REPORT

MARCH 1987

CONSULTING REPORT

ON EMBRYO TRANSFER TECHNOLOGY

March 12-28, 1987

Agricultural Research Project (386-0470)

Delivery Order No.30

Contract No.386-00000-C-00-5039-00

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D.O 30

A Report of the Consultancy in India
for the Indian Council of Agricultural Research
from March 10 to 27, 1987

Embryo Transfer Subproject Under the
Agricultural Research Project/India

Submitted by:

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March 17, 1987

The National Dairy Institute
at Karnal Embryo Transfer Project

Only a few embryo recoveries have been attempted, and two embryos have been transferred. However, Drs. Singh and Jain understand the principles. Facilities are good, with ample laboratories filled with sophisticated equipment managed from all appearances by very competent technicians lead by a senior scientist.

The reasons for such a small effort in embryo transfer appear to be a lack of funds for the project and the diversified activities of the two scientists involved leaving too little time for developing their skills in embryo transfer.

Several other scientists would benefit from a competent embryo transfer group from the cytogenetics group to nutrition, e.g., manufacturing identical twins for experiments as we did in Colorado. Thus, funds are eminently necessary as soon as possible before the enthusiasm of these young scientists is turned to other areas of activity.

Recommendations

A minimum of two scientists should be appointed to be responsible for motivating this project. One should devote 100 percent of his time and thought to embryo transfer in farm animals of significance. One or two donors initially should be superovulated every working day to thoroughly familiarize the personnel in basic technology of recovering, transferring, freezing, and eventually splitting embryos. Donors selected could be superior milk producers so that genetic improvement and a sense of responsibility in doing the best job possible is engendered from the beginning, leading to early signs of meaningful achievement.

Training from foreign experts at the Karnal location would not only be more economical by far, but the results would also be superior to training overseas for the following reasons:

1. There are ample donors and recipients for training which will not be the case in developed countries where cows and labor are expensive.

2. Facilities are excellent for schools at Karnal.

3. Embryo transfer techniques suitable in developed countries are frequently unsuitable in a developing country. The expert on location will be able to learn local conditions and adapt techniques as he teaches.

4. Training programs at Karnal will be at a fraction of the costs in the United States of America.

5. Research on embryo transfer techniques can be carried out while holding embryo transfer schools.

Haryana Agricultural University March 18 and 19, 1987

Very little embryo transfer work has been completed. There are two groups claiming interest--one in the veterinary school and the other in animal sciences. Facilities and equipment are adequate, but funds for establishing a competent embryo transfer team are lacking.

There are adequate supplies of animals, cows on the campus and the large national buffalo herd close by which will apparently cooperate and provide animals for embryo transfer. At a faculty meeting, members explained there were no funds for feeding cows or buffaloes for embryo transfer work; however, the buffalo herd will alleviate this problem and serious discussions on collaborative efforts should be pursued.

As at Karnal, several scientists at Haryana could greatly benefit in their research if a competent embryo transfer team were available to supply embryos on a regular basis. Embryo transfer is an extremely powerful research tool, thus providing not only more superior animals but more research opportunities.

Recommendations

A combined team should be formed between the two groups. Only two or three scientists need to initiate the project with one aggressive person to ramrod the activities, spending most of his time and thought in this area. At least two donors should be prepared for embryo collection each day and at least 100 embryos should be collected and either transferred into recipients or frozen over the next few months. At the same time, work could be started with the buffalo; however, progress in this species will be slower as we have no basic information on optimum methods for embryo transfer. Thus, the cow should be the basic training unit, and, with diligence, Indian scientists can become competent within three to four months.

The basic embryo transfer tools are the required equipment (see list attached). With two stereoscopic microscopes (approximately $1,500 each) and an embryo freezer ($1,275), basic recovery and transfer equipment should be around $8,000 to $10,000 for one year's work. Supportive equipment for hormone profile work is already available. FSH, if bought judiciously, can be purchased for $30 per 50 mg. (beware when selecting a supplier). Local prostaglandin is apparently $.80 per dose.

A reasonable minimum number of collections in the first year would be 200.

Superiority is observed in the following significant traits in the Australian-Friesian-Sahiwal breed which has been fixed at the fourth generation and is now known as AFS.

