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Techno-economics involved with the on farm production of pure Jersey embryos in Ooty, Nilgiris

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Embryo transfer technology (ETT) is one of the most important reproductive biotechnologies where male and female genetic material can be utilized for the faster improvement of livestock (Misra *et al.* 2005). With the acute shortage and increasing demand of exotic germplasm in India, this technology can be exploited to its maximum. Presently due to non-availability of better female germplasm of exotic herd, semen stations are running short of exotic breeding bulls. Again a disease free breeding bull/cow from the field in Indian condition still remains a problem. The cost involved to produce a single embryo and to further develop into a calf and then into a breeding bull/cow, limits this technology for its acceptance in an organized farm and field. With a view to find an answer to a few of the above problems, a collaborative work was taken up between 2 organized farms- Sabarmati Ashram Gaushala, Bidaj (SAG) and Nucleus Jersey Farm, Ooty (NJF- to provide Jersey animals).

Pure Jersey donors were selected from NJF, Ooty, located at the height of 2200 m above mean sea level. Animals were kept under stall fed condition. The programme was conducted in spring. Out of total available open animals, 6 milking cows and 2 heifers were selected based on their pedigree records. Records for vaccination and disease testing [tuberculosis (TB), Johne's disease (JD) and Brucellosis] were confirmed before starting the actual programme. Preliminary selection of recipients was done based on health, cyclicity, age and from Brucella free village (Milk Ring Test done), among the surrounding villages of Ooty, with the help of Nilgiris District Cooperative Milk Producer's Union. Later 23 recipients from nearby villages were selected for testing against diseases tuberculosis TB, Johne's disease and brucellosis. Finally 19 animals were considered as recipients and were synchronized using double PG (prostaglandin) @ dinoprost–0.75 mg (Iliren, Hoechst) at 11 days interval. Based on history of previous estrous cycle, donors were synchronized using single PG @ dinoprost–0.75 mg. Animals in standing estrus were checked per rectally for uterine tone and later on 9th to 11 th day for development of CL (superovulatory CL i.e. SOV CL). The two milking cows were treated with 400 mg (equally divided constant dose), other 2 milking cows with 280 mg (tapering dose) and 2 heifers with 200 mg (equally divided constant dose) of Folltropin V (porcine follicle stimulating hormone). Although it was decided to give PG at 48 h interval after first FSH injection, it was found that 1st animal reported for estrus 12 h post PG. So for other animals, PG was given 60 h later to first FSH and with that all animals reported estrus 36 h post PG. Flushing, screening, grading, transfer and freezing of embryos were done as per the standard procedures [(Misra *et al.* 1990 and by International Embryo Transfer Society Manual (IETS manual)]. Based on the availability of recipients, 9 fresh Jersey embryos transfers were made in 8 recipients and the surplus 23 embryos were frozen using 1.5 M ethylene glycol in Nicool MS–21 freezer.

The summary of the results obtained from flushing and embryo recovery is shown in Table 1. Out of total 49 embryos recovered, 14 degenerated. This might be due to

Table 1. Summary of flushings and embryo recovery

Particulars	Actual (%)
No. of donors selected	8
No. of donors programmed	6 (75.00)
No. of animals flushed (% of programmed)	6 (100.00)
Total ovulations	56
Total embryos recovered (% of ovulations)	49 (87.50)
Total viable embryos (% of ovulations)	32 (65.31)
Viable embryo/flush	5.33

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Table2. Expenditure incurred on embryo collection and embryo transfer

