

Response to selection

Basis for designing breed improvement programmes



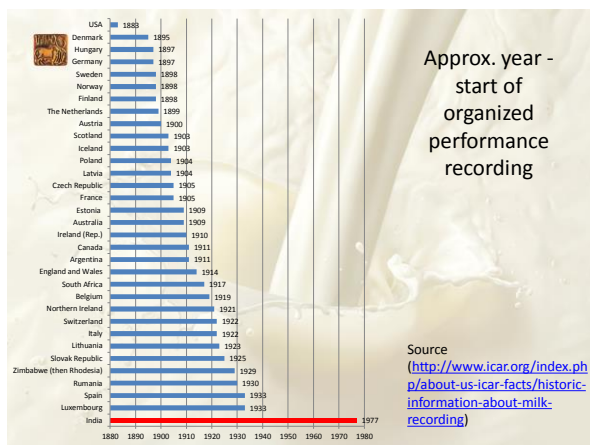
National Dairy Development Board

Performance recording

History, current status

World History

- The first official herd book was established in the Swiss Canton of Berne in 1806 for Simmental breed of cattle.
- In 1822, George Coates published the first volume of his herd book; this was the first pedigree herd book for cattle in the world. - Beef Breeders' Annual, An Inverell Times supplement, Shorthorn breed arrived with the First Fleet, July 2008
- World's first milk recording society was started in Denmark in the year 1895 (Hansen, 2014).
- The first Cow Testing Association (CTA) was started in America in the year 1905 (Ferris, 2006).
- In France first Milk Recording Syndicat, came into operation in the Seine Maritime Department in 1907





ICAR survey on recording

- Recently International Committee on Animal Recording (ICAR) surveyed 41 recording organizations in various countries and found that most of the organizations are either privately or cooperative owned and only around 25% were owned by government or public sector. (Bucek et. al. 2017)

Ownership type	No. of Organizations	% of Organizations
Government	7	17
Other Public Organization	3	7
Private/Cooperative/ Others	31	76



Standardization of recording

- As early as 1923 the countries that had set up Milk Recording systems were already attempting to standardize test methods and the form in which results were expressed.
- At the International Congress on Agriculture held in Paris in 1923, the following motion was passed:

“As regards Milk/Butter Recording of dairy cows, there is a case for standardizing recording procedures among the countries of Europe. In particular, it should be recommended that milk and butter records be expressed in the same form.”



Source: <http://www.icar.org/index.php/about-us/icar-facts/historic-information-about-milk-recording>



Standardization of recording

- first assessment of the situation worldwide, published by the International Institute of Agriculture in 1924 under the title “Dairy Cow Recording in Different Countries”, listed twenty countries practicing Milk Recording, with a combined total of 1.8 million cows tested.
- The idea of international standardization of Milk Recording was first aired long ago. As early as 1922, and again in 1925



International Committee on Animal Recording (ICAR)

- “International Agreement for the Unification of Cattle Herd Book Methods” was signed (Rome) in 1936.
- After a gestation period of nearly thirty years and efforts by many scientists, an International Organization designed to harmonize Milk Recording methods, calculation procedures and formulation of results, finally saw the light of day on March 5th-9th, 1951, in Rome – Which later on was named ICAR

Sources of records -developed dairy industry

- Today in the era of computerization, the data comes from varied sources to a single database. The database is later on accessed by all stakeholders
- An example of data sources is described by Frandsen (2015). Danish Cattle Database receives data from various sources as below:
 - Mandatory recordings. – Birth, identity, pedigree, culling
 - Milk recordings. – volume, components, SCC
 - The farmer own voluntary recordings. - Volume
 - Recordings from service suppliers. - Conformation traits
 - Veterinarians. – Disease and health related parameters
 - A.I technicians. – Breeding data
 - Breeding advisors. – mating advises
 - Nutritional advisors. – Feed related information
 - Dairies. – total volumes and components
 - Slaughter houses. – carcass traits
 - Etc. ...



