is Embryo Transfer :

It is specialised technique of breeding wherein a sexually mature superior quality female animal (donor) is superovulated by exogenous hormones, ova fertilized, embryos recovered prior to their implantation and then transferred to a reproductively sound, low pedigree foster mother (recipient).

ET normally means collection of embryos from a donor female and it's transfer to a recipient female (a biological incubator) which carries it to full term. This way a donor can be kept open and repeatedly used for production of embryos. Inherently since cows shed only one egg per cycle, by a procedure called super ovulation the donors are induced to relase more eggs in one cycle so that the embryo harvest can be increased many fold. This is popularly known as **"MULTIPLE OVULATION and EMBRYO TRANSFER (MOET)**. Hence with the use of MOET we can produce 8-10 calves from a female in one year and about 50-70 calves in her lifetime.

History of Embryo Transfer :

Walter Heape (1890) was the first to successfully perform this diverse technique in rabbits. However, it was only in 1951 that the birth of a ET calf in cattle was reported (Wellet et al). Since then ET has become the primary subject of research in reproductive biology. The world's first buffalo calf was born on 18th March 1983 in Florida, USA (Maarten Drost). International transshipment of embryos became a relaity when the first frozen ET born calf was reported by Wilmut and Rowson in 1973. The late seventies have witnessed a boon in the establishment of commercial embryo banks in Europe and America.

In India, ETT was conceived and implemented as part the National Science and Technology project on cattle herd improvement for increasing productivity using ETT in 1987. The nodal agency of this project was the dept. of Biotechnology, Govt. of India. The first calves through transfer of

fresh, frozen and bisected embryos were born at National institute of immunology, New Delhi in January 1987, March 1988 and November 1988 respectively. Recently the ICAR under NATP-MM programme has initiated a project on "PRODUCTION OF SUPERIOR MALES THROUGH ETT" and one such project on Ongole cattle is under way at cattle project, LRS, Lam farm, Guntur since July 2000.

Applications of ETT :

It increases the rate of reproduction i.e. production of more offspring per donor. This helps in faster multiplication of rare, genetically superior dams.

It allows applying higher selection intensity on bull mothers leading to faster genetic gain when used in AI programme.

Sire evaluation can be done more accurately on the basis of sib and pedigree records. The generation interval is also reduced.

This technique can be used to protect the rare species and breeds from the risk of extinction.

It is possible to obtain offspring from genetically valuable cows that have become infertilie due to injury, disease or age (senility) by means of ET.

By adapting cryo preservation technique the embryos can be frozen and stored for future use (embryo bank). The cryo preservation of embryos has changed the whole concept of animal transport. It is easy and economical to transport embryos than to transport animal. Also an exotic animal born and reared in a new environment will adapt well to it.

With imported embryos, the resulting offspring will have 100 per cent of desired genes; a criterion which scores over semen import.

Effective utilisation of low pedigree female animals as recipients.

It has paved way for further advances in embryo biotechnology like cloning, sexing and production of transgenic animals.

Embryo transfer is a multifactorial process involving donor and recipient management, estrus synchronisation, superovulation, embryo collection, screening and evaluation, Cryopreservation, embryo implantation etc. Each step has to meticulously performed lest it reflects on final conception rate.

Selection Of Donors :

Careful selection of donors based on genetic superiority and reproductive fitness are the essential requisites of a successful super ovulation. Animals with hypoplastic ovaries, history of abnormal calving, cystic ovarian syndrome, repeat breeding, kinked/fibrosed cervix, extremely fatty and debilitating condition and early post partum period (less than 2 months) are not good subjects for super ovulation and flushing. A good donor is one, which can be superovulated once in 75 days, producing a minimum of 4 viable embryos.

Estrus Synchronisation :

Estrus synchronisation refers to control the life span of the corpus luteum (CL) - a structure developed on the ovarian surface post ovulation. So long as the animal is under the influence of progesterone produced by functional CL, it fails to exhibit behavioural estrus. Hence estrus synchronisation mainly aims at affecting the functional activity of CL. Estrus synchronisation can be brought by treating the animal either with prostaglandin's (Prosolvin, Lutalyse, Iliren etc.) or with progesterone compounds (PRID, CIDR, Crestor ear implants etc.) Precise estrus detection is an essential prerequisite to decide the day and time of embryo collection. Vulval congestion, cervical mucous discharge, bellowing, restlessness are indicators of estrus, but only sexual receptivity by a male is a sure sign which should always be confirmed by rectal palpation an experienced

practitioner. Parading a vasectomised male or androgenised female at least thrice daily can effectively monitor estrus detection in a large herd. The overt signs of estrus are more pronounced in super ovulated cows than in unstimulated animals.

Selection And Management Of Recipients

Recipient management is more often neglected while giving more importance to donors. The success ET programmes, if required to be measured based on number of calves on ground, depends largely on selection and management of recipients. They should be absolutely healthy, cycling normally without any gynaecological abnormalities. Pregnancy rate in ET depends again on degree of synchrony between donor and recipients. If the asynchrony is more than $\pm$ 12 hours, the conception rate is likely to go down.

Superovulation Of Donors :

The response to superovulation (SOV) in cattle is highly unpredictable. This is because the cattle ovary contains a fewer number of recruitable follicles at any stage of the oestrus cycle. Endocrine milieu, individual idiosyncrasy, species, breed, parity, stage and number of lactation, season, nutritional status etc., are some of the factors that affect response to superovulation. Repeated superovulation reduces ovarian response. A cyclically normal cow can be successfully superovulated 4-5 times a year with 70-90 days interval between treatments.

Superovulation in animals is brought about by administration of certain exogenous hormones like PMSG (Folligon, Trophovet etc.) or FSH (Folitropin, Super OV etc.). More anovulatory follicles, development of cystic ovaries post-treatment and less viable embryo recovery are some of the problems limitig usage of PMSG for superovulation. A satisfactory superovulation regimen using FSH has been developed for routine use.

If we consider the day of oestrum as zero day, day 10 (range 9

to 11) is ideal to begin the SOV treatment i.e. mid luteal phase is the best to bring about optimum follicular growth, low follicular atresia and more ovulations. The total dose of hormone is given over a period of 4 days, twice daily at 12-hour intervals in declining dose. Luteolysis is induced by administration of prostaglandins 48 hours post initiation of superovulation. At the end of superovulation treatment, the animals exhibit estrus. The estrus symptoms in superovulated animals are more conspicuous and last 6-8 hours longer than that of normal oestrus. Three to four inseminations are carried out at 12-hour intervals to avoid risk of non-fertilization.

Embryo recovery/flushing :

Identification of standing heat and timing of flushing in animals are the most crucial steps to ensure recovery of most of the embryos before they undergo hatching. It is said that embryos reach morula to blastocyst stage by day 6-7 super estrus and hence embryo collection is carried out on day 7 to ensure satisfactory embryo recovery. After day 7 the embryos are likely to under go hatching and recovery of such embryos is difficult.

Prior to 1976 surgical procedures (Mid line laparotomy or flank incision) were used to collect embryos. However in later years, due to inherent problems associated with surgical collection, non surgical (trans cervical) embryo collection technique has been developed which has become more popular and feasible.

Rusch Catheter (16 or 18G German make) is being effectively used for non-surgical collection of embryos. The animal is brought into a chute and restrained properly. After performing back racking, 4-5 ml of 2% Lignocaine is injected epidurally(sacrococcygeal) to anaesthetize the posterior portion. Epidural anesthesia reduces straining and defecation at the time of flushing. After thorough washing and cleaning of the vulval region, the catheter with a stylet inside and locked to it is passed into either of the horns up to the anterior one-third part.

The catheter is held in position by inflating the balloon. The stylet is removed and the inlet and outlet tubes through a 'Y' junction are connected to the catheter. Hand-operated valves control the flow of medium in the tubes. The other end of the inlet tube is connected to a bottle containing flushing medium and hung at a height of 1-1 1/2 metre. Each time 15 to 20 ml of medium is allowed to pass into the horn. By closing the inlet valve and opening the outlet valve, the same medium is collected in a filter which traps the embryos and allows the medium to run out. Each horn is flushed with 400ml of medium by repeating the above procedure 10-15 times. A column of 1 cm medium should be held in the filter to avoid exposing the embryos to air and getting dried.

Once flushing of both horns is completed, one dose of antibiotic is infused intrauterine as a precaution against spread of any infection. Then, 25mg of PGF2 is administered by intramuscular(I.M.) or intra vulval submucosal (ivsm) route. This helps in luteal regression and also prevents unwanted pregnancies (if any). The donor returns to oestrus in about 8-10 days. They can be bred normally in the following cycle or can again be subjected to superovulation after a gap of about 2 months.

Screening And Evaluation Of Embryos :

The contents of the filter are collected in a petri dish (90 mm) and examined under stereo zoom microscope. The embryos are collected in a small petri dish (35mm) containing holding medium (PBS with 0.4% BSA). The embryos are then evaluated based on stage (morula, blastula etc.) and quality. Grade I and Grade II embryos will have to be transferred fresh immediately to a suitable recipient.

Embryo Freezing Or Cryopreservation :

Long term storage can be accomplished by freezing them using approprite cryoprotectant like Glycerol. Programmable freezers (HAAKE, German make) that reduce the temperature at a controlled rate are now available.