AFS				Friesian			
Milk	Fat	Dry Period	Inter-calving interval	Milk	Fat	Dry Period	Inter-calving interval
liters	Kg	days	days	liters	Kg	days	days
2558	105	.83	389	2291	82	93	448

Superiority of AFS over Friesian

Growth Rate	Milk	Fat	Dry Period	Intercalving Interval
26.0% faster	11.6% more	27.0% more	12.6% shorter	13.2% shorter

Cows were grazed under tropical conditions in the open with relative humidity varying from 64 percent in the winter to 85 percent in the summer.

Indian scientists can develop a similar superior cross, for example, the following steps:

1. Select 50-100 of the best Sahiwal breed to the top Jersey or Friesian bull.

2. Select 10 bulls each year for progeny testing. Bulls from the top cows are mated to cows of similar high production.

3. Grow to 15-18 months of age and select for growth rate, tick resistance.

4. From each bull select 20 daughters and place in at least 3 different herds (the more herds the greater reliability of the test) and measure milk production.

5. Evaluate production under the technique of Best Linear Unbiased Production and eventually as numbers increase a Breeding Value can be given to bulls.

Utilizing a conventional scheme using bull progeny testing, the genetic gain is 1 percent per year; but if multiple ovulation and embryo transfer is used, the gain is estimated by Smith and Nichols to be 2.5% (MOET). Progeny testing bulls may not be feasible under conditions in India, and the MOET plan may be worth considering.

This plan is as follows:

1. From half-crosses, Sahiwal x Jersey, select the top 20 heifers on milk production.

2. Breed the heifers to the top half-cross bull (either imported semen or one bred in India) after superovulating with FSH.. Collect embryos and produce 10 pregnancies per year from each of the 20 elite heifers.

3. The 80-120 heifers are bred to calve at 2 years of age. Measure first lactation and select and repeat as before. Heifers are evaluated on:

   a. first lactation performance
   b. performance of full- and half-sisters
   c. their dam's first 3 lactations
   d. bulls are selected on female relatives' lactation performance

Advantages of MOET

1. Generation interval is halved from 6.3 years to 3 years.

2. Only elite females are used so the selection differential is greater.

3. Avoid conventional bull-testing programs which are probably impossible to perform in India.

4. A rapid surplus and a continuing one to provide semen, embryos and cull animals from the superior nucleus herd. The culls will still be far superior to the general population.

5. Testing for milking ease and resistance to mastitis is simplified and more accurate.

PLAN 2 Import Tested AFS Heifers and Multiply by MOET

Import the AFS and avoid the initial years of building a new breed which takes four generations. This action would also avoid the early very high culling rate (up to 60 percent) due to retained milk which happens if Bos indicus cattle are milked by machines, although this may not apply under general Indian conditions.

Either cattle or embryos could be imported and a MOET plan instigated immediately. Unfortunately, there may be a problem in purchasing due to the scarcity of this breed and small Indian foreign reserves.

PLAN 3 — Rapid Genetic Improvement Plan for Buffaloes

From existing records, select elite buffaloes for MOET. From each elite herd select the top 20 heifers as before and superovulate.

Record milk production, fat production, days to puberty, intercalving interval, milking ease, susceptibility to mastitis.

Sell from these elite herds semen, embryos, animals.

PLAN 4 A Teaching, and Research and Development Scheme

While teaching embryo transfer techniques in India, it is possible to simultaneously carry out experiments, e.g., donors eventually for students can undergo superovulation experiments and experiments such as freezing and splitting on embryos can be performed. Thus schools would serve two purposes, saving money and speeding up progress into buffalo reproductive and embryo transfer investigations.

It is suggested intensive 10-14 day schools be held; from experience this time period is sufficient. Students must already be accomplished in palpation of the reproductive tract and passing rods through the cervix. Ten donors per day are prepared for classes of 10-20 persons. If possible, around 20 recipients per day but this is not essential.

Methods can be developed in embryo transfer techniques for indian conditions and restraints.

PLAN 5 Teach Embryo Transfer Techniques to Indian Scientists in the U.S.A.

My consultant colleague prefers this method of teaching, and he can explain his reasons. I also have facilities available for teaching in the U.S.A.

How are all of these plans to be funded?

