

7. Livestock Improvement

Livestock improvement depends on the research for development comprising farm and extension management, herd testing, artificial breeding, DNA analysis, physiology, reproduction, epidemiology and microbiology.

Cattle

Development of crossbred strain of cattle – Frieswal: The total population of Frieswal females at 37 Military Farms has reached 16,874 from 2,305 with 1,054 elite cows from 484 in 1989. The average age at first calving was 975.86 days. Least squares mean of 300 days milk yield, total milk yield, peak yield and lactation length were 3,240.81 kg, 3,309.31 kg, 14.86 kg and 331.30 days respectively. The simple average of MY300 was 2,859 kg in first lactation and reached to 3,542 kg in fourth lactation. Ninety bulls have been evaluated for their genetic merit based on the first lactation 300 days milk yield of their daughters and Sire Directory has been prepared.

Conservation and genetic improvement of Indigenous cattle breeds: Progeny testing on Ongole, Gir, Kankrej and Sahiwal was undertaken for genetic improvement and conservation.

Field progeny testing project: Field progeny testing project for improvement in crossbred cattle was undertaken at different centres.

Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana: Field Progeny Testing (FPT) programme was undertaken through the adopted villages of 25 AI centres in Ludhiana district. The average first lactation 305 days milk yield of the crossbred progenies was recorded to be 2,910.1±24.6 kg.

Kerala University of Veterinary and Animal Sciences, Pookot: In 10 different sets, 174 bulls have so far been used; 88,155 inseminations were carried out and 1,081 daughters produced from first eight sets of bulls. The average 305 days milk yield of first eight sets increased from 1958 to 2402 kg.

BAIF, Uruli-Kanchan, Pune: In 8 different sets, 166 bulls have been used. A total of 72,916 inseminations were carried out and 8,873 female calves were born. The present average 305 days milk yield was 2,976 kg.

ICAR Research Complex, NEH Region, Gangtok, Sikkim: From 1,428 inseminations, 379 pregnancies were confirmed and 47 calves were born. Average conception rate was 40-42% after first insemination.

GBPUA&T, Pantnagar, Uttarakhand: The overall conception rate was 57.26% in the farmers' herds around Pantnagar.

Buffalo

Network project on buffalo improvement

Field progeny testing programme: The field progeny testing programme is being carried out at the CIRB, Hisar, NDRI, Karnal and GADVASU, Ludhiana centres for Murrah breed. Artificial insemination of 3,000 buffaloes in the adopted villages was undertaken using semen of tested bulls. Semen of 12 bulls of 12 set was used and total 13,026 of artificial inseminations were performed, 5,002 pregnancies were confirmed and 3,796 calvings recorded at three centres; of which 1,754 were females.

Progeny test evaluation of bulls: Data of first lactation milk yield of the daughters born from the eight sets of test bulls were used to evaluate bulls. Bull from the GADVASU, Ludhiana top ranked with sire index value of 2,303 and superiority of 24.9% over contemporary daughters. Top ranked bull was followed by bull number 4,813 of NDRI centre with sire index value of 2,104 having 12.5% superiority, and Bull No. 2,422 from CIRB centre with sire index value of 2,060 having 9.4% superiority. These bulls were nominated for mating with elite buffaloes for production of future superior progeny.

Sheep

In prolific sheep (GM × Malpura), the body weights at birth, 3, 6 and 12 months were 2.54, 13.65, 19.60 and 26.39 kg respectively. Topping and lambing rate were 92.78, 86.45 with twinning rate of 42.86%. In GMM × Patanwadi (three-breed cross), body weights of 31.82 and 39.35 kg and in reciprocal cross of Patanwadi × GMM, body weights of 20.42 and 29.14 kg at 6 and 12 months of age, respectively, were gained. Kendrapada, a prolific sheep with relatively higher



Prolific sheep GM × Malpura (GMM)

Success story

Reproduction rate improvement in Muzaffarnagari sheep

The Muzaffarnagari sheep usually produces single lamb. The selective breeding undertaken in the Muzaffarnagari Sheep Unit of AICRP on Sheep for Mutton Production at Central Institute for Research on Goats, has improved the twinning rate to around 14.0%. For the first time since the inception, a sheep (ID 6698) produced triplet lambs. The total litter weight of the three lambs was 7.3 kg and 20.8 kg at birth and 2 month of age respectively. The higher litter weight of triplet lambs than single born lamb indicated that the multiple births in this breed can be exploited for increase in mutton production.



Birth of triplet lambs in Muzaffarnagari sheep

body weights than Garole were purchased from native tract of Odisha. *Fec B* gene was detected in 84% of the purchased flock of Kendrapada.

