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ARTIFICIAL INSEMINATION IN DEVELOPING COUNTRIES

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Some of the world's most persistent human and political difficulties can be traced largely to an imbalance in the distribution of food resources in relation to population. Studies and conferences sponsored by FAO, have brought to light the fact that the so called developing nations account for some 75% of the world's people, about 70% of its milk- producing and meat- producing livestock, and nearly 60% of its agricultural land area. Yet these countries produce only 21% of the world's milk, and only 34% of its beef.

Lack of sufficient locally- produced high- quality protien food has led to malnutrition and all its related problems.. suffered by a majority of the people living on this planet.

In most countries, cattle have traditionally been a main source of high quality protien. But cattle productivity varies widely due to differences in genetic quality, animal health, animal nutrition and management methods. The importance of animal health, feeding and management must not by minimised. However the key to improving milk and meat productivity is up-grading genetic potential. The most promising approach to improvement of the genetic potential of cattle as well as programmed prevention of venereal diseases, is the application of artificial insemination (A.I.), by which local female animals are cross-bred with superior bulls. Artificial insemination is a comparatively sophisticated method of animal husbandry. Its impact on cattle development is closely linked to the simultaneous introduction of reasonable standards of animal nutrition, disease control and husbandry, and of infrastructure. Unfortunately this has not always been recognized, and in most cases A.I. has not adopted

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purely as a technical method of getting cows in calf. It is therefore necessary to emphasize that any A.I.Scheme aimed at large scale improvement of the national herd must by supported by programmes for the improvement of the closely allied sectors of animal husbandry and animal health.

A basic precondition for the successful introduction or extension of A.I. services in developing countries would by the provision of economic incentives to farmers to breed improved animals. Areas for the operation of A.I. breeding services should therefore be selected in relation to such considerations as market prospect, feed availability and animal health conditions. Where dairy cattle are concerned, preference should be given to areas with an organized milk collection scheme a satisfactory outlet for milk and mild products.

There are also certain basic technical qualities required of an A.I. service. Once an A.I. scheme is introduced it should be available at all time, and not be allowed to collapse because of indequate resources or because of conflicts among representatives of the component disciplines of genetics, veterinary science, animal husbandry and economies, whose close cooperation is essential for the programme. It is also important to ensure that the service is reliable and that it results in acceptable conception rates. The introduction of A.I. by over- enthusiastic individuals who under-estimate the resource requirements of such a service can do more harm than good, because once the farmers lose their confidence in A.I., which is inevitable in such circumstances it is difficult to regain it in the future.

Organizing for genetic improvement:

Basically organisation of a genetic improvement proramme involves three levels: 1. national, 2. regional, and. 3 local.

1. **National Organization:**

The centralised functions of genetic improvement programmes based upon A.I. have been organised in different countries. In North America, A.I services are provided by privately-owned companies. In the Scandinavian countries and France, they are offered by national cooperative organisations. In centrally planned

nations, including most of the developing countries, A.I. programmes are controlled by the government.

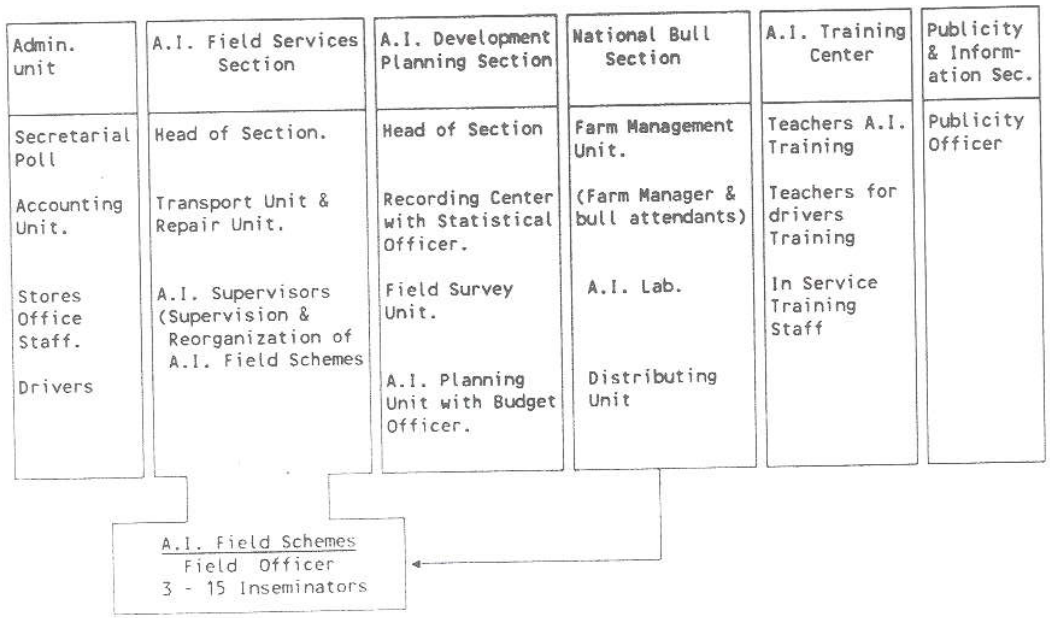
Regardless of the approach, however, it is vital to integrate planning, operation and supervision of A.I. field services, procurement and distribute of A.I equipment, production and distribution of semen and training of A.I. staff.