The money for funding these plans could be from diverting large portions of USAID monies allocated to incredibly expensive equipment and teaching plans. For example, it is ridiculous to spend 26 weeks as suggested on learning how to collect embryos when it only takes two weeks. To spend $300,000 on Foley catheters for one group when $2,500 would buy the type of catheter most of us use in the industry indicates incredible ignorance. There are many more examples of overspending which finally totals $2,000,000 which does not include even running costs.

If the purpose of spending the $2,000,000 is to stock the laboratories with equipment at this time, it has to be a gross example of overkill. From observations made this past week, most

laboratories already own and are operating more than sufficient equipment for embryo transfer. In addition, it will be two years before scientists developing embryo transfer skills can use the sophisticated equipment suggested even if it were necessary. In my experience for several reasons, buy as you need.

Flow of Technology to the Field

1. Train a nucleus of Indian veterinarians in embryo transfer (ET) techniques. This training should be given by experienced veterinarians from the United States.

2. Nucleus veterinarians practice daily to become efficient culminating in publishable results.

3. Simultaneously develop nucleus herds with superior performance plus identify local superior donor cows in the villages.

4. Identify rare germ plasm (breeds) considered to be worthy of conserving by collection and preservation of gametes.

5. Apply MOET plan to nucleus herds to supply proven superior semen, embryos, and animals. Work will be conducted by nucleus veterinarians.

6. Train country or local veterinarians in embryo transfer technology using the experienced nucleus veterinarians.

7. Transfer frozen embryos from the nucleus herds into village recipients. Initially, embryo transfer work would be performed by nucleus veterinarians, but eventually this would be the task of village veterinarians.

8. Organize blood-typing laboratories to verify parentage.

9. Make embryo transfer part of the University syllabus.

10. Make embryo transfer audio-visuals for farmers and veterinarians.

Savings could be made in the following way:

Training		
Already allocated	$	841,000
My opinion		500,000
Savings		341,000
Equipment		
Already allocated	$	843,200
My opinion		325,705
Savings	$	517,495

Approximately $859,505 will train and supply teams at the locations mentioned in the 1986 report. The remaining $1,140,495 could be diverted to running costs for which there is no provision and to the suggested projects enclosed. This money will supply an adequate funding for the scientists and will augment milk supplies in a relatively short time utilizing the latest—biotechnology. Indian scientists will be even more motivated to learn and apply new techniques, and will have an endless chance of performing exciting and practical experiments with unlimited material for writing and publishing meaningful experiments.

Conclusions

1. Several scientists are familiar with embryo transfer technology in embryo recovery and superovulation but not in embryo transfer, but further instruction is needed.

2. Approximately two weeks of intensive teaching will be sufficient to make the scientists proficient in the above subjects plus surgical transfer and freezing of embryos. Nonsurgical transfer will take several months but should be practiced immediately and used exclusively once surgical pregnancy rates are achieved.

3. In my opinion, from past experiences in other underdeveloped countries, schools held in India will be the most efficient and economical method of teaching. Approximately 10 to 20 persons could be trained at one time. Karnal is a good location with laboratories, cattle and accommodation for students. Simultaneously, some research can be performed on donors and recipients used by the students.

4. Immediate steps should be taken to design and expedite superovulation experiments in buffaloes because there are problems and different protocols will be needed.

5. As soon as possible, experiments on finding an optimum medium for buffalo embryos are needed as we found medium used for cow embryos was not suitable.

6. An experiment should be designed (once proficiency is achieved) to transfer buffalo embryos into cow recipients and buffalo recipients.

BASIC EMBRYO TRANSFER DRUGS AND EQUIPMENT NEEDED BY EACH GROUP

For 100 superovulations and 200 transfers, collect 5 donors each day worked.

LIST A Expendable Items

Country of source		
USA	FSH 50x50 mg FSH @ $30/50 mg	$ 1,500.00
India	Prostaglandin $0.80/dose. $1.60x100 donors	100.00
	0.80x200 recips.	160.00
India	Local anesthetic	20.00
India	Syringes: 1 cc, 5 cc, 35 cc, 50 cc	30.00
India	Hypodermic needles: 18 gu, 22 gu	5.00
India	Media-PBS powder x 200 liters	200.00
India	Distilled water-make in laboratory	
USA	Media-100 ml PBS triple distilled 10x$3 ea	30.00
USA	BSA Fraction V. sold in 500g bottles for $350	50.00
USA	ET plastic bags with tubing disposable $5x20	100.00
USA	Foley catheters $5x20, reuse	100.00
India	Stillettes, use from 0.5 cc Al gun or make	
USA	Filters, $12 ea, 1/day/20 days	240.00
USA	Searching dishes, reuse 100x50 c	50.00
	Culture dishes, reuse 200x25 c	50.00
Straws	1500/packet 0.25 cc	12.00
ETsheaths	200x$1.35 ea	270.00
ETchemise	2 packets	20.00
TOTAL		$ 2,937.00