Network project on sheep improvement

Chokla Unit, CSWRI, Avikanagar: The least square means for birth, 3, 6 and 12 months body weights of lambs were 2.97, 14.01, 25.09 and 30.11 kg respectively. First 6-monthly greasy fleece yield of 1.34 kg has been achieved. Adult 6 monthly and adult annual greasy fleece yields were 1.314 and 2.436 kg respectively.

Marwari Unit, Arid Region Campus, CSWRI, Bikaner: The average birth, 3, 6, 9 and 12 months body weights were 3.01, 12.90, 20.07, 25.26 and 31.87 kg respectively. Average annual greasy fleece yield was 1,484 g. The overall survivability was 97.4%.

Muzaffarnagari Unit, CIRG, Makhdoom: The least square means for birth, 3, 6, 9 and 12 months body weights were 3.49, 13.80, 22.48, 25.40 and 30.23 kg respectively. Lambs first clip and adult annual greasy fleece weights were 478 and 1,132 g respectively.

Deccani Farm-based Unit, MPKV, Rahuri: Average body weights at birth, 3, 6, 9, and 12 months of age were 3.42, 15.48, 21.47, 22.88 and 23.89 kg respectively. Average age of ewes at first lambing was 642 days.

Nellore Unit, LRS, Palamner: The body weights at birth, 3, 6, 9 and 12 months of age were 2.92, 11.94, 15.82, 18.12 and 22.92 kg respectively. Lambing and replacement rate in ewes were 83.5% and 28.95% respectively.

Mega Sheep Seed Project

Chottanagpuri sheep, BAU, Ranchi: A flock of Chottanagpuri sheep was established for production of superior sheep seed. Survey of Chottanagpuri sheep was conducted in the breeding tract for identification of flocks, selection of flocks, their registration and collection of baseline data and 60 rams were distributed to registered farmers for improving their flock.

Mandya Sheep, KVAFSU, Bidar: A flock of Mandya sheep has been established. Survey in the breeding tract was conducted to generate base line data. Bandur, Akkaanakoppalu, Belakavadi, Dabbahally and Hadly centres comprising 300 to 500 ewes per centre were identified.

Mecheri Sheep, TANUVAS, Chennai: A flock of Mecheri sheep has been established for production of superior seed. Survey in the breeding tract was conducted to generate base line information. Field centres, namely, Mecheri sheep are Mettur, Thennilai north and Thennilai south were registered under the project.

Sonadi Unit, RAJUVAS, Bikaner: A flock of Sonadi sheep was established for production of superior seed. The survey for generating base line information was conducted in breeding tract of Sonadi sheep. Ewes belonging to 8 centres are covered under the project.

Patanwadi Unit, SDAU, Sardarkrushinagar: The least square means for birth, 3, 6, 9 and 12-month body weights were 3.06, 15.60, 20.99, 24.49 and 27.91 kg respectively. Overall annual lambing percentage was 102.63.

Magra Unit, RAU, Bikaner: Average body weights at birth, 3, 6 and 12 months and adult stage were 3.03, 21.66, 30.79 and 39.53 kg respectively. Average greasy fleece weight at 6-month age and adult annual were 1,025 and 2,129 g respectively.

Success story

Birth of twins

Male and female twins were produced through *in-vitro* fertilization (IVF) in goat for the first time. The surrogate mother was of Sirohi breed. The birth weight of male kid was 2.4 kg and of female 2.6 kg. An IVF technique is an important method for improvement and conservation of goat breed, has applications in faster propagation of the genetic merit of the elite female goats.



Twin kids, a male and a female, produced through IVF

Success story

Milk production performance of Jakhrana goats

Jakhrana, one of the best milk producing goat breeds is native of village Jakhrana in the Alwar district of Rajasthan. As the population is decreasing in its home tract, the CIRG took initiative to establish a nucleus flock for improvement and conservation of the breed. Selection resulted in improvement in milk production by 27.53%. Does having the peak yield above 2 litres of milk/day are common.



Madras Red Unit, TANUVAS, LRS Kattupakkam: Average body weights at birth, 3, 6, 9 and 12 months were 2.85, 11.37, 15.46, 19.28 and 22.22 kg respectively. Overall, 84.90% lambing was observed.

Ganjam unit, OUAT, Bhubaneshwar: Average body weights for birth, 3, 6 and 12 months were 2.73, 11.88, 16.98 and 24.61 kg respectively.

Deccani Field-based Unit, MPKV, Rahuri: Survey of Deccani sheep was conducted in the breeding tract for identification of flocks. A total of 37 Deccani sheep flocks were identified and registered. The overall means of body weights of progenies at birth, 3 and 6 months of age were 3.40, 15.57 and 21.83 kg respectively.