These functions should be preferably by performed or coordinated by some central body or National A.I. Centre (Figure 1). Which has the following objectives:

- providing specialised help for technical and economic planning of A.I. service throughout the country.
- examining and approval regional A.I. plans.
- allocating staff, A.I. equipment, semen and other essentials.
- supervising and assisting A.I. field offices in technical and administrative operation.
- helping A.I. field offices to investigate fertility problems.
- designing and operating standard A.I. recording systems.
- producing, purchasing,importing and storing frozen semen, liquid nitrogen, laboratory equipment, and material to meet national needs.
- distributing frozen semen, liquid nitrogen, A.I. equipment,and material to assure uninterrupted operation of A.I. services.
- assessing continuously the need for the need for training and retraining of staff, and arranging for such training.
- producing and distributing information on A.I. and breeding services.
- deciding on the location, promotion, and replacement of A.I. field staff.
- preparing annual estimates of development costs and recurring expenditures of the A.I. services, and
- preparing periodical reports on A.I. services as required.

It is extremely important, that the admonistration of the A.I. programme must not be allowed to become enmeshed in bureaucratic complexities. Purely financial and personnel questions could be handled by local government administrations. But technical matters should remain the essential prerogative of technically-trained people.

Figure (1): National A.I. Center



Yearly budgets should be proposed incooperation with technical staff. So that realistic financial reserves are always available currently. Technical specialists should even have the power to influence or interrupt the operation of technically weak and uneconomical A.I. services, in close consultation with overall decision-making bodies. Whithout a clear understanding between technical and administrative specialists, it will be difficult to maintain an ongoing, efficient and cost-effective A.I. programme.

It is ideal, that the National A.I. center should be coordinated with other functions involved with animal production at the national level as breed-related activities including milk and/ or meat recording, progeny testing, A.I. supervision, health maintenance, agricultural reasearch, dairy and meat marketing, and animal production forecastin. One way of integrating these functions is by setting up an organisation which may be called a "National Animal Breeding and Production Centre". The possibale organisation of such a center is shown in Figure (2).

2. **Regional organisation**

The important principle is that the regional organisation must be carefully adapted to local conditions. Priority for A.I. development must be given to areas with the best potential for improvement in production. This means that facilities for disease control, and the collection and processing of milk, will have a strong influence upon the areas in which A.I. services are established.

Once the field offices are established, they should be supervised regularly by A.I. supervisor reporting to the A.I. national center. They should check on A.I. records and financial aspects including transport cost and liquid nitrogen use.

They should also follow up on inseminator's performance in the field, by checking on time schedules, proficiency in handling A.I. equipment, care in making A.I. records, insemination techniques, maintenance of vehivles and even attitude towards the farmers.

Also, they should check on stores, use of transport facilities, supplies of semen, recording of A.I. fees and the balance of the number of semen doses in relation

Figure (2): National Animal Breeding and Production Center
A.I. Department
A.I. Field Service
A.I. Development Planning
A.I. Recording Center
National Bull Station.
Animal Genetic Department
Livestock Genetic Specialists
Progeny Testing
Performance testing
Stud herds
Animal Production Service Department
National Milk Records
Production Economy Section
Forecasting Section
Advisory Section
Health Section
Livestock Training Center
A.I. Training
Recorder Train
Feeding advisory Training
Data Processing Unit
System Deve. & Programming
Adminstration Services
Clerical Staff
Accounts
Purchases Stores
Publicity & Inform. Sect.
Publicity Officer
Dairy & Meat Marketing Org.
Govern. Agric. Extension Service
Governrator Veterinary Service
Agriculture Research Institutes
Veterinary Research Institutes
Govern. Agric. & Vet. Train. Institute

to inseminations performed. Contacts should be maintained with district government staff, farmer's representives and others, able to provide information on the level of performance of all A.I. field service in the region.