The embryos are placed in 1.0M or 1.4M glycerol solution for 20 minutes. One embryo is loaded into 0.25ml straw and the open end is sealed with a marker stick. All the straws will then be transferred to a propanol path precooled to - 7°C. after holding the straws at 7°C for 5 minutes, seeding is induced by touching one end of the straw with supercooled forceps. After seeding, the straws are held at the same temperature for an additional 5 minutes and then cooled to - 33°C at the rate of 0.4°C/minute. Once the temperature reaches - 33°C, the straws are plunged into liquid nitrogen.

Embryo Thawing :

The straw containing the embryo to be thawed is taken out from the liquid nitrogen container and dropped in a water bath at 37°C till the contents are liquefied. A 1.0M sucrose solution is used to remove the cyoprotectant glycerol in 3 steps. The embryo is kept for 5 minutes in each step and then washed 3 times in holding medium. After evaluating the post-thaw grade, the embryo is transferred into a synchronized recipient.

Embryo Transfer :

The embryo is transferred into the horn ipsilateral to the ovary containing the corpus luteum. After deciding the side of the corpus luteum, epidural anesthesia is induced to prevent straining and defecation during trasnfer. The perineal region is thoroughly washed and the vulva is blotted dry. The embryo is loaded into a 0.25 ml French mini straw between two air pockets and two columns of holding medium. The straw is kept in IMV mini ET gun and a sheath with self locker is fitted over the gun and fixed to it. One plastic sanitary sheath with self locker is fitted over the gun and fixed to it. One plastic sanitary sheath is applied over it to avoid any vaginal contamination transferred up to the cervix and uterus. Near the external os, the sanitary sheath is pulled to allow the gun passed into the cervix. The embryo is deposited in the anterior one third of the horn.

Embryo transfer is a bhighly sensitive procedure,d the gentleness and time spent in handling the cervix and uterus can greatly affect the conception rate. The site and grade of transfer, synchrony between donor and recipient, stage and quality of embryo are the major limiting factors to achieve high pregnancy rates in embryo transfer.

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Ongole Breed Characters and Judging for Functional Efficiency

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Ongole breed characters

All Indian Zebu Cattle are having thoracic and musculo fattu hump except Siri of Bhutan. They were divided into 6 groups by Olver (1938).

Group I : Lyre horned Gray cattle with wide forehead, prominent orbital arches. Face flat or dished in profile represented by 1. Kankrej, 2. Malvi, 3. Tharparkar, 4. Hissar, 5. Kherigarj, 6. Kenwaria.

Group II : Short horned, white or light Grey in color with long coffin shaped skull, orbital arches not prominent, face slightlyconvex in profile. 1. Bhaguari, 2. Nagori, 3. Mehrathi, 4. Rath, 5. Harina, 6. Krishna Valley, 7. Ongole, 8. Gaolao, 9. Bachaur

Group III : Ponderous, usuallyspooted, red and white or brown and white milch type cattle with prominent forehead pendulous dewlap and sheath, lateral and often curly horns.

1. Dangi, 2. Gir, 3. Sahiwal, 4. Deoni, 5. Nimari, 6. Red Sindhi.

Group IV : Medium sized, compact, draught type animals, usually prominent forehead, long pointed horns arising close together.

1. Hallikar, 2. Killari, 3. Kangayam, 4. Alumbadi, 5. Bargen, 6. Amruthamahal.

Group V : Small red or black cattle, often with white markings, short horned, with light sheath, poll and top of hump usually covered with coarse hair.

1. Lohani, 2. Ponwar, 3. Siri.

Group VI : Muscular and thoracic hump and of recent origin is Dhauni.

The Ongole breed characters are as defined below

Those Indian Zebu cattle while migration from middle east to Indian subcontinent along with Aryan civilisation has separated into several breeds based on environmental factors prevailing for centuries. The increase in density of human population has forced further colonization in search of food and water resources. Such south down migration has resulted in Ongole breed of cattle settling at southern most part of coromandal coast i.e. Nellore.

Ongole breed Characters

I. Head : Masculine in males - Feminine in female. Moderate and proportionate to body. Alert and attractive.

i. Fore head : Broad between eyes, slightly prominent face, moderately long and coffin shaped, with no hollows in Temples.

   Bridge of nose to nostril is straight, slightly prominent with a shallow furrow poll. In between horns should not be raised.

ii. Muzzle : (including lower lip) : Black Muzzle with wide nostrils; well developed White or fleshy Muzzle is not allowed. Lower lip should be black.

iii. Jaws : Wilder at base, Well muscled and strong.

iv. Eyes : Moderately large, Flaccid, Full, Bright elliptical in shape, Well developed pupil, Black eye lashes, ring of black hair around lids, 0.6 to 1.3 cms. White eyelashes are not allowed.

v. Ears : Alert, Moderately long with slight drooping. Tip of ears black. Inside of ear has silky hair.

vi. Horns : Short and Stumpy, Slightly tapering towards tip; growing outwards, upward and backward. Thick at base without crack. In cows horns are longer and thinner than in bulls. Poll

b) **Side View :** Straight top line; strong muscular neck always level with rump; small flank; black appearance; straight squarely set bony legs with short pasterns, deep at heels; Strong hooves with moderate bent croup; full flat lean behind hump; moderatelythin dewlap ending with brisket; Moderate sheath (not pendulous); Well developed testes covered with thin skin and black in colour.

c) **Hind View :** (Rear appearance) Very wide hooks and pins, well set tail below the two pin bones; wide space in between thighs indicating this thighs (particularly in cows); Wide hook and pins; Long tapering tail with black switch almost touching pastern; close digits, deep at heels; strong straight hocks; Hind limbs while walking should not swing.

XI. Points of Disqualification :

1. Red colour and red patches on body.
2. White switch of tail, white eye lashes, white prepucial hairs.
3. Flesh coloured muzzle; partly or full and light colored hooves.
4. Mottle spots or Albino patches on body.
5. Black markings on hind quarters.
6. Feminine head in bulls (Lean long head)
7. Long drooping ears.
8. Raised poll.
9. Pitted temples.
10. Presence of groove below inner canthes to bridge nose.
11. Bi-concave hump.
12. Leafy hooves
13. Floating ribs or uneven number of ribs on eighter side.
14. Short tail with Switch ending above the hock joint.
15. Straight Hock.
16. Supernumery teats.

17. Rubbing hooves while walking.
18. Single testes (cryptorchid)
19. Winged shoulders.
20. Swinging hind limbs at hip joints.
21. Soft (Leather) horns.

Additional essential qualities of breed as per farmers in the tract :

Long features : 3

1. Legs.
2. Quarters
3. Barrel

Shorts : 7

1. Muzzle
2. Ear lobes
3. Neck
4. Sheath
5. Tail
6. Hollow of flank
7. Dewlap

Blacks : 9

1. Muzzle
2. Eyes
3. Ears
4. Knees and hocks
5. Fetlocks
6. Sheath
7. Switch of tail
8. Anal region
9. Tip of testes

Judging of Ongole cattle for functional efficiency :

Judging of Ongole cattle for functional efficiency is only to select parents of future generations. From olden days of cattle histroy,

proof of descent and proof of production amde a tremendous contribution for growth of cattle industry.

Pedigree : Proof of descent, sire, dam, collateral relatives, their abilities with help of identification and registration through associations.

Production : Proof of production abilities, these were made through measures, valuation forms and evaluation methods.

Measures may be of height at withers, scrotum, chest and unciform; length maybe of body, back, chest, pelvis, head andnose, width maybe of breast, loins, hips, hip joints and Ischium; circumferences of chest, loins, scrotum and body.

Accordingly the ICAR has fixed maximum, minimum and average values of measures for Ongole breed of cattle and the same is given.

Valuation forms may be ciphers, points procedure, numerical judgement of the value of single and collective, physical properties of animal as,

Standard point system (score card 100)
Gradation 1 to 10 by giving marks.
Combined method

Evaluation method for milk yield, lactation yields, maximum dailyyeidl, total butter fat, lactation lenth, life time calvings, life time production, Inter Calving Period etc. For Beef : starch equivalent value, carcass yields, weight gains at different ages etc.

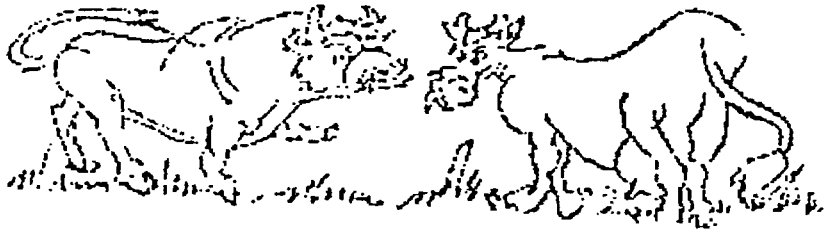
For draught change in physiological responses, weight pulling energy developed etc.