Rabbits

In Angora rabbits, the fibre yield ranged from 149 to 170 g in five clips in a year. Improvement in staple length was from 6.06 to 6.12 cm, fibre diameter from 12.89 to 12.84 μ and guard hair from 5.62 to 4.99%. Angora rabbits (99 males + 154 females) were supplied as germplasm to the farmers and NGOs of Himachal Pradesh, Uttarakhand and Delhi.

Black Brown (BB), Soviet Chinchilla (SC), White Giant (WG), New Zealand White (NZW), Grey Giant and Dutch broiler rabbits attained 1.8-2.0 kg body weight at 12 weeks of age at Avikanagar. Mean weights at 6 and 12 weeks were 0.892 and 1.962 kg in WG and 0.879 and 1.916 kg in SC, respectively, at SRRC, Mannavanur (Tamil Nadu).

Pig

Development of suitable crossbred pig: Three crossbred lines consisting of 50% exotic inheritance



Crossbred pig

of Hampshire with Ghungroo showed promising results. The average litter size at birth and weaning in the crossbred line was 9.84 ± 0.40 and 8.81 ± 0.40 respectively. The average litter weight at birth and weaning was 10.94 ± 0.45 and 59.97 ± 2.75 kg respectively.

Poultry

Poultry for egg: Under the AICRP on Poultry Breeding, pure lines of White Leghorn chicken (IWH, IWI, IWD, IWF, IWN and IWP) were improved through intra-population selection. Hen housed egg production up to 72 weeks of age in IWN and IWP was 309.63 and 297 eggs, respectively. In the 20th Random sample Poultry performance test at Gurgaon, the cross of Anand centre stood first in egg production. At KAU, Mannuthy, annual egg production of hen housed under field conditions of N \times P cross was 296 eggs up to 40 weeks with egg weight of 53.8 g. At AAU, N \times P cross produced 303.8 eggs up to 72 weeks of age. At SVVU, Hyderabad, hen housed egg production was 280 up to 72 weeks of age in IWD and 290 in IWF.

Poultry for meat: Five synthetic coloured broiler populations were improved through mass selection for 5-week body weight (Coloured broiler line Punjab Brown (PB)-1 and Coloured Synthetic Male Line, CSML and 5-week body weight along with egg production (PB-2, Coloured Synthetic Female Line, CSFL and Synthetic Dam Line, SDL). The average genetic and phenotypic response for 5-week body weight in PB-2 was 23.6 and 15.6 g respectively. At GADVASU, Ludhiana, the 5-week body weight in PB-2 improved by 47.3 and 57.1 g/generation on the phenotypic and genetic scale respectively. At CARI, Izatnagar, the genetic response for five weeks body weight was 14.0g in CSML and 15.9 g in CSFL. At OUAT, Bhubaneshwar,



Coloured broiler breeder male

Poultry Seed Project

Parent chicks of Vanaraja and Gramapriya were reared and the chicks produced were distributed in the area. At Patna centre, 29,929 eggs of Vanaraja and 29,714 eggs of Gramapriya were produced and chicks were distributed. At Kolkata centre, 13,553 chicks were produced and distributed to farmers in Sunderban delta of West Bengal. At Jharanapani centre, 62,788 eggs produced from Vanaraja and Gramapriya parents were hatched and the chicks were distributed among the 262 farmers of different districts of Nagaland. At Gangtok centre, day-old 5,571 chicks were produced and distributed to the farmers. At Imphal centre, 12,879 chicks of Vanaraja and Gramapriya were distributed to the farmers in nine districts of Manipur. In comparison to local chicken, birds were far superior with 95% higher production.

body weight at 5-week improved over previous generation in SDL and CSML lines. The CSML × SDL (Coloured Synthetic Male Line × Synthetic Dam Line) cross attained body weight of 1.54 and 1.84 kg at sixth and seventh week, respectively, under field condition.

At Project Directorate on Poultry, coloured broiler lines PB-1, PB-2 and control broiler were maintained and evaluated. In PB-1, the genetic response for 5-week body weight over the last generation was improved by 109 g (S-21). On genetic scale, there was an improvement of 16.2 g in 5-week body weight over the last six generations. In the 34th Random sample poultry performance test at Gurgaon, the strain cross from Bengaluru centre recorded 1,490 and 1,910 g body weight at 6 and 7 weeks of age, respectively, with corresponding FCR of 1.89 and 2.04.

Development of germplasm for rural poultry: Pure lines (PD-1, PD-2, PD-3, PD-4 and PD-5) were improved through selective breeding. The base generation for male line of egg type rural germplasm (Gramapriya) was produced through random mating of the existing synthetic line and evaluated till 40 weeks of age.