LIST B Capital Equipment

USA	E T embryo transfer gun	$ 87.00
USA	Microscope stereoscopic with ZOOM	1,500.00
USA	Freezer	1,275.00
India	Cervical dilator 30 cm x 5 mm make	5.00
TOTAL		$ 2,867.00

LIST A	$ 2,937.00
LIST B	2,867.00
TOTAL	$ 5,804.00

Additional costs:

- Purchasing agent
- Packaging
- Permit for FSH
- Transportation
- Import duties

XN-AAZ-000-A

EMBRYO TRANSFER TECHNOLOGY AND BIOENGINEERING IN LIVESTOCK SPECIES AND THEIR PATHOBIOLOGICAL IMPLICATIONS

A REPORT OF DR. A.K. KARIHALOO, U.S. CONSULTANT ON EMBRYO TECHNOLOGY TO INDIA

1. Introduction

Winrock International approached me in January, 1987 to act as consultant to the U.S.-aided project entitled "Studies on Embryo Transfer Technology and Bioengineering in Livestock species and their pathobiological implications" (Project No.386-0470 Subproject 6) to be implemented by the Indian Council of Agricultural Research in India at various ICAR Institutes and Agricultural Universities. The consultancy started on 12th March, 1987 and ended on 29th March, 1987.

The terms of reference of this consultancy were to visit the institutions where this project was to be implemented and to make a general assessment of the facilities available, the staff in position and to examine the equipment, training and consultancy needs of each sub component. It was further suggested that I attend a Workshop of participants/scientists working in the project organised in Delhi for 2 days in which the technical programme of the project and the facilities required were to be discussed.

2. Arrival in India

I arrived in India on 14th March, 1987 and was met by Winrock International at the airport. The same morning I held preliminary discussions with Dr. C.L. Arora, Assistant Director General, ICAR and Dr. P.N. Bhat, Director, IVRI, in Delhi. I had no opportunity to visit with Dr. R.M. Acharya, Deputy Director General, ICAR who was away. I met over lunch with Dr. Mark Smith of USAID and Dr. Guy Baird of Winrock International on 16th March and had discussions with them pertaining to my assignment. I was given the travel itinerary to visit various Institutes and Universities in India.

3. Visits

The travel itinerary is given in Annexure I. I along with Dr. Peter Elsden (another consultant) had an opportunity to visit all the stations except Indian Veterinary Research Institute and G.B. Pant University of Agriculture and Technology, Pantnagar. Since I had earlier visited IVRI in December, 1986 and was familiar with the facilities available there, visit to this Institute was not included this time. This tour gave me a comprehensive view of the available facilities as each of the Units.

4. Strategy

The subproject has seven components besides the coordinating agency at the ICAR headquarters. I visited most of the components and observed the facilities, staff and laboratories; my observations are that except for Indian Veterinary Research Institute (IVRI) where well established facilities for research exist; at all other institutions, the infrastructure is very marginal. Most of the staff at all Institutes and Universities are engaged in some kind of research in reproductive physiology, but there is no definite program in embryo transfer available at any other participating institutions. In view of this, it is not conceivable that most of these institutes or institutions could really immediately take up the work with regard to either the primary focus or the minor focus. I had detailed discussions with the scientists of each center during visits and at the workshop and it was realised that all of them were of the opinion that it will be necessary that they get "hands on" training in embryo collection, evaluation, cryopreservation and transfer so that they can produce pregnancies which will give them confidence and training to take up work in the defined areas as delineated in the project document. Since the management team of this project is visiting U.S.A. in April, they should identify one or two places where these scientists can be trained.

What I envisage during the current year (i.e. 1987) would be that a few scientists should be trained in basic techniques in the United States. While they are being trained, it will be necessary to complete all the formalities for purchase of equipment, which is needed by the various units and as soon as they return back, they will need six months to standardize what they have learnt in the United States as far as their own indigenous cattle and buffaloes are concerned. It would be desirable to arrange in the later part of 1987 an intensive training course for the project where these scientists trained in U.S.A. would act as faculty. One or two U.S. consultants could at that training course help in sorting out any difficulties in the techniques.