Traits listed by ICAR

- Countries record more than 30 traits
- ICAR in its latest revised guidelines (ICAR 2016, www.icar.org), have grouped traits recorded in different countries

Group	Trait
Production Traits	Standard Lactation Milk Yield (1 st , 2 nd and 3 rd Lactation) Fat Yield (1 st , 2 nd and 3 rd Lactation) Protein Yield (1 st , 2 nd and 3 rd Lactation)
Beef Production Traits	Weight gains at different periods Carcass quality trait (EUROPE Form Scores)

Group	Trait
Fertility Traits	Age at first AI Calving-1 st AI days Conception Rate (%) Insemination Rate (%) 1 st to Last AI days Number of AI Days Pregnant Calving Interval
Calving Traits	Still birth Heifer calves (1 st and later lactations) Still birth Bull Calves (1 st and later lactations) Calving ease (1 st and later lactations) Total difficult calvings ((1 st and later lactations)
Longevity Trait	Days at Culling
Mastitis	Mastitis incidences (1 st , 2 nd and 3 rd Lactation)

Group	Trait
Other Diseases	Metabolic disease occurrence Feet and Leg Problem occurrence (Dermatitis, Digital dermatitis, Heel horn erosion, Sole hemorrhage, Sole ulcer, Wart growth, ID fibroma, ID phlegmon, Fissure, white line Abscess, ulcer of white line Abscess, ulcer of toe, Double sole, Chronic laminitis, Laminitic ring, Asymmetric claw, Screw claw, Over grown claw, Scissor claw, Lameness, Hock lesion) – Claw Atlas Early Reproductive Problem occurrence Late Reproductive Problem Occurrence
Conformation Body	Body Strength Angularity Rump width Rump Angle Chest width Stature
Conformation Udder	Udder height Rear Udder height Rear Udder width Teat Length Teat Thickness Front Teat Placement Rear Teat Placement Central Ligament

Group	Trait
Conformation – Feet and Legs	Rear Leg Rear View Rear Leg Side View Foot Angle
Conformation Milking Speed	– Scores provided by farmers
Conformation Temperament	– Scores provided by farmers
Other traits not in index	Calf Survival at various periods Somatic Cell count Milkeability
Research traits	Methane emissions, Residual Feed Intake, adaptability etc.

Indian scenario

- BAIF initiated milk recording and progeny testing of crossbred bulls in villages of the Ahmednagar district during the year 1970. (Mangurkar 1997)
- Kerala Livestock Development Board, a fully Kerala State Government-owned company formed in 1976 integrating the Indo Swiss Project, has been implementing milk recording and genetic evaluation of bulls through progeny testing since 1977. - Chako et. al. 1997



DIPA

- NDDB initiated its Dairy Herd Improvement Programme Actions (DIPA) in six districts in Gujarat in the early 90's: in Mehsana district for Mehsana Buffaloes, in Kheda district for Murrah buffaloes and in Sabarkantha, Baroda, Panchmahals and Surat districts for Murrah buffaloes and crossbred cows.
- These all programmes were initiated with the purpose of milk recording of daughters for progeny testing of bulls.
- Field performance recording to identify elite bull mothers was carried out by Karnataka Milk Federation and Tamil Nadu Cooperative Milk Producers Federation (Trivedi, 1997)



Central Herd Registration Scheme - CHRS

- CHRS was started with the aim to milk record cattle and buffalo breeds in their native tract to identify elite cows and procure bull calves for both NS and AI
- Here pedigree is not recorded



AICRP on cattle and buffaloes

- All India Coordinated Research Project on buffaloes was started in the year 1970-71 with an aim to progeny test bulls of buffaloes (now covers Jaffarabadi, Nili Ravi, Surti, Bhadawari, Pandharpuri, Godavari, Swamp, Murrah and Surati buffaloes) in the associated herds. Later on the project was named as Network project on buffaloes
- Similarly, AICRP on cattle was started in the year 1971 for progeny testing Frieswal cattle. Later on Indigenous breeds were included



Field Milk Competitions

- Various state AHDs conduct field milk competitions during cattle fairs and other events
- State of Haryana organized large scale competitions to identify elite Murrah buffaloes
- Only Peak Milk Yield for 3 days was recorded in the competitions.



Data on organized herds

- Detailed pedigree sheets since many years available at the organized farms since establishment.
- Most in paper format – not computerized
- Data disconnected – cannot be combined for analysis – inferences valid only for those farms.



Traits recorded

- Initial emphasis was only for milk volume
- Fat % were recorded under DIPA programmes
- Reproduction events were recorded under DIPA programme for all the daughters born out of test mating. However dam recording was not carried out



Data recording platforms

- amul.org online data recording facilities – data on limited aspects, no pedigree information recorded
- Herd management software (e.g. Herdman) – stand alone herd data. No unique id mechanism
- Animal health cards – data limited only on vaccination. Production details, pedigree, environment etc. ignored. Not useful for genetic evaluations
- INAPH- system with unique ID, pedigree integration, recording possible on all aspects of dairying by service providers. Got decided to use as national database. Not useful for individual farm management.
- Paper based recording and reporting system followed by most farms and govt. services – cannot be aggregated and analyzed.