S.No.	Details	Males			Females		
		Max	Min	Avg.	Max	Min	Avg.
1.	Height behind hump	155	142	148	145	125	137
2.	Length from part of shoulder of pin bone	183	157	167	160	132	144
3.	Lenght of quarters from angle of hip to pin base.	58	48	54	54	42	49

S.No.	Details	Males			Females		
		Max	Min	Avg.	Max	Min	Avg.
4.	Height at angle of hip	160	137	148	149	126	137
5.	Width between angles of hip	66	43	55	56	42	48
6.	Height at pin bone	141	122	134	131	118	126
7.	Length of tail	117	91	101	109	86	96
8.	End of tail switch from ground	48	5	24	33	9	21
9.	Girth	221	197	204	208	160	182
10.	Height at point of elbow	86	76	83	81	71	76
11.	Measurements of bone below knee	26	20	23	20	17	19
12.	Lenght of face from occipital crest to upper edge of muzzle	62	51	55	53	46	49
13.	Width of face immediately above eyes (orbit)	36	22	26	22	17	20
14.	Length of lower surface of ear measured from tip of junction of ear to face	30	23	27	28	23	25
15.	Greates width of ear	17	14	16	17	14	15
16.	Slope of rump (Height of hook bone to height at pin bone.	13	8	10	14	10	12

Every animal is the end product of the total interaction between genotype and environment. Unfavourable environment is a limiting factor for expression of genetic potential, thus effecting growth, colour, body profile and other related anatomical features.

General appearance is very important. Genetic and hereditary defects are to benoticed. Characters of conformation and efficiency are judged. Sexual dimorphism (when viewed from side) to be carefully observed.

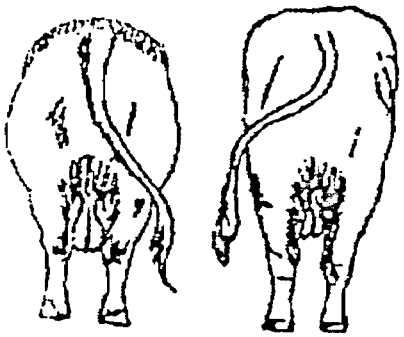


A caricature stressing the sexual dimorphism between male and female the profiles of the bull and cow differ completely the sex hormones are the cause of these differences. Note the depth of the chest in the male and well developed hind quarters in female.

(Courtesy : Prof. Jan. C. Bonsma)

The judgement is based on valuation forms of standard point system (score card 100). Under this system basic items of structures of animal observed in addition to individual organs.

1. **Skeletal differences :** Relating to age, sex hormonal balance and nutritional status to be keenly noted. The long bones of a bovine which is subfertile continue to grow for a much longer period of time than is the case with normal animal. The profile of subfertile bull is like that of a castrated bull. Generally animals with hypogonadism possess tremendous growth potential because of delayed ossification of cartilages of long bones. Excessive skeletal growth is a sign of infertility in female.



A B

A) The bare view of a normal bull : note the well sprung ribs, strong hind legs and a pair of normal testicles with full epididymis.

B) A typical tall fat eunuchoidal bull with small hypoplastic testicles and no indication of full epididymis. Such bulls are usually sub-fertile. The sub-fertile bull has got tremendous growth potential. (courtesy : Prof. Jan. C. Bonsma)

2. **Hair (coat) and Hide :** There is marked difference inhair of bull and cow. Bull hair is coarser and darker especially on neck, upper flank, lower shoulders and lower thigh above hocks is the result of androgens of adrenal cortex. Darkening is the index of libido, losing shade is a sign of losing libido, but not fertility in males. Hide of bull thicker than cow. Bulls having good libido had deep yellow greasy lines on the skin folds of the neck. The fertile female has lighter shade of colour thanmales. Female animals have glossyand lively coat indicating hormonal profile.

3. **Fat :** Fat is an index of nutritional status. Fat deposition in sex linked. Deposits at specific points is controlled byhormones maybe hypothytoid, hypogonadal, adrenal or pituitary type of obesity., generally over feeding is the cause.

   Fat deposits on brisket, lower rib region, between shoulder blades, on hip and pin bones, below external genetalia and in front of udder in a cow are symptoms of endocrinological disturbance. If these deposits ar veryhard in females at hip and pin bones, hardened at brisket chin, withers and lower rib region it is definite disturbance of hormones.

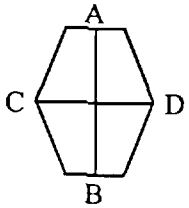
4. **Muscle Development :** Muscle development is also sex linked. Male sex hormones exert stimulating effect on muscle development of the bull whose muscles are prominent and bulge. In females muscles are smooth and not clearly defined.

5. **Animal behaviour or Temperament :** Animals to be docile but alert temperament too highly heritable, linked to the endocrinological status.

In addition some of the individual parts of the body are to be observed.

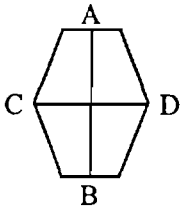
Head : Standard form is coffin shaped, slight convex profile, lighter, drier, shorter and less oblique with correct cranial alignment of 45°.

Males



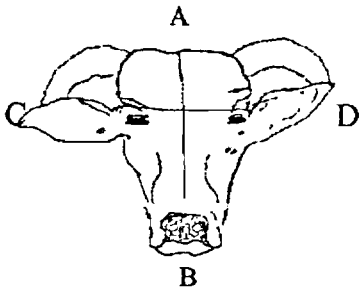
AB = 2
CD Breadth is 50% of length of face in male

Females



AB = 2.5
CD Breadth is 40% of length of face in female

Fore head - Males



Small headed animals are playful vivacious and alert. Inter orbital distance in males is 26 cm and in females is 20 cm.

Ears : Ears are a mass of cartilage attached at 45° angle, moves only in horizontal direction, length of ears in males 27cms and in females 25 cms, covered with silky hair with tip of ear tapering.

Horns : Horns to be black, round, usually not exceeding 8" to 10", with out cracks, may be Nandi horns, fore horns or combed horns. The last one is most preferred in the tract.

Hump : Resting on thoracic vertebrae, musculo fatty, biconvex usually leaning to right side. The size is influenced by plane of nutrition. Usually length is 21/2 time of its breadth. In female only crest is observed. There are hundred o varieties of humps in relation to length, width, shape, size and elegance etc.

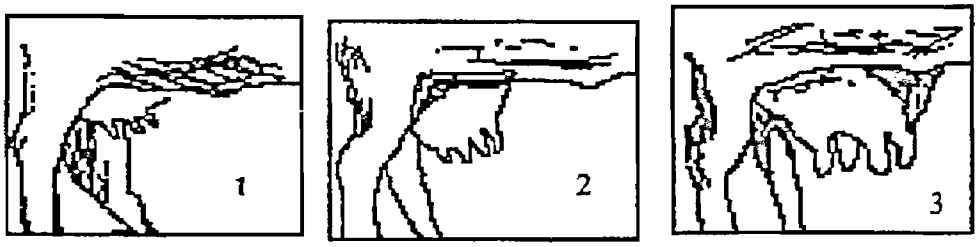
Tail : The last vertebrae of tail to be just above or in line with hock joint. Switch is small in males and long in females, which is black. Always long tails associated with loose naval and sheaths and hanging testicles. Insertion to be correct. Presence of fine hairs in switch is a sign of milk strain in female.

Scrotum : Pear shaped long drooping equal and mobile. While walking the testicles are to be movable in the sac. The scrotal sac to be always above hock level and have a good perimeter of more than 36 cm for a 3 year bull.

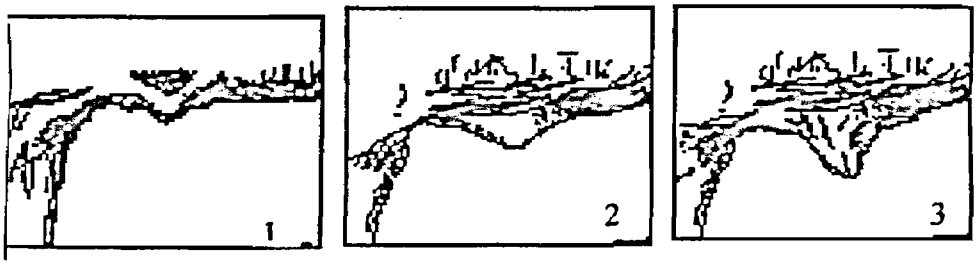
Mammary System : Milk veins to be long, tortuos and significant. Udder broad, deep and teats symmetrical, texture of udder is fine, soft and pliable with perfect let down.

Noval : Not to be loose. The short naval helps in avoiding injuries of grazing animals.

