

7. Livestock Improvement

Cattle

Frieswal cattle: The total population of Frieswal females at 37 Military Farms (MFs) at the end of reporting year was 16,714 including 10,043 adult cows, 5,096 young stock and 1,575 calves. The strength of elite cows at various Military Farms was 1,021. The highest number of elite cows (99) was at MF Pimpri followed by Ambala (98) and Lucknow (97). Frozen semen doses (55,635) of high genetic merit Frieswal bulls were distributed to different Military Farms. Besides this, frozen semen doses were sold to different stakeholders for improvement of farmers' animals. The overall least square means of 300 days milk yield (MY300), total milk yield (TMY), peak yield (PY) and lactation length (LL) were 3,273.77 kg, 3,355.05 kg, 15.14 kg and 334.32 days, respectively. Mature 300 days lactation milk yield of 3,612 kg was achieved.

Conservation of indigenous cattle: So far 65 Ongole bulls have been inducted in the programme and 3,410 daughters were produced from them. Bulls (32) of first four sets were evaluated for their genetic worth on the basis of their daughters' first lactation milk yield. Kankrej (8), Sahiwal (7) and Gir (6) bulls were introduced in first set under the programme, and semen doses were used for artificial inseminations.

Field progeny testing programme: Genetic improvement of crossbred cattle in field conditions under FPT programme is in operation at Guru Angad Dev Veterinary and Animal Sciences University (GADVASU), Ludhiana; Kerala Veterinary and Animal Sciences University (KVASU), Thrissur, Kerala; BAIF Research Development Foundation, Uruli-Kanchan, Pune; and GB Pant University of Agriculture and Technology (GBPUA&T), Pantnagar. The average 305 days first lactation milk yields of the progenies of bulls under test in different batches were 3,133.8±38 kg at GADVASU, 2,715.0±71 kg at KVASU and 3,065.65 kg



A cow with calf at Field Progeny Testing Unit, Pune

at BAIF, and the average age at first calving was 1,127.4±17.1, 1,435.1±21 and 952.52 days, respectively. The average first lactation 305 days milk yield of the HF crossbred progenies in adopted villages of FPT areas increased by 27.9% at GADVASU Ludhiana, 83% at KVASU Thrissur, and 11.76% at BAIF Pune.

Cattle calf 'Holi' produced through OPU-IVF technique: Using Ovum Pick-Up technique first time, a cattle calf was produced in India. The female Sahiwal calf born on 7 March 2012 with a normal birth weight of 23 kg, was named 'Holi'. This technology will be useful for harnessing valuable germplasm from live infertile and aged dairy cattle.

Buffalo

Semen conservation and dissemination: Field champion buffalo bulls available with farmers were identified for semen collection at farmers' door. Doses (20,271) of frozen semen were produced and supplied/sold to farmers.

Field progeny testing programme: Under the field progeny testing programme AI were done on farmers' buffaloes in the field, which resulted in 6,510 calvings. Till date, test day monthly milk yield on 236 progenies has shown average age at first calving of 41.67 months, and average milk yield of 7.83 kg/day was recorded from farmers' animal in the field.

Sheep

Improved prolific sheep: Crosses of Garole and Malpura (GM) produced 47.92% multiple births. In GMM (GM × Malpura), the body weights at birth, 3-, 6- and 12-months of age were 2.25, 11.80, 16.80 and 25.88 kg respectively. Topping and lambing rates were 94.93 and 90.78 with twinning rate of 43.01%. In GMM ×



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Patanwadi (three-breed cross), body weights of lambs were 20.15 and 32.5 kg at 6 and 12 months of age and 21.47 kg at 6 months in the reciprocal cross (Patanwadi × GMM).

Network Project on Sheep Improvement

Chokla: The birth, 3-, 6-, 9- and 12-month body weights of the lambs were 2.73, 12.88, 21.41, 23.76 and 25.74 kg respectively. The greasy fleece yield in first 6-monthly clips, adult 6-monthly and adult animal were 1.25, 1.36, and 2.52 kg respectively. Topping and lambing per cent on ewe's available basis was 99.13 and 103.74, respectively.

Marwari: The average birth, 3-, 6-, 9- and 12-month weights for the year were 3.13, 17.24, 24.37, 27.35 and 30.07 kg respectively. The overall topping and lambing per cent on ewe's available basis were 96.56 and 94.37 respectively. The average fibre diameter and medullation were 37.01 μ and 57.9% respectively.

Muzaffarnagari: The birth, 3-, 6-, 9- and 12-month body weights of the lambs were 3.72, 16.92, 21.63, 26.52 and 31.71 kg respectively. Topping was 103%, and lambing per cent based on ewes available and topped was 91 and 88.2 respectively.

Deccani: Average body weight at birth, weaning, 6-, 9- and 12-months of age were 3.42, 15.55, 21.84, 23.02 and 24.41 kg respectively. The topping per cent was 93.88 while the lambing based on ewes available was 84.17%. Survey of Deccani sheep was conducted in the breeding tract for identification of farmers' flock, selection of flocks, establishment of centres and collection of baseline data.