Potential Research areas

- Recording harmonization and ways to combine data from different sources
- Methods to measure (at farmer's place)
 - Disease resistance (and disease to be considered)
 - Feed efficiency in small holder condition
 - Heat tolerance related traits
- Cost benefit analysis for performance recording in various conditions
- Traits of importance and methods of recording in breeds that are not reared for milk recording
- Optimizing recording cost by evaluating impact of frequency of recording
- Developing breed wise scales of scoring for type traits and traits to be considered
- Extension methods indicating importance of recording for farmers, policy makers and implementers



Productivity of Indigenous breeds

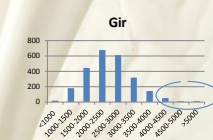
Breed	Avg. Lact. Yield Kg*	MSP for Semen prod.	Average recorded in field	Maximum Lact. Yield Kg recorded
Cattle				
Gir	2110	3000	2473	5956
Hariana	997	2000	2097	4536
Kankrej	1745	2500	2418	5476
Rathi	1560	2000	2799	5433
Tharparkar	1749	2500	2052	3611
Sahiwal	2325	3000	2300	4763
Buffalo				
Jaffarabadi	2239	3500	2700	6729
Murrah	1752	3000	2644	6629
Mehsana	1988	3000	2470	5555
Pandharpuri	1502	1600	1713	3044
Niliravi	1850	3000	2413	4855

* Nivsarkar et.al, 2000

Gir cows and their performance



No. of AI	48066
No. of Calving	10478
No. of bull calves registered	345
No. of bulls procured	45
No. of bulls distributed to semen station	26



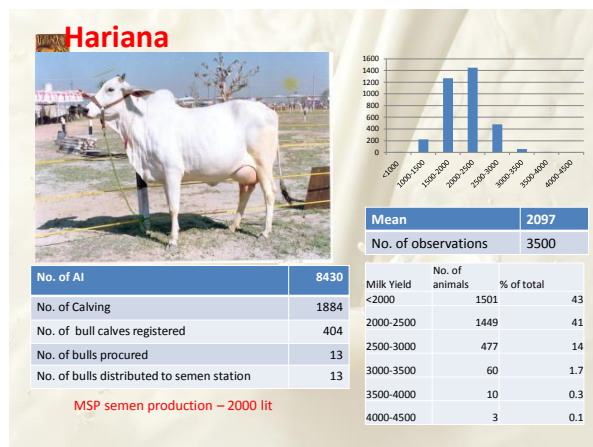
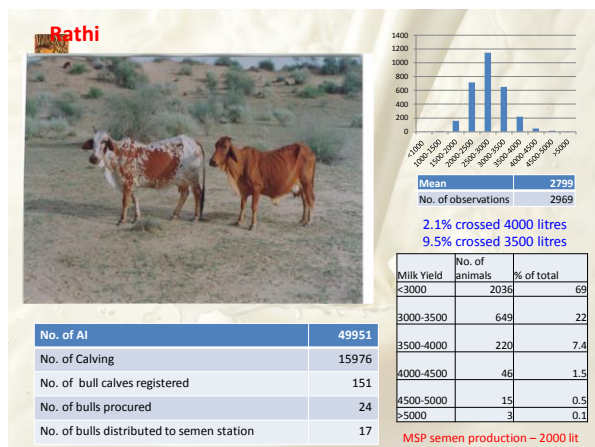
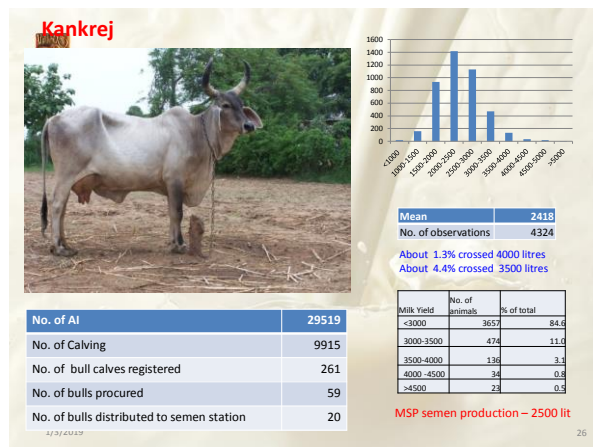
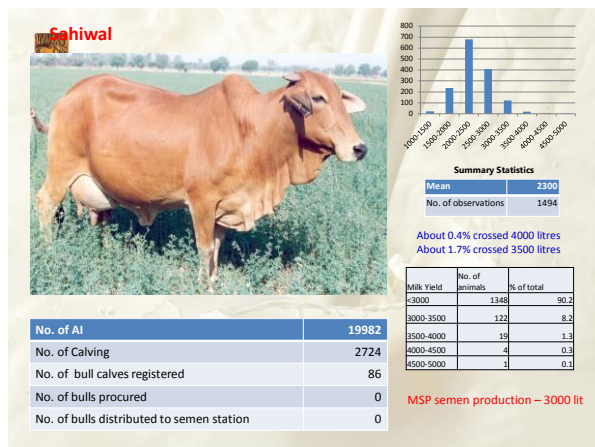
Summary Statistics