Finally, the supervisors will normally participate, along with A.I. field officers and local administrators, in planning and budgeting. The key position in any A.I. field service is that of the field officers, who are in charge of local A.I. centres and/or a certain number of stationary inseminators, in a given area. A.I. supervisors should be recruited from those field officers who have established a particularty good performance record.

3. **Local organisation**

Organisation of local services involves selecting the most realistic means of supplying local farmers with insemination services, planning daily A.I. runs, locating insemination points, and selecting the means of transport.

It is important that this initial planning be discussed in depth with local government officials, farmer's cooperatives and similar organisations and individual farmers themselves.

The basic rule is to maintain adequate financial and personnel reserves, and not to stretch resources too far, even when pressure is applied to do so. Operations in new areas should not be started before there are enough resources to maintain uninterrupted operation in the "old" areas.

Here, the key element is the comptence of the inseminator. A.I. in the field demands considerable skill to create good pregnancy results. This bears not only upon training, but also upon specialisation. Combining insemination with other duties, lends commonly to discouraging results. When using full time specialized inseminators, it is possible to provide a maximum number of inseminations per day. It also helps the insimator maintain his manual skill. Performance of inseminators should be monitored carefully. Refresher courses are advised.

One method of organising the field service itself is by stationing inseminators individually and letting the farms bring their cows to the insemination points with

this method, often, an average of one or two inseminations per day may be obtained. Another possibility is to have the inseminator go to farm when a cow is found to be in heat. However, travelling tends to be uneconomic, and a single insemination may take several hours. An obevious variation of this method is to have the inseminator move along a scheduled circuit within his area every day, on foot or by bicycle. Farmers are informed of the period of time the inseminator will remain at each insemination point, which may be a roadside "Crush".

If the farmers are living around in large villages as in the Middle East, one locally-stationed inseminator can thus serve, one or more villages. In general, indivedually stationed inseminators are recommended mainly when they are employed directly by local group of farmers in an area with dense cattle population, or when they are working at one or more large- scale farms with enough cows to employ the inseminator virtually full-time.

Mobile service, which include several inseminators, operating from the A.I. field centre provided by motor car. Such a center could serve as a base for up to 15 inseminators covering a wide area. The cows are inseminated in roadside "Crushes". Using this system, inseminators may cover some 150 kilometers per day passing about 30-50 Crushes. Some 12-20 inseminations per day are performed per car-round. If motorcycles are used, an inseminator may cover about 80 kilometers daily, pergrming about five inseminations. The roadiside crush system can even be used, in difficult or densely populated areas, when the inseminations per inseminator per day, minimising the cost per insemination. It is also easy to supervise and road crushes can be used for infertility treatment and health care.

If cars are to be used, the number and scheduling of daily rounds can usually be used on 150 kilometers per car-round per day; for motorcycles, about half this distance. The distances should be reduced if the number of inseminations per round is more than 20. To compensate for breakdowns, ordinary services, and minor repairs, about 1.3 cars per daily round should be available. Continuous service with motorcycles will require a reserve of about 1.5 per daily round.

Finally, staff requirements should be carefully

considered. The number of inseminators for an effective A.I. field service should be about 60% more than the number of daily rounds. This is based on a 240-day working year, with reserve for training, sick leave, and other contingencies.

Keeping records:

An efficient information system is a necessary component of an A.I. breeding services. First, the actual conception rates per bull, per inseminator and per area would need to be recorded. Complete information on the number and performance of inseminated animals in various areas is also essential. There is a real danger that the primary collection of data can be made so ambitious that the processing becomes too difficult. It is therefore, important to limit records to those which are really necessary, and to establish a system for the regular processing of up-to-date information from the operations. On the basis of this information, the A.I. recording center compiles monthly statistics on the number of inseminations performed, including repeats per region, distrct. A.I. field programme and inseminator. Inseminators per bull and breed are also compiled. Non-return rates and first inseminations are recorded in the same way.