Two-way crosses C1, C2, C3, C4, Vanaraja and Gramapriya were developed and evaluated for production traits up to 72 weeks of age, from which four-way crosses (crosses A, B, C, D and E) were developed incorporating native, broiler and layer genetic base. During early age, C cross showed significantly higher body weight. The B cross appeared to be a promising cross with better egg production (102eggs) and egg weight (52 g) at 40 weeks of age. The HC-3 and HC-4 weighed 1,000 g and 1,100 g, respectively, at 7 weeks of age and crossed 2 kg at 12 weeks of age, are promising for backyard poultry.

Fish

Breeding and seed production of F₁ generation of cobia: Second successful spawning (first achieved in April 2010) and larval production of cobia (*Rachycentron canadum*) was achieved. The brooders

Success story

Early breeding of grass carp

Grass carp (*Ctenopharyngodon idella*), a fast growing herbivorous fish, was successfully bred and produced spawn on 12 April 2011 in a farmer's fish farm in Khurda district, Odisha, under the technical guidance of the CIFA. This early breeding of grass carp in April will ensure availability of fingerlings in June, which marks the commencement of monsoon, during which most of the village community ponds would be ready for stocking.

selected from F₁ generation were induced for spawning with HCG at doses of 500 IU/kg body weight for female and 250 IU/kg body weight for males. The total eggs spawned were estimated as 0.5 million. About 28% fertilization was recorded (fertilized eggs amounted to 0.14 million). The percentage of hatching was 80 and the total number of newly hatched larvae was estimated as 0.11 million.

Larviculture protocols were developed by appropriate management of live feeds in suitable quantities and also taking into consideration, the nutritional requirements of larvae. The repeated successful spawning obtained is a step forward towards standardization of cobia breeding and seed production technology, which in turn can pave the way for cobia aquaculture in the country. Good meat quality and

Success story

Breeding of finfish pompano

The Silver pompano (*Trachinotus blochii*), one of the high value marine tropical finfishes, was bred mainly due to its fast growth rate and high market demand. Its larval production was successfully accomplished. It can be considered as a milestone towards the development of pompano aquaculture in the country. Silver pompano is caught only sporadically in the commercial fishery and hence its natural availability in the sea is rather scarce. It is a much sought after species and hence demands can be met only through aquaculture. The species is able to acclimatize and grow well even at a lower salinity of about 10 ppt and hence it is suited for farming in the vast low saline and brackishwaters of our country besides its potential for sea cage farming.



high market demand especially for sashimi industry are some of the attributes that makes cobia an excellent species for aquaculture.

Evaluation of growth performance of different strains of common carp: To improve the economics of carp culture in mid-hill region, the improved strains of Hungarian scale carp, Ropsa scaly and Felsosomogy mirror carp were bred. The parent stock is being reared at Champawat field centre of the DCFR. The fingerlings of F₁ generation were supplied to different hill states particularly Department of Fisheries of Arunachal Pradesh, Sikkim and ICAR Research Complex for NEH region, Barapani, mainly to evaluate the performance in different eco-climatic condition for later dissemination to fish farmers.



Ropsa scaly and Felsosomogy mirror carp were bred and released as Champa 1 (left) and Champa 2 (right)

Nutrient profiling of clam, crab and prawn: Nutrient profiling of clam, crab and prawn (*Villorita cyprinoides*, *Portunus pelagicus* and *Fenneropenacus indicus*) were analyzed. Total protein content of these species did not differ significantly (clam 18.2%, crab 16.2% and prawn 19.6%). Similarly, the mineral composition was comparable among them (clam 1.98%, crab 1.59% and prawn 1.43%). The saturated fatty acid content was significantly high in clam (39.6%) as compared to crab (26.7%) and prawn (31.1%). The monounsaturated fat content was significantly high in

Success story

Breeding and seed production of blackfinned anemone fish

Broodstock of *Amphiprion nigripes* was successfully developed. The fecundity ranged from 400 to 600 per egg clutch. Survival of the larvae ranged between 60 and 80% during the first 30 days. Production was started in commercial quantities. Broodstock of seven species of clown fishes is being maintained in the hatchery. Black finned anemone fish or Maldives anemone fish *Amphiprion nigripes* is a native species of Western Indian ocean and has good demand for fish hobbyists throughout the world. The demand is mostly met from the wild collections which are threatening the wild stock and habitat. Availability from farm cultured source will help to conserve the wild stock.



clam (13.7%) as compared to crab (12.0%) and prawn (11.1%). The polyunsaturated fat content was significantly high in crab (60.3%) and prawn (57.0%) as compared to clam (45.1%). The fatty acid composition of these species indicated that crab has superior nutritive fat profile.