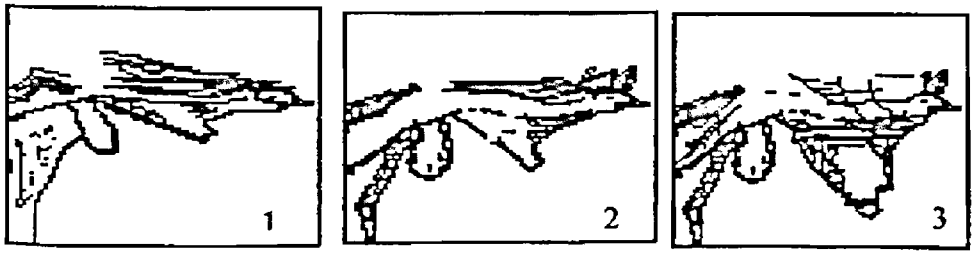
TEAT SCORES Number 2 is most suited

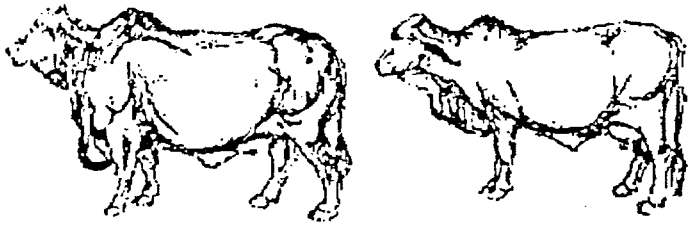


NAVEL SCORES Number 2 is most suited

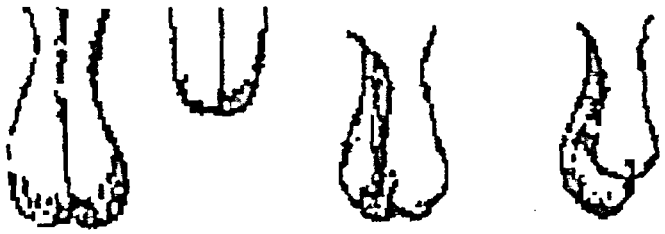


SHEATH SCORES Number 2 is most desired





A scale drawing of the highly fertile cow as compared to the large sub-fertile cow. The regular calver is always smaller than her sub-fertile counter part (courtesy : Prof : Jan. C. Bonsma)



1. *Normal well developed testicles with a well developed neck. The circumference should be 35 - 40 cm.*
2. *The scrotum and testicles of a bull that has been overfed. The testicles did not descend properly in the scrotum due to too much fat in the Inguinal canal. Such bulls are sub-fertile or sterile.*
3. *Twisted testicles, one testicle in front of the other. This condition is an objection in bulls. How this condition influence fertility is not quite clear. In one herd where three bulls with this defect was used, the incidence of retained after births in their progeny was high. Research should be done on this.*
4. *A condition of cryptorchidism, one testicle much smaller than the normal testicle. A highly heritable defect. Such bulls should be castratd. A very serious disqualification. (Courtesy : Prof. Jan. C. Bousma)*

SCORE CARD - ONGOLE

Standard of excellence — Total marks : 100

S.No.	Description	Male		Female	
1.	General appearance, carriage, giant demorphic appearance.	10	10	10	10
2.	Head :				
	- Forehead	3		2	
	- Face	2		2	
	- Horns	2		2	
	- Eyes	2		2	
	- Ears	2		2	
	- Nose & nasal bridge	2		2	
	- Neck	3		2	
	- Shoulder	4		2	
	- Hump	5		2	
	- Chest floor	3		2	
	- Dewlap	3	31	2	22
3.	Heart girth front ribs	7		6	
4.	Barrel rear ribs	6		5	
5.	Back	3		3	
6.	Loins	3		3	
7.	Rump	2		8	
8.	Hook bones	2		2	
9.	Pin bones	2	25	2	29
10.	Tail switch	2	2	2	2
11.	Rear leg hocks	8		6	
12.	Fore legs	6		4	
13.	Feet	6	20	5	15
14.	Scrotum	7		–	
15.	Skin	3		–	
16.	Sheath	2	12	–	
17.	Mammary system, milk veins, udder and teats	–		17	
18.	Milking abilities	–		5	22
	Total		100		100

Ongole as Meat Animal

D.V.G. Krishna Mohan
Professor and Head, Department of Animal Nutrition
College of Veterinary Science Gannavaram - 521 102. A.P. India

Ongole is a truly multipurpose breed useful for milk, meat and work. As Hindus traditionally do not consume beef, Ongole cattle are not popular as meat producers in India. But in other countries mainly in Latin American countries it is used for meat and milk. Since only limited number of males are required for breeding purpose, most of the males can be fattened for meat production. Females which are not used for herd replacement can also be used for meat production. While this is taking place in beef eating coutnries, this is not being practiced in India on a significant scale.

Ongole cattle have excellent resistance against tropical diseases and parasites. They can utilize fibrous crop residues and other inferior quality tropical pastures as major source of nutrients and can thrive in very hot and humid tropical climatic conditions. They attain good mature body weights and therefore are very attractive for meat production in tropical developing countries. They provide good quality animal protein which is essential in the diet of humans to balance to protein quality on a predominantly vegetarian diet. As the incomes increase the demand for meat is increasing and the demand for beef is particularly high in urban industrialized areas.

In certain states of India, slaughter of cattle is permitted. In other states, surplus male animals, which cannot be fed by farmers, are being diverted to modern abattoirs for slaughter and the meat is either used for domestic consumption or exported.

It is necessary that to prevent wastage of valuable animal protein source, use of surplus male cattle for meat purpose by rearing them to

attain reasonable market weight should be encouraged. The export of beef and buffalo meat to South East Asian Countries is fetching valuable foreign exchage to the Country. Already buffalo beef production has started in India and certain modern processing plants like Al Kabir in Andhra Pradesh, Allana sons in Maharastra, Hind Agro Industries in Uttar Pradesh and Punjab Meat Ltd. in Punjab have come up which utilise buffaloes for slaughter. Hind Agro industries have started raising male buffalo calves under contract farming with farmers where inputs and services such as feeding, breeding and health cover are provided to farmers for producing quality animals.

It is necessary to educate and convince the farmers in India that rather than neglecting the male calves and allowing them to die at an early age due to neglect, starvation and disease, it is more desirable if they are fed and managed well and then used for beef production in a more humane way in modern processing plants. In this way farmers can get additional income, animals are cared for in a more humane way and then used as valuable source of animal protein in the human diet in a more acceptable way. If farmers. are prepared to raise male calves in a scientific way, they can be helped with inputs, services and other knowhow at their doorstep by the user industries on a contract farming basis. The user industries can assure the farmers of marketing the animals with reasonable profits.

The following methods can be adopted for rearing of surplus male calves for their final use as meat animals.

Semi intensive method of rearing

Traditionally farmers feed their ruminant livestock on fibrous crop residues like paddy straw, wheat starw, jowar straw and allow them for grazing on marginal lands. The contribution to nutrient intake through grazing can be significant only in certain favourable seasons. The growth rate on such type of feeding regime can be very low and may not be sufficient for

scientific rearing of calves for meat production. The quality of meat from such underfed animals will be poor.

In such situations, supplementation of the diet can be done by locally available concentrates, tree fodders, multinutrient blocks containing urea, molasses, minerals and vitamins and bypass proteins. In this way the rumen fermentation of fibrous roughages can be optimized and at the same time the availability of bypass nutrients at the intestinal level can be enhanced so that growth rate can be enhanced to about 500g per day with the result that a body weight of 300 Kg can be attained by 11/2 to 2 years of age at which time they can be marketed. Thus, the male calves which are being neglected till now can be salvaged to serve as a valuable animal protein source in the human diet.

Intensive method of rearing

Where costs permit farmers can resort to feeding high level of concentrates and good quality green fodders. This is feasible only for a limited number of farmers in areas where natural resources are plenty and where the prices are also attractive resulting in reasonable profits for the farmers. Under such systems of rearing certain additives like methane inhibitors (eg. monensin) can be added in the diet to improve the feed efficiency and to decrease the cost of production. Such additives are routinely used in Europe and U.S.A. in commercial beef production but seldom used in our country.

However, keeping in view the Socio economic conditions in India and the availability of feed resources, the semi intensive method of rearing appears to be more feasible. The type of supplement to be used has to be carefully selected by the farmers to suit the basic roughages available which will result in maximum improvement of performance of the animals. In India there is good demand for Ongole male calves for rearing them as future draught animals. Male calves with good conformation fetch premium

prices in the market. But for optimum use of Ongole cattle, it is necessary to divert the animals not suitable for milk and draught towards meat purpose. But for achieving production of good quality meat as per international standards, it is necessary to finish the Ongole cattle meant for slaughter on either semi intensive or intensive methods so that the meat can either be exported or used for domestic consumption.

Economically Viable - Nellore/Ongole Cattle Breed

C. Ramakrishna
B.Sc. (Ag.), C.V.C. Mining Company, Gudur

In its' 5000 years history of the Nellore breed, this is 2nd Internationa symposium. This type of exposure is very essential for Indian scientists.

Most modern breeds about 14 starting from "American Brahman" have Nellore blood in them. There is not a single breed developed in India in this list.

There are five Million registered Nellore cattle in Brazil and many more in other parts of the world. What is our share of market ? Nil. How do we also enter this market ? We have no registered breeders or infrastructure.

Introduction :

1.1. The Nellore/Ongole breed of cattle was developed in these Andhra Pradesh districts by ancient Andhras. The breed developed under the British, also till Independence. Today 50 years after Independence it is in a sad state and we see some ray of hope in the conducting of this International symposium. Not only there is no development and encouragement, but also preposed closing down the available facilities like Chintala Devi Farm (started in 1918) gave wrong signals on its importance.

1.2. This is one breed which is wanted by the whole world and in India we have to make use of this demand. Our views on priorities for the breed must change. The exmple of Texmathi Rice is there. We had Basmathi but now the World has come out with Texmathi and we may lose our Basmathi demand.

2. Discussion :

2.1. From the first American Brahman breed which had Ongole blood, 14 new breeds were developed all had Nellore blood. There are over 5 million registered Nellore cattle in Brazil and many more in other parts of the World.

2.2. Nellore breed semen is used by 65% of the market. The largest used.

2.3. Embryo transfers 50,000 per year. There is demand for Ongole breed in more than 10 countries.

2.4. What is our share of this market ? Nil. How do we also enter this market ? We have no registered breeders. No recognised auction houses.