I also recommend that it would also be possible to initially centralize training activities at IVRI where capabilities to offer the training immediately are available as well as a well developed laboratory can hold 15 participants. This should be followed by NDRI which also can rapidly develop facilities for training of scientists.

The other details of the technical programme can only be worked during the early part of 1988 after seeing the progress made in the first year. As soon as the first stage is completed, hopefully by the end of 1987, the training programs for the second stage can also be initiated.

5. Sub-Project Implementation

With regard to sub units, the equipment needs have been reviewed with them and my observations on each unit are given as under:

ii) Component II (IVRI):

The list appended at page 1 of the Appendix-B of the subproject document shows a number of equipments. These will be needed at various stages, since the basic work on embryo transfer will be concentrated at this center. As far as the requirement is concerned, I would like to make the following observations:

I am not in agreement that the IVRI should purchase a mobile van at this time. They need to purchase equipment upto such amount as very little has been budgeted for supplies. While discussing the item on scanning electron microscope assembly, I was informed that there is a typing mistake. What they need is a transmission electron microscope assembly, particularly for patho-biological application of embryo transfer and disease transmittance studies which is a responsibility of this institute which has very large facilities in animal health. It is my view that they should get a transmission electron microscope assembly of a very good quality so that they can undertake the transmission studies of diseases like Rinderpest and FMD etc. which may be very critical in the near future. I recommend at a later date in place of scanning electron microscope, they purchase a transmission electron microscope. Funds saved from the embryo transfer van should be used for this purchase. A provision has been made for a DNA/RNA sequencer. But what they really need is a synthesiser and not a sequencer. There is no provision for a carbon-dioxide incubator. I have seen one of the laboratories, but considering the kind of work involved and the scope of the project they need, a carbondioxide incubator which needs to be added to the list. The chemical and consumables are estimated at about $10,000 for a period of five years which is much too low and this has to be enhanced. They do not need a microcomputer with printer plotter etc. at this stage. The amount saved from this should be used for lab supplies.

iii) Component III (NDRI):

NDRI has an Embryo Transfer Group under the leadership of Prof. M.L. Madan, I could not meet Dr. Madan during my visit because he was away. Dr. R. Nagarcenkar, Director, NDRI was also not there. I was shown around the laboratory by Dr. Jain and Dr. Singhla. I was informed that there are three scientists currently working in the group. One of them has been trained in France. They impressed me with their dedication, devotion and hard work. From the experiments which they described to us, I am of the view that they are quite competent to take up work on embryo transfer and hormone profile in cattle and buffaloes.They have adequate facilities for this type of work. I was told that they are building infrastructure for embryo transfer work in cattle and buffaloes and, with the assistance of USAID, it should be possible to develop this laboratory into one of the major centers of research in India. In subsequent discussions at Delhi, Dr. Madan impressed me with good grasp of the problems involved and the approach which he would like to take in solving them.

They have asked for a number of equipments which are quite in order. However, I would like to state that a microcomputer with printer and plotter, reprographic copier and mobile embryo transfer van would not be required immediately. In their place provision should be made for lab supplies which I consider the basic need. In this project the consumables are somewhat expensive and therefore, should be the first charge on the equipment. Although I have seen a liquid scintillation counter and a gamma counter in the department, I still feel that they need one extra unit each in view of use rate of these equipment and the difficulty of repair facilities in this country. The four items which I am recommending to be converted to consumables at this stage can well be asked for at the mid term review.

I am of the opinion that if research in embryo transfer technology has to make an impact at NDRI, one scientist should be declared as incharge to run the Embryo Transfer Technology Laboratory and look after day to day work. It would be proper to give this person exclusively this responsibility.

iv. Component IV (CIRB, Hissar):

This newly established research institute has no facilities for embryo transfer work at present either in staff or in equipment. However, it has a large buffalo herd. A group has to be developed which will undertake this work. The equipment proposed is too inadequate if this has to function as an independent unit.

v. Component V (HAU, Hissar):

I was shown the Departments of Veterinary Gynaecology and Obstetrics and Animal Production Physiology. Both departments are doing work on embryo transfer in bits and pieces. Primary attention is on the superovulation regime. Both departments have virtually no infrastructure for embryo transfer work. They have competent staff in reproduction, gynaecology and physiology and it should be possible for them to quickly develop competence in embryo transfer technology. A list of equipment submitted is fairly comprehensive, but apart from a sum of $3,000 provided for foley catheters, there is no provision for consumables. I find that they have asked for a laminar flow hood, a microcomputer, both of which are not required. A sum of $20,000 from this should be converted to consumables.