Economics involved by SAG for flushings and transfer at ooty			
Particulars	Quantity	Cost/Unit (Rs)	Total (Rs)
Biologicals			
FSH	4.15	4035	16745
Iliren	14	330	4620
DPBS	6	400	2400
Semen doses	25	25	625
BSA	1	450	450
Consumables			
Rusch catheter	2	8000	16000
Flushing Tubing and 'Y' Junction	2	300	600
Embryo filter	6	500	3000
Millipore Syringe filters	8	100	800
Alcohol	1	60	60
Arm gloves	200	1.3	260
Disposable needle 18 G	1	209	209
Disposable needle 20 G	1	209	209
Paper napkin	5	35	175
Sanitary sheath roll	1	523	523
Towel	10	7	70
Thermocol Box	1	130	130
Syringes 2 ml	1	190	190
Syringes 5 ml	1	190	190
AI Sheath	1	47	47
inj. Lignocaine	5	10	50
Inj. Dicrysticin	12	25	300
Petridishes 35 mm	1	120	120
Petridishes 100 mm	1	120	120
LN2	10	8	80
Administrative and other charges			
Labour wages (2 labours×40 days)	80	110	8800
Feeding cost (6 animals×40 days)	240	75	18000
TA/DA of SAG officers	1	25000	25000
Miscellaneous expenses	-		5000
TOTAL	104773		

still higher dose rate of FSH in 1st ever flush of animals.

It was decided to initiate with lower dose rate i.e 200 mg and 280 mg, but based on the response to lower doses, the dosage of drug can be still reduced to cut down the cost involved. Donors (2) having medium size of SOV CL responded with an average of 5 ovulations, 5 total embryoes (TE) and 1 viable embryo (VE) were recovered. While other 4 donors with big size of SOV CL had an average of 11.50 ovulations, 10.50 TE and 7.75 VE, indicating increased response to better quality of SOV CL.

Complete economics involved (direct cost only) on materials utilized for flushing and transfers is presented in Table 2. As this was a collaborative work and SAG was to provide technical support, the cost involved on the materials taken from SAG like microscope and embryo freezer was not considered. While Table 3 gives the techno-economics of each flush done and each viable embryo produced. Also techno-economics without TA/DA is given to understand the reduction in cost if expertise is available with the farms. As reported by Misra and Pant (2006), the direct cost of production of each viable embryo comes to about Rs 3222, while transfer cost per embryo comes to Rs 600. The overall cost can be reduced by reduction in FSH dose for CB donors (half dose, i.e 200 mg of FSH).

Table 3. Techno-economics per flush and viable embryo produced

Particulars	Over all	Without TA/DA
Total cost	104773	79773
Total cost per flush	17462	13296
Cost per viable embryo	3274	2493

As there is economic burden on farms to maintain recipients, the collaboration with farmers is the only option to increase upon pregnancies and increase number of male calves produced to be supplied to semen station. The same has been emphasized by number of workers to have the best embryos and recipients with good health and condition to achieve the best results (Hasler *et al.* 1987, Petrikovic and Svetlanska 1991, Broadbent 1992). Stringent selection of recipients is must to get the live calf born after spending a lot to produce an embryo. Also the farmers need to be educated for adopting the ETT and their due help and cooperation is required to propagate the technology at field level by utilizing young, healthy and regular cycling animals as recipients.

With the results obtained in the present study, it could be concluded that ETT can be an important tool to exploit the available germplasm in Indian conditions. Well organized farms can take up the programme in similar manner by collaborating with farmers to use their animals as recipients and thereby producing and procuring males under the programme. Although India is having number of personnel with expertise in ETT, owing to certain limitations they are unable to take up the ET programme. As cited above, still cost reduction can be done of each embryo produced.

SUMMARY

With the present scenario of increased demand for exotic animals, Pure Jersey/HF bulls and nonavailability of desired genetics, there is a need to exploit the available germplasm. In view of this a collaborative Embryo Transfer (ET) work was taken up by SAG and NJF to superovulate and flush available elite females and then transfer embryos into the synchronized recipients available in the field. All donors and recipients selected were tested against TB, JD and Brucellosis. Disease free animals were selected and taken for programming. Total 6 Jersey cows were flushed using semen from the exotic bulls.

Total 49 embryos were recovered with an average of 8.17 embryos per flush, while viable embryo recovery was 32 with an average of 5.33 per flush. Nine fresh embryos were transferred in 8 recipients, while 2 frozen transfers were also done in 2 recipients. The overall direct cost involved including biologicals, consumables, administrative and TA/DA etc. was Rs 104 773 with Rs 17 462 per flush and Rs 3274 per viable embryo recovered. It was concluded that as cost to produce one pure bred viable embryo is Rs 3 274, ETT should be used as a tool by established farms and institutions for producing elite germplasm.

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