2.5. I request the Andhra Pradesh Breeders and Scientists to make use of this symposium and learn to develop our own Ongole cattle industry.

2.6. The good practices should continue 1. Ongole Cattle shows : These were started by the Nellore District Collector in 1858 and continued to 12 years till 1871. The last show in Guntur was in 1997.

2.7. Grazing Lands : In 1867 the then British Government addopted a principal of reserving 30% of cultivated land as grazing land. This is a very important factor which must be followed. As the Ongole breed was developed in grazing on the wild Iscilema laxum (Chengalli Gaddi) grass of these districts.

2.8. The demand for livestocks is likely to increase immensely and the Nellore breed being a premier triple purpose breed it will be in the forefront. The milk yield capacity of Ongole cows of over 2000 Kgs. in adverse conditions is quite attractive for local farmers.

2.9. Polled Ongole Breed : I understand the hornless character of Nellore breed is a dominant gene and that these herds are being developed in large scale. I was ignorant of this as I had not seen any polled herds in India, though first polled registered Ongole in Brazil was in 1969.

3. Conclusion :

Some suggestions for developing the Ongole cattle Industry of Andhra Pradesh for the participants to consider :

Collaboration with other countries. As an example in 1960's Shaver Poultry breed was introduced in India from Canada and their technics in all departments were also used, and today Andhra Pradesh is India's largest producing state with 130 million bird population. The model of Ranchs (Farm) in USA, dealing with semen, Calves, Embryos may be setup with foreign help to act as a model.

4. Refereces :

1. Hand Book of Animal Husbandry and Dairying - V.T. Subbaiah Mudaliar.
2. Nellore Cattle - Internet.
3. Brahman The Beef Cattle Breed Builder - Internet.
4. Environmental Adaptability - Internet.
5. OB Ranch - Internet.

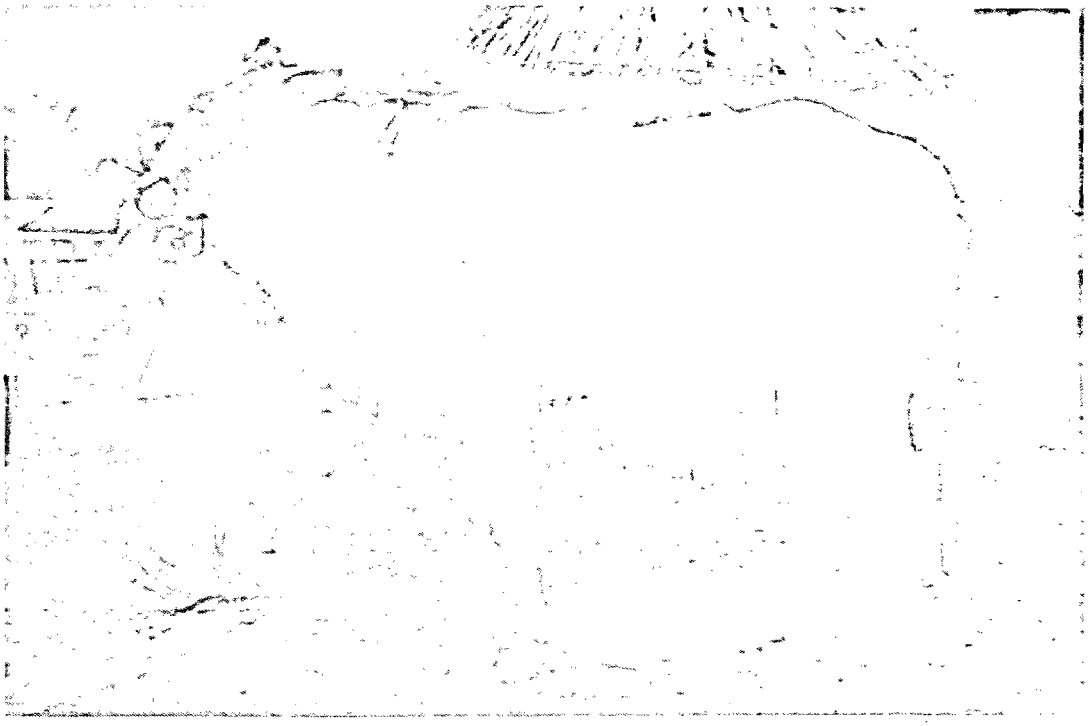
Best of Ongole

A Photo Feature

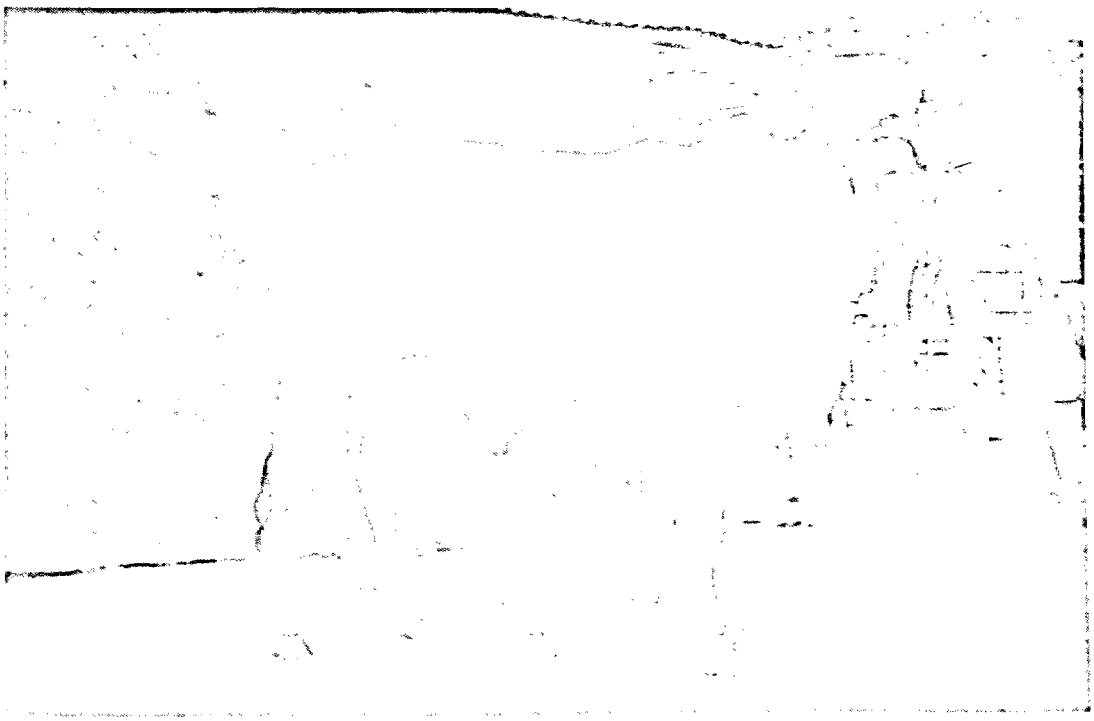
Ongole cattle are the pride of India The breed is exhibited by enthusiastic cattle breeders who are devoted to conserve the breed in several National and State level cattle shows. Some of the best of the Ongole breed of Cattle which have been adjudged as the Best are presented in the following pages.

Photographs-Courtesy

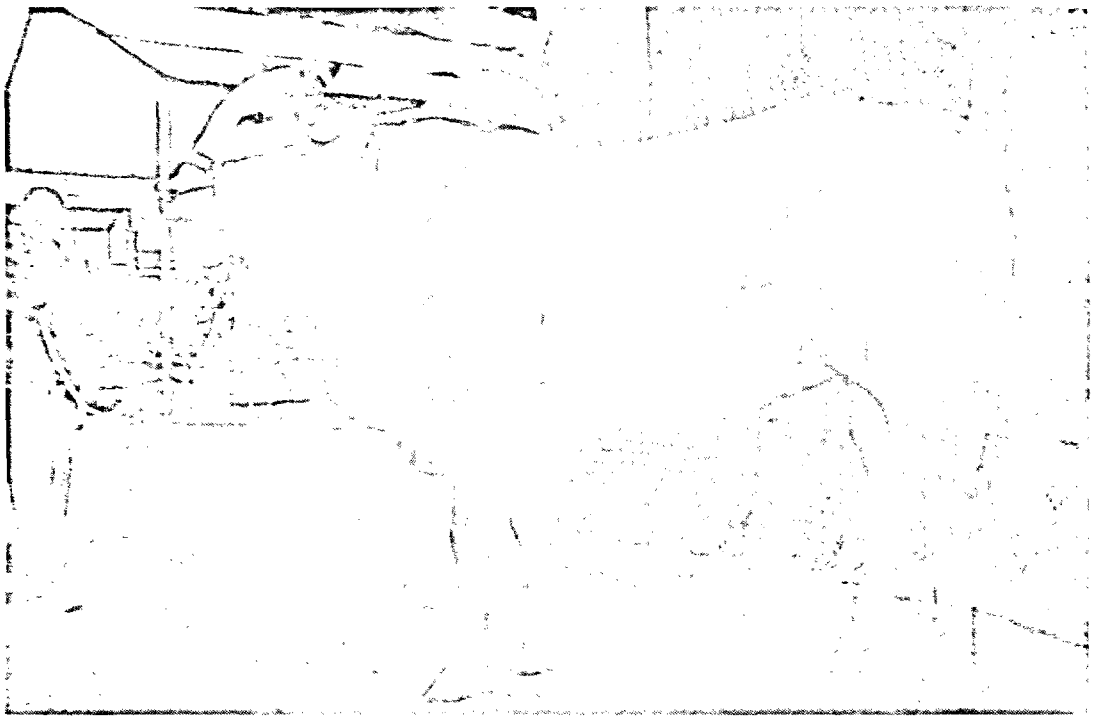
Dr. P. Sreeramulu
Additional Director of
Animal Husbandry, Govt. of A.P.
Shantinagar, Hyderabad