Nellore: The overall means for body weight at birth, 3-, 6-, 9- and 12-months of age were 3.20, 14.03, 18.56, 23.23 and 24.44 kg respectively.

Magra: The average body weights at birth, 6 and 12 months and adult stage were 3.05, 21.71, 30.84 and 39.71 kg respectively. Average greasy fleece weight at 6-month age and the adult animal were 1,012 g and 2,243 g, respectively.

Madras Red: Overall mean of body weights for lambs born during the year were 2.83, 11.36, 15.46, 19.28 and 22.31 kg, respectively, at birth, weaning, 6, 9 and 12 months of age.

Ganjam: The body weights at birth, weaning, 6 and 12 months of age were 2.70, 11.62, 16.98, 21.51 and 24.64 kg; and 84.29 % lambing was observed during the year.

Sheep Seed Project

Flocks of Chottanagpuri, Mandya, Mecheri and Sonadi sheep were built up for production of superior sheep seed. Surveys were conducted in their breeding tract for identification and selection of flocks, their registration and collection of baseline data. Breeding rams of Chottanagpuri (61), Mandya (45), Mecheri (84) and Sonadi (34) were distributed to the field units to cover breedable ewes.

Goats

Selective breeding has resulted in significant

improvement in body weight, kidding rates, milk yield and population growth both under farm and field conditions in Barbari, Jamunapari and Jakhrana goat breeds. The improved flocks maintained at institutional farms had 25-45% higher body weight at 12 months of age than the base population. Introduction of superior germplasm has enhanced body weight (up to 79%), population growth (up to 63.26%), and kidding per cent (up to 84.58%) in farmers' flock as well. A Barbari doe, under field conditions, produced record number of 13 kids in 3 kiddings—including two quintuplets born. Introduction of superior genetic resources has also facilitated conservation of indigenous goats with considerable enhancement in the income of goat keepers ensuring better nutritional and livelihood security.

Camel

An elite herd of 355 animals of Indian camel breeds comprising Bikaneri, Jaisalmeri, Kachchhi and Mewari has been established at Bikaner following continuous selection for two decades. The Bikaneri, Kachchhi and Mewari are good milch breeds. The Jaisalmeri breed is excellent for racing. The milk production potential of Indian dromedary breeds is 7 litre/day with some of the best milkers producing more than 10 litre/day. Although camels continue giving milk up to 24 months the average length of lactation is around 16 months.

Rabbits

In Angora rabbits, fibre yields of 151.33, 169.39, 155.96, 152.59, 182.21 and 176.57 g for first to sixth clips, respectively, with staple length, fibre diameter and guard hair of 65.86 cm, 12.66 μ and 3.75%, respectively were recorded. German Angora rabbits were distributed among farmers and NGOs for improving Angora wool production. In White Giant and Soviet Chinchilla broiler rabbits, body weight of 2.01–2.02 kg at 12 weeks of age was achieved. Broiler rabbits of both the breeds were also popularized among farmers for improving meat and fur production.

Poultry

The CARIBRO-Mritunjai bird was adjudged to be the best genetic group for production under hot-tropical climate as they exhibited highest means for production traits and also heat stress tolerance.

Genetic improvement of poultry for eggs

Under the AICRP on Poultry Breeding, six pure lines of White Leghorn chicken (IWH, IWI, IWD, IWF, IWN and IWP) were improved through intra population selection. At the KVASU, Mannuthy centre the hen house egg production up to 40 weeks of age increased in both IWN (by 3.4 eggs) and IWP (by 4 eggs) over the previous generation. The average genetic response for egg production to 40 weeks of age in IWN (2.99 eggs) was higher than IWP (2.18 eggs) in the last nine generations. The average genetic response of egg production to 40 weeks of age (1.95 in IWN and 2.08 in IWP) in both the selected strains was positive over the last nine generations

at the AAU, Anand centre. The average genetic response for egg production up to 64 weeks of age for last 11 generations was 0.99 egg in IWD and 0.58 egg in IWF, respectively, at the SVVU, Hyderabad centre. The genetic response of egg production up to 64 weeks of age was -1.67 eggs in IWI and 1.37 eggs in IWH in the last eight generations at the CARI, Izatnagar.

The rural poultry centers evaluated different native and exotic germplasm for field conditions. The MPPCCVV, Jabalpur centre evaluated a cross having Kadaknath (25%) and Jabalpur Colour (75%) with promising performance and acceptance by the farmers. At the MPUAT, Udaipur centre, terminal crosses (RIR × Native) × RIR (RNR) and (Broiler × Native) × RIR (BNR) were produced and evaluated. These two crosses will be used for backyard poultry farming.