Mean	2473
N0. of observations	2454

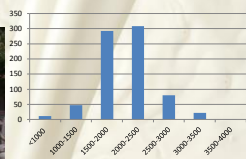
About 2.7% crossed 4000 litres
About 8.5% crossed 3500 litres

Milk Yield	No. of animals	% of total
<3000	1925	78
3000-3500	319	13
3500-4000	142	5.8
4000-4500	51	2.1
4500-5000	9	0.4
>5000	8	0.3

MSP semen production – 3000 lit



Tharparkar



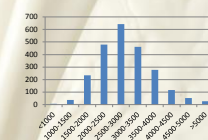
Mean	2052
No. of observations	762

Milk Yield	No. of animals	% of total
<1000	11	1.4
1000-1500	47	6.2
1500-2000	293	38.5
2000-2500	308	40.4
2500-3000	80	10.5
3000-3500	22	2.9
3500-4000	1	0.1

MSP semen production – 2500 lit

No. of AI	6725
No. of Calving	604
No. of bull calves registered	19
No. of bulls procured	0
No. of bulls distributed to semen station	0

Jaffarabadi



Mean	2700
No. of observations	2337

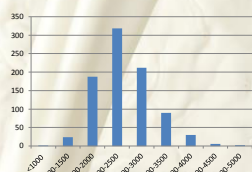
About 8.5% crossed 4000 litres
About 16.4% crossed 3500 litres

Milk Yield	No. of animals	% of total
<3500	1861	80
3500-4000	279	12
4000-4500	117	5.0
4500-5000	53	2.3
>5000	27	1.2

No. of AI	46069
No. of Calving	10478
No. of bull calves registered	151
No. of bulls procured	17
No. of bulls distributed to semen station	13

MSP semen production – 3500 lit

Nili Ravi



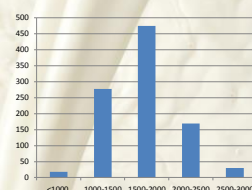
Mean	2412
No. of observations	871

Milk Yield	No. of animals	% of total
<3000	743	24.3
3000-3500	90	10.3
3500-4000	30	3.4
4000-4500	6	0.7
4500-5000	2	0.2

MSP semen production – 3000 lit

No. of AI	18141
No. of Calving	1917
No. of bull calves registered	206
No. of bulls procured	0
No. of bulls distributed to semen station	0

Pandharpuri

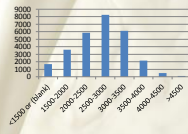


Mean	1713
No. of observations	969

Milk Yield	No. of animals	% of total
<1000	18	1.9
1000-1500	277	28.6
1500-2000	474	48.9
2000-2500	169	17.4
2500-3000	30	3.1
3000-3500	1	0.1

No. of AI	11824
No. of Calving	1936
No. of bull calves registered	45
No. of bulls procured	5
No. of bulls distributed to semen station	0

MSP semen production – 1600 lit

Murrah**Summary Statistics**

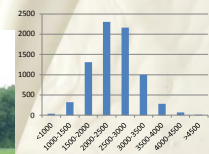
Mean	2544
No. of observations	28393

About 3.2% crossed 4000 litres
About 15.3% crossed 3500 litres

Milk Yield	No. of animals	% of total
<3000	19476	68.59437
3000-3500	6110	21.51938
3500-4000	2172	7.649772
4000-4500	503	1.771562
>4500	132	0.464803

MSP semen production – 3000 lit

No. of AI	830706
Daughters registered	70788
No. of bull calves registered	2035
No. of bulls procured	312
No. of bulls distributed to semen station	167

Mehsana**Summary Statistics**

Mean	2470
No of observations	7502

About 1.2% crossed 4000 litres
About 5% crossed 3500litres

Milk Yield	No. of animals	% of total
<3000	6129	81.698187
3000-3500	998	13.304452
3500-4000	284	3.785657
4000-4500	74	0.986404
>4500	18	0.239923

MSP semen production – 3000 lit

No. of AI	272591
Daughters registered	27356
No. of bull calves registered	375
No. of bulls procured	130
No. of bulls distributed to semen station	74