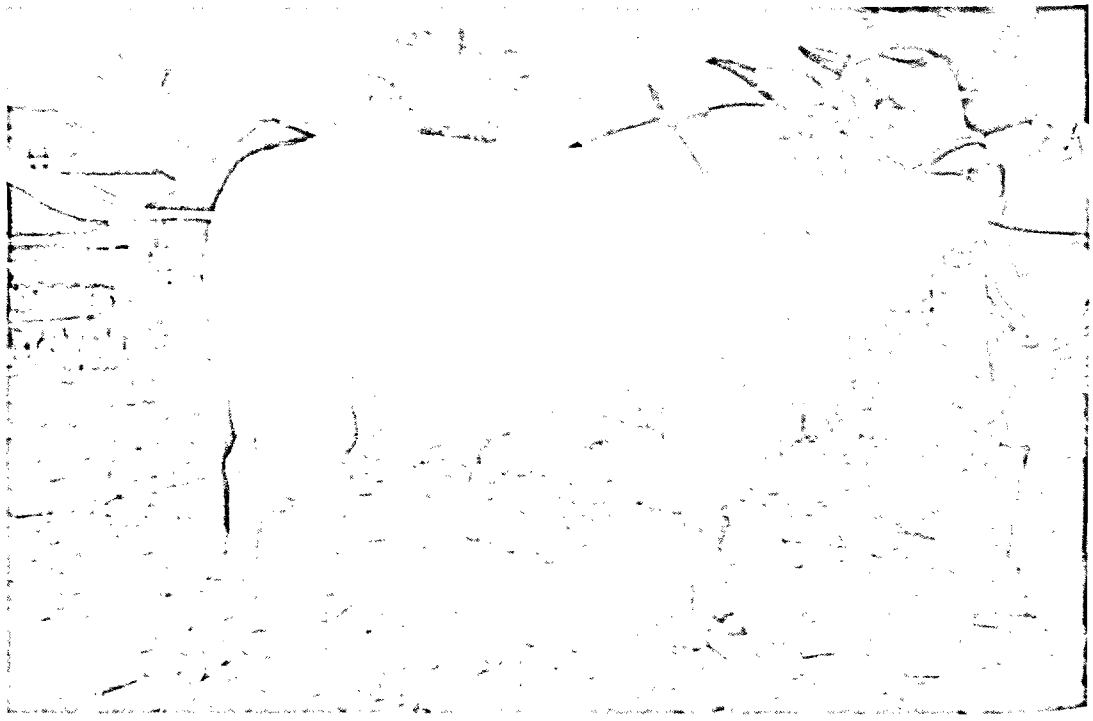
1 . Ongole young bull - Rythu Utsavam1998. Hyderabad, A.P.



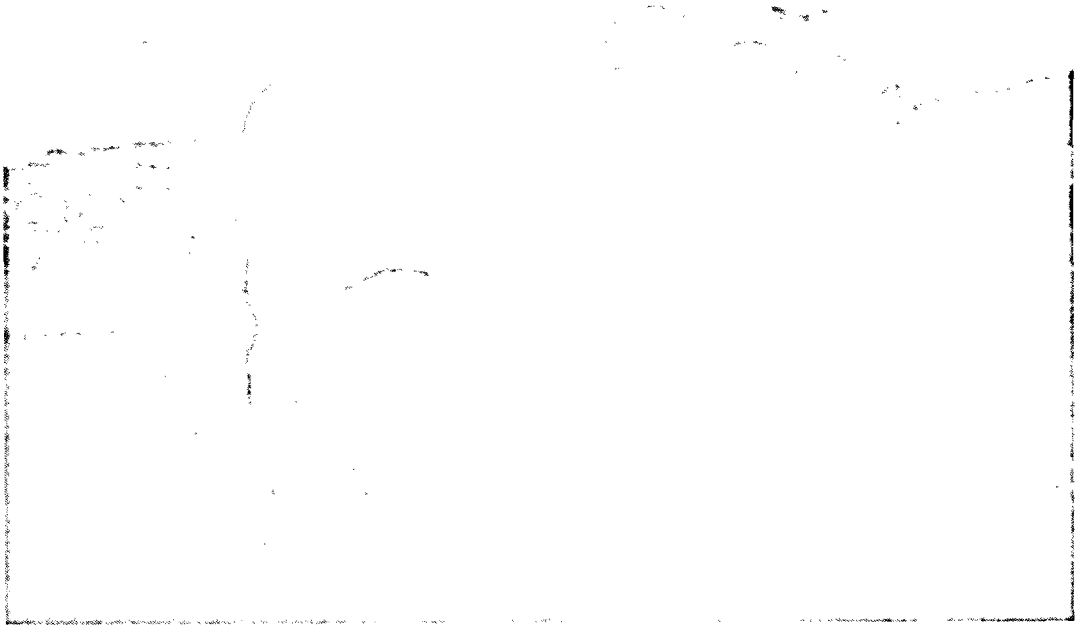
2. Ongole young bull - Rythu Utsavam1998. Hyderabad, A.P.



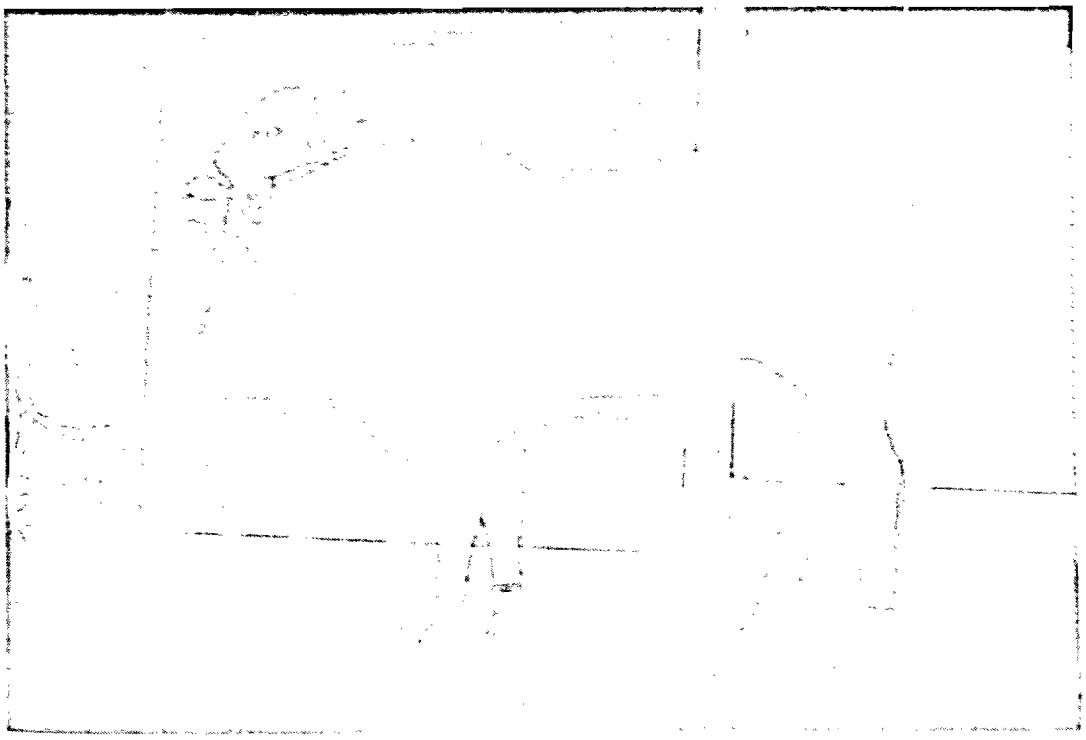
3. Ongole young bull - Rythu Utsavam 1998. Hyderabad, A.P.