Genetic improvement of poultry for meat

Under the AICRP on Poultry Breeding, five synthetic colour broiler populations were improved through mass selection for 5-week body weight in sire lines (PB 1 and CSML) and 5-week body weight along with egg production in dam lines (PB 2, CSFL and SDL). The average genetic and phenotypic responses in PB 2 were 3.71 and 12.07 g, respectively, over last seven generations at the KVAFSU, Bengaluru centre. Over the last six generations, the 5-week body weight in PB 2 improved by 30.14 and 15.2 g per generation on phenotypic and genetic scale at the GADVASU, Ludhiana centre. Commercial cross in the field attained body weight of 1,552 and 1,996 g at 6 and 7 weeks of age, respectively. Body weight at 5 weeks was improved in Coloured Synthetic male line (CSML) and Coloured Synthetic female line (CSFL) at the CARI, Izatnagar centre. The genetic response was 16.61 g in CSML and 16.05 g in CSFL line per generation for 5-week body weight over last 11 generations. The body weight of Synthetic Dam line (SDL) at 5 weeks of age was 1,088 g and was improved over previous generation by 18 g at the OUAT, Bhubaneswar. The strain cross from Bengaluru centre recorded 1,476 g and 1,742 g at 6 and 7 weeks of age, respectively, in Random Sample Poultry Production Test (RSPPT), Gurgaon.

At the Project Directorate on Poultry, three coloured broiler lines namely, PB 1, PB 2 and control broiler were conserved and evaluated. In PB 1, the genetic response over the last generation was 36 g (S 22). In PB 2 (S 21) there was an improvement of 16.8 g on genetic scale in 5-week body weight over the last eight generations.

Fish

Open sea cage farming: Marine fin fish cobia (*Rachycentron canadum*) was evaluated for its potential for cage farming because of its rapid growth rate and high quality lean flesh. Cobia cage aquaculture was initiated in circular open sea floating net cages. Cobia juveniles, ranging in size from 13 to 15 cm, with weights of 10 to 15 g, respectively, attained a body weight of 24.85 kg after 2 years of rearing with average FCR of 1:1.6. The fish grew @ 7.75 g/day in initial 4 months,



Cobia (*Rachycentron canadum*) has potential for cage farming

26.35 g in next 11 months and 44.78 g in second year of rearing. Its successful farming can provide opportunity for export earnings as it is highly prized fish across the world.

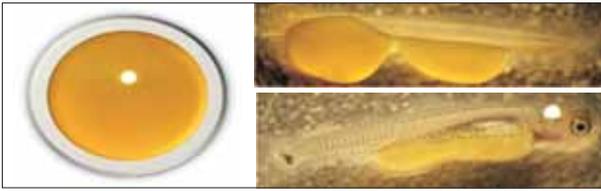
Strategies for fisheries enhancement in reservoirs:

A working module was developed to enhance the fish production in Dimbhe reservoir, Pune, Maharashtra through community co-management. Production of reservoir was improved by plantation of green manure crop, *Sesbania aculeata* (*dhencha*), which increased primary production from 250 mgC/m³/d, to 300 mgC/m³/d, soil organic carbon from 0.45 to 0.85%, nitrate nitrogen and phosphorous from 0.12 to 0.20 mg/litre and 0.01 to 0.05 mg/litre, respectively, reflecting comparatively more availability of nutrients during the course of project period. Seed reared in cages within the reservoir was used for stocking the reservoir. The community was trained for aquaculture practices for rearing fry to fingerlings and for taking up stocking programme of the reservoir resulting in enhancement of fish production.



Dimbhe Reservoir with *in situ* seed rearing in cages

Seed production of chocolate mahseer: The breeding and rearing of chocolate mahseer (*Neolissocheilus hexagonolepis*) available mainly in North-Eastern Himalayan streams was successfully carried out at Bhimtal (Central Himalaya). The fecundity of chocolate mahseer was found to be 6,000-8,000 eggs/kg body weight, breeding period August-September, fertilization 95%, hatching 80%, incubation period 38-



Egg and larval development of chocolate mahseer (*N. hexagonolepis*)

40 hr, egg color light yellow- lemon yellow. The study revealed that chocolate mahseer under temperature 19°–23°C (March) gained high body weight as compared to the other months in both the culture systems.

BRD for the bagnets: Based on the length weight relationship and using linear regression analysis of the juveniles of fishes caught in stationary bagnets, the optimum mesh size for the BRD for the bagnets operated along the Hoogly estuary, Kolkata, was fixed as 50 mm for conservation of *Tenualosa ilisha*. Selectivity trials

Success story

Black pearls produced through culture

The black pearls were cultured for the first time under the MOES funded black lip pearl oyster farming project operated from Port Blair in Andaman and Nicobar Islands. The oysters *Pinctada margaritifera* were seeded and after more than 300 days, the pearls were harvested. The pearls were oval/baroque in shape, measuring 4.8 mm × 3.7 mm and weighed nearly 80 mg. The pearls which were grey-black with golden hue were valued at US\$ 40–50 each.

are being carried out using 50 mm mesh size square mesh windows and cover in the bagnets in Hoogly estuary for the first time and the juveniles of several species could be eliminated through the BRD.

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