Three different laboratories, two located in the same university and the third in The Buffalo Institute, four miles away, are rather spreading the resources too thin. I suggest that all the three resources should be pooled together in one place so that effective use of the talent and animals can be made.

vi. Component VI (APAU, Tirupati):

I was impressed with the work done by Dr. Rama Krishna at Tirupati. With totally inadequate facilities they have been able to transfer and get the pregnancies. This is indeed a commendable effort. I saw a 14 months and a 6 month old embryo transfer calves. The potential for work exists at that center. The equipment provided for this center has been properly chosen but incidentally no provision has been made for consumables except for catheters. Sub zero freezer and laminar flow are not required for this work. These funds may be diverted to consumables.

vii) Component VII (G.B. Pant University):

I had no opportunity to visit G.B. Pant University but from the discussions I had with the scientists at Delhi I was informed that this work is to be taken up in three departments, viz. surgery, gynaecology and obstetrics and physiology. They have had some experience of embryo transfer with rabbits and goats. The equipment on echography, sub zero freezer, straw filling machine and laparoscope are not considered necessary at present. It is suggested that the work should be concentrated only in one department in place of three because of the obvious achievements of such enterprises. A team leader may be identified and this person may not take any other responsibilities except looking after this work.

viii) Component VIII (CIRG, Makhdoom):

This institute has tremendous facilities in goats and sheep, headed by the competent specialist Dr. N.K. Bhattacharya. I was impressed with his past work and have no doubt he will be able to establish a laboratory within the shortest possible time. I was told by Dr. Bhattacharya that he has already produced 200 embryo transfer kids while he was at IVRI. Dr. K.P. Agrawal briefed me about his work on embryo transfer done at IVRI as a graduate student. I am told he is going to Cambridge for training in embryo splitting. Although there are no facilities available in the Institute other than a Leproscope and semen freezing equipment, they should be able to build facilities within 6-9 months. No provision has been made for consumables. I do not see any use of cell culture sterilization equipment provided for them. I am not quite certain what this equipment is. In any case if it is sterilization equipment, I am told it is available locally.

7. General Recommendations

i) Wherever the E.T. Centre has been sanctioned for a university or for an institute, there need not be competition between the departments. All resources for research in embryo transfer may be collected at one place and team leader with a team identified who should concentrate on both research as well as field application of embryo transfer.

ii) At each of the centers it would be necessary to train the scientists in superovulation, embryo collection, evaluation, cryopreservation and transfer to get confirmed pregnancies and this intensive training of the scientists should be completed as soon as possible preferably by December, 1987.

iii) It would be desirable to send at least 2-3 scientists from each unit to U.S.A. for hands on training to learn the discipline and the drill necessary in routine procedures for embryo transfer. As soon as they return it would be necessary to organise an intensive training program for other scientists of the project wherein U.S. trained personnel would act as the faculty. They would be supervised by one or two U.S. consultants who will have an opportunity to see the lacune in the scientists trained in U.S.A. They could smoothen any doubt as well as help in training the group.

iv) Dr. R.M. Acharya, DDG (ICAR) in his remarks at the workshop said that "National Biotechnology Centre at IVRI had a major focus on basic research on embryo transfer technology and it is one of their major mandates under the biotechnology program. It must function as a trainer institution for this project". I agree with these views. Currently facilities are available for intensive training, e.g. 10-12 candidates at IVRI. If 50 animals are purchased by IVRI the number of trainees can be increased to 15.

Although it appears that IVRI is only one place where training can be organized immediately, but NDRI has been sanctioned funds to hold E.T. training in Karnal in the near future. Since this training is to take place, I think it will be more meaningful if 2 or 3 scientists from NDRI could first take E.T. training under USAID in U.S.A. and on return hold this training session under guidance of consultant(s) who imparted the training in U.S.A. This I believe should be the first order of the business, thus giving a good start to much needed training program in India.

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