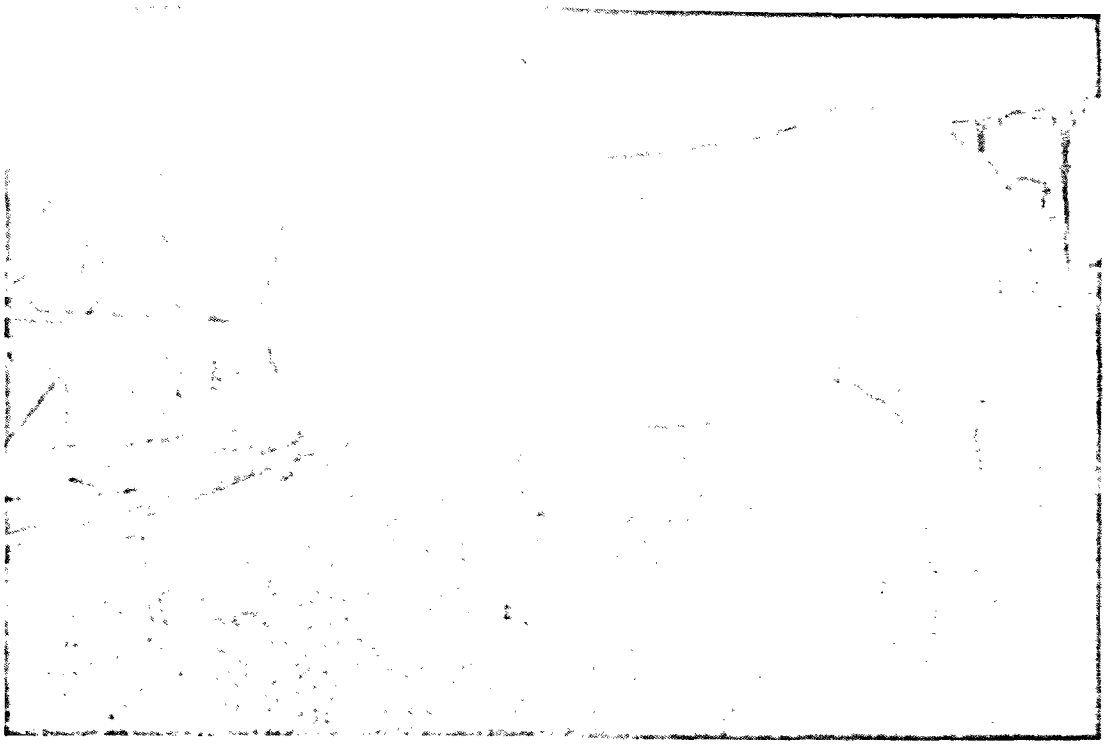
4. Ongole bull-Rythu Utsavam 1998. Hyderabad, A.P.



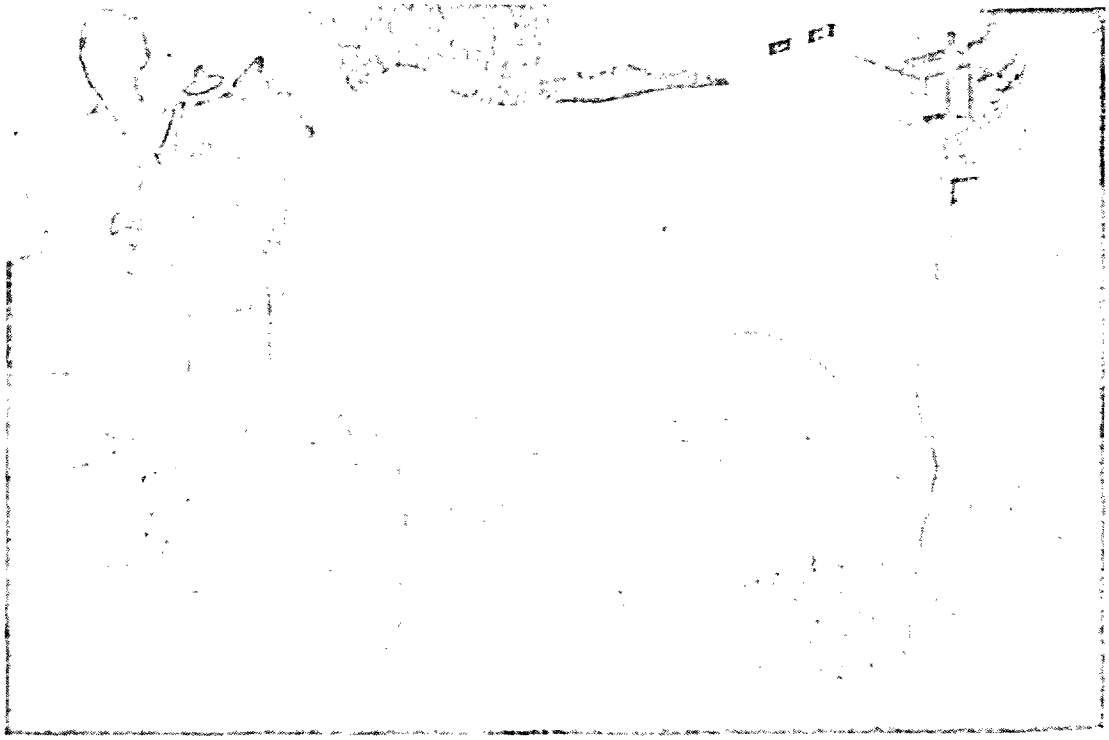
5. Ongole bull -48th All India livestock&Poultry show 2000. Bangalore.



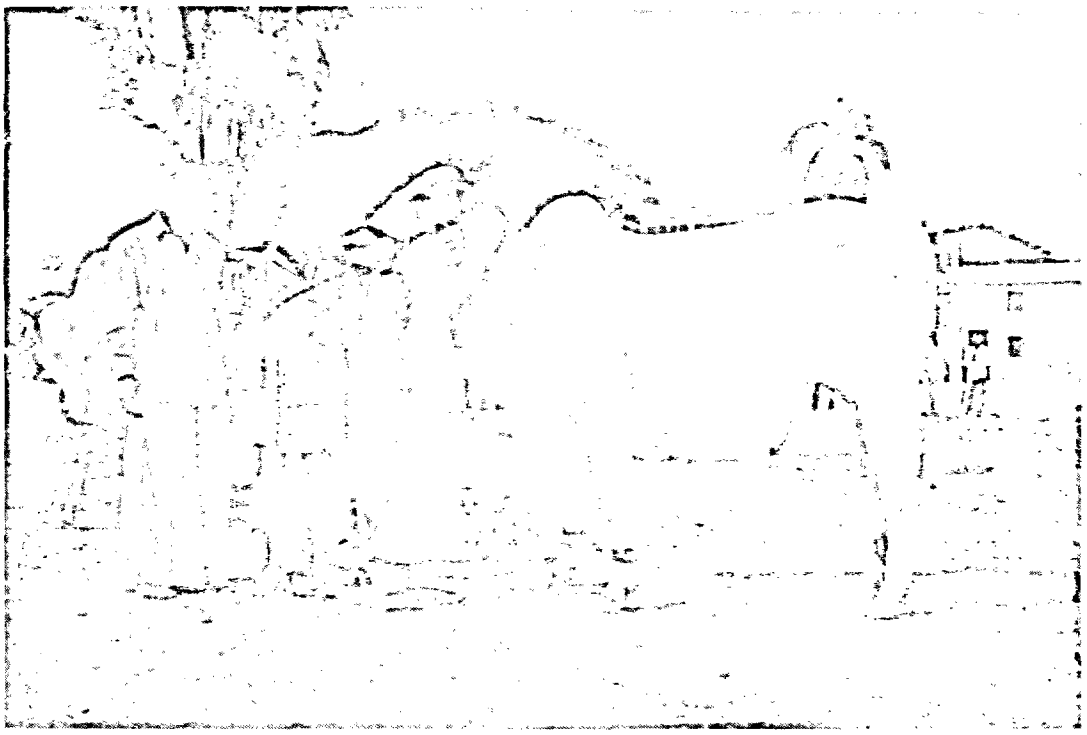
6. Ongole young bull - 46th All India livestock& Poultry show 1998, Hyderabad, A.P.



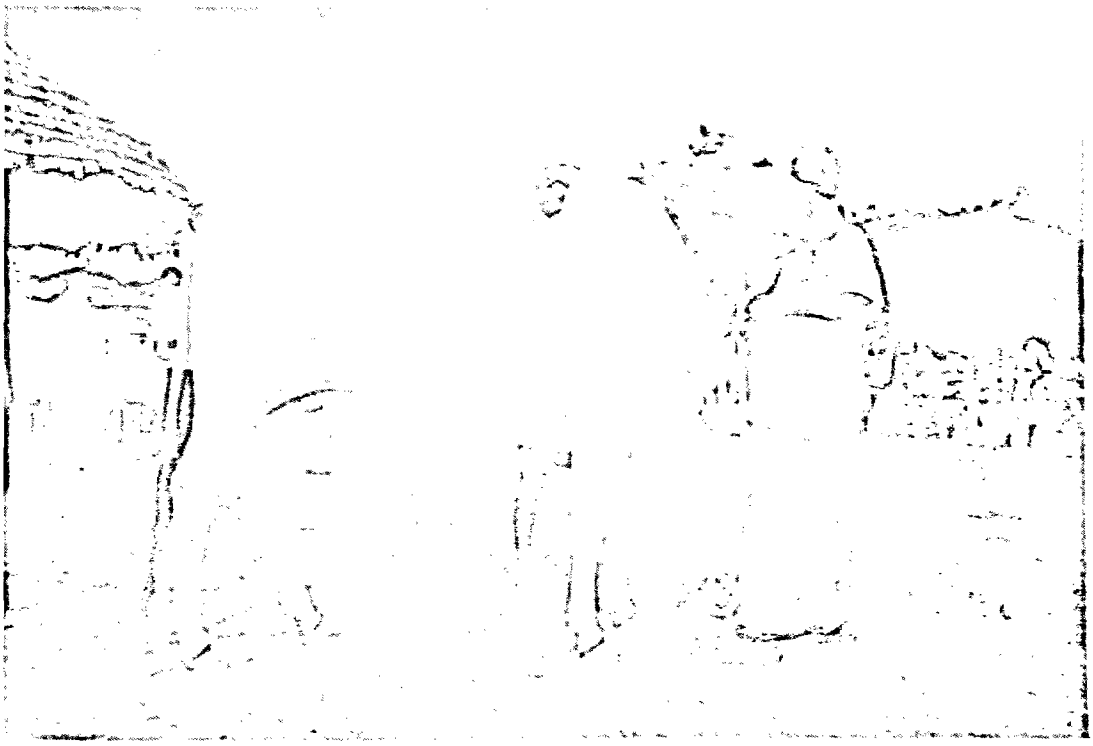
11. Ongole cow - 48thAll India livestock & Poultry show 2000, Bangalore.