In conclusion, it is not an exaggeration to say that without efficient record keeping, any genetic improvement programme through A.I. is doomed to failure.

Some features of A.I. service in developing countries

Refering to the recent survey carried by FAO in March 1991 in developing countries, the following features were described:

A- Labour

The status of the A.I. technicians varied widely between countries. In Africa 26.5% were full-time, while 89% where in this category in Asia; however, no striking differece was apparent in the number of A.I. applications performed per technician (full-and part time) per year (443 in Africa vs. 543 in Asia). The highest number of A.I. application per technician was in Latin America (841 per year). Two-thirds of technicians performed less than 500 A.I. applications per year, and only 16% performed more than 1000 per year.

B- Payment of A.I. services

In 57 of the countries with A.I. services (72%) farmers are asked to pay for these services. In Bermuda and Guana A.I. is highly subsidised whereas in Israel there are no subsidises. In Morocco and Tunisia Farmers pay for some of the costs (transport, strorage and imported semen) and in Indonesia farmers pay only for A.I. in dairy breeds. In the Philippines A.I. is free only for small farmers, while in Turkey it is free government service.

C- Semen availability

Local production: 70% of countries with A.I. services produce semen locally. Locally produced semen represents more than 50% of the semen available in 75% (40 countries) of the semen- producing countries, and more than 90% in 42% (23 countries) of these countries. Countries in Asia and Near East are more dependent on their own production.

Fresh semen: The average proportion of semen used fresh is low at 5% (1.3% in Latin America -10% in Africa). Some countries produce and use only fresh semen. There are two main reasons for using fresh semen:

- A.I. with fresh semen requires five to ten times less spermatozoa than A.I. with thawed frozen semen. So best bulls can be used more intensively.
- It does away with the need for a reliable and economical source of liquid nitrogen.

Breed distribution: Distribution of the doses produced can be classified into three categories of breeds: local, temperate and crossbred. Nearly 80% of the doses produced locally were from temperate breeds, most likely from dairy breeds. In Africa and the Near East, almost all the doses produced (94.6 and 97.4%, respectively) were from temperate breeds. In Latin America, 38.3% of doses came from local breeds.

D- Semen importaion

On average, 86.5 of countries imported semen, with a minimum of 75% in the Near East and maimum of 90% in Africa and Asia.

Dairy breeds constitute the major part of semen importations (88.3%) of which 86% are Holstein, 3.7%

Jersey and 9% from other dairy breeds, mainly Brown Swiss.

E- A.I. Activity

Available data for 62 countries for the years 1980 and 1990/91 showed that total number of A.I. applications increased globally by 131% between 1980 and 1990/91, with large differences between regions: -5% Africa; +11% in Latin America; +85% in Asia; and 2.3% in the Near East. The decrease in total number of A.I.S in Africa is the result of the loss in Kenya (-20%).

F- Problems and constraints

Motivation: While it is quite easy to establish the facilities and equipment for an A.I. center, it is more difficult to implement and maintain in operation the corresponding field service. First, farmers should be informed about the advantages of A.I. at the genetic, veterinary and reproductive levels. Information campaigns are essential. Highest technical level of inseminators must be sustained, both by regular retraining and circulation of technical and genetic informations as well as by the presence of reward system for efficient performance.

There is a general feeling that the privatization of A.I. services would bring efficiency and higher pregnancy rates and open the road to a sustainable activity. It is clear that payment for A.I. would not be the only effect of privatization, however, and the main effect would be imporved motivation.

Communications: It is the main problem facing A.I. services in developing countries-involve the distribution of information and the circulation of personnel and semen.

Communication is difficult between the farmer and technician. The exchange of information between the technician and the center is poor as well: few records are kept or else records are kept but not collected nor analysed. Finally feed back from the center or vehicles and the conditions of the roads.

Faced with all of these communications problems, the service must provide more than just A.I. applications, the least of which is reproduction follow up. Veterinary

assistance and advice on feeding and marketing should also be offered.

Technical: The weakest point in A.I. programme is the need for a regular, reliable and economical source of regular reliable and economical source of liquid nitrogen. This is rarely available. Also distribution of LN_2 to field technicians, in many cases, is a major constraint.

Heat detection is another serious technical problem, mainly for small farms, and they need training and extension in this area. Oestrus is particularly difficult to detect in very small groups, in Zebu and in hot climate.

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