12. Ongole cow - 46thAll India livestock & Poultry show 1998, Hyderabad, A.P.

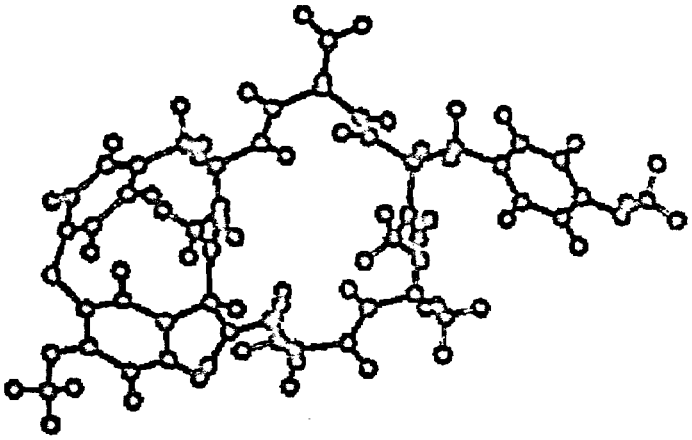


13. Ongole dry cow - 46th All India livestock & Poultry show 1998, Hyderabad, A.P.



14. Ongole Heifer - 46th All India livestock & Poultry show 1998, Hyderabad, A.P.

Exploring Healthy Possibilities!



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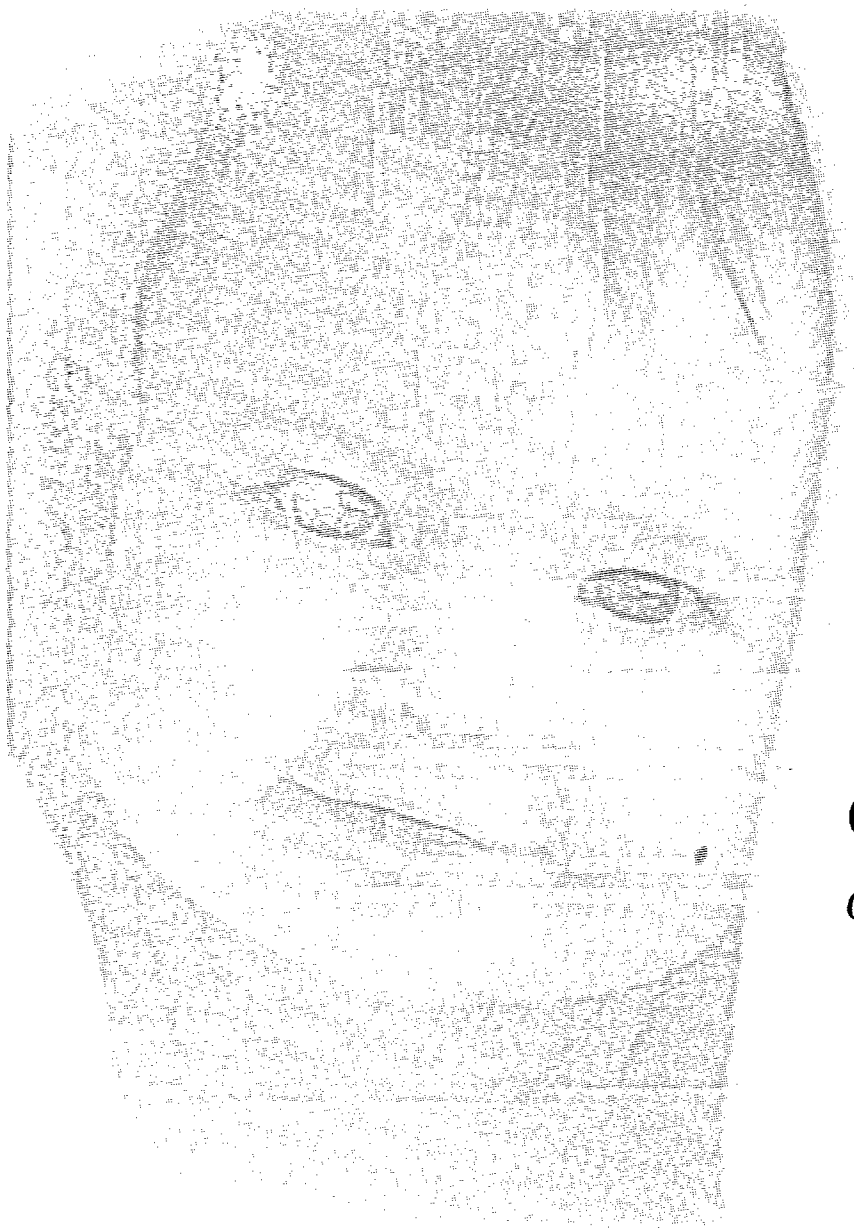

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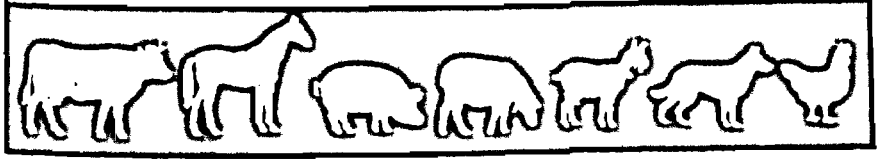

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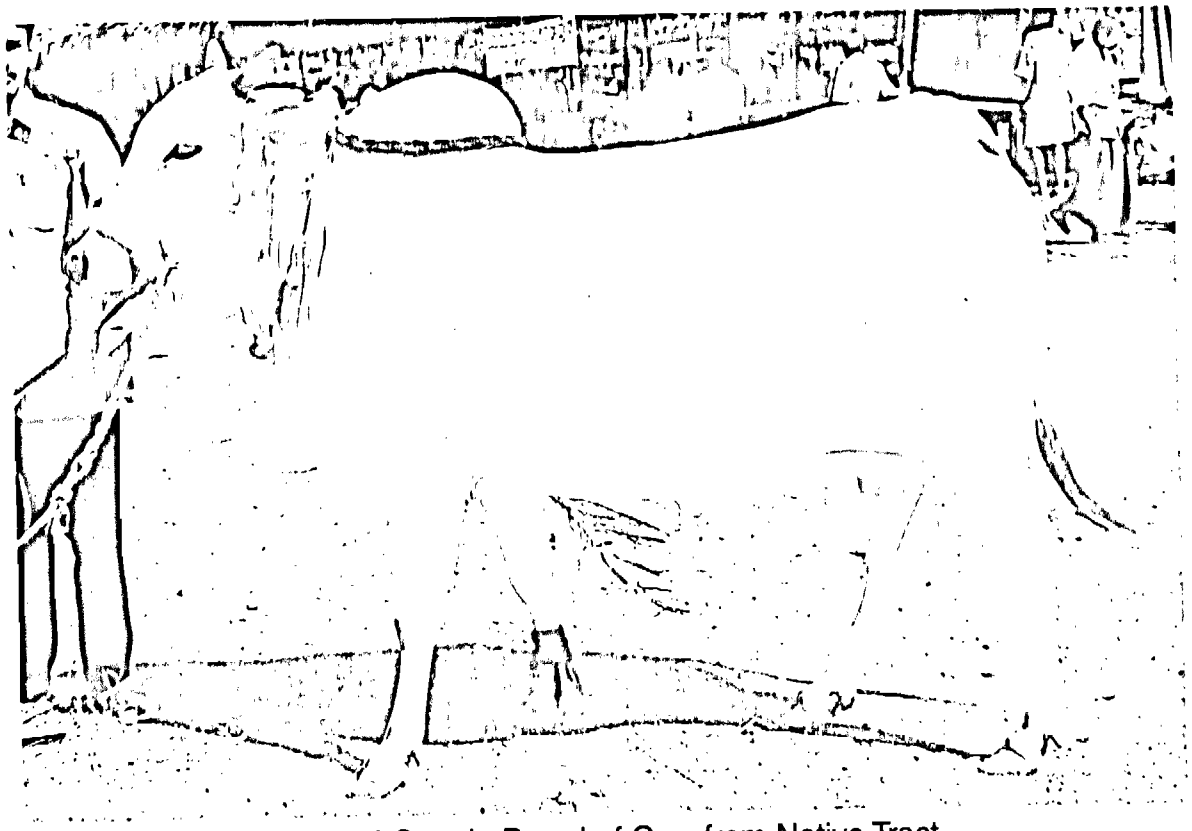

A typical Ongole Breed of Cow from Native Tract.

Sri. Pathuru Nagabhushanam
ZP Chair Person, Guntur Presenting 1 Lakh cheque to the
ANGRAU Vice-Chancellor, Dr. I.V. Subba Rao
and also seen Dr. A. Satyanarayana, Director of Extension.

SOUVENIR

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