SYSTEMS OF ANIMAL IDENTIFICATION AND THEIR IMPORTANCE FOR DISEASE SURVEILLANCE

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Summary: Reports were received from eleven Member Countries: Bahrain, Cyprus, Egypt, Iran, Lebanon, Libya, Kuwait, Oman, Qatar, Saudi Arabia and Turkey.

According to the information collected from the responses only Turkey has an official identification scheme for cattle and small ruminants.

All countries stated that any suspicious case found in abattoirs can be traced back.

Methods of animal identification including tattooing, branding, ear tagging and microchipping are discussed.

Subsequently, the requirements of the Identification and Registration (I&R) System, in the Member States of the European Union comprising double earmarking, computerised database, animal passports and individual registers kept on the holding are described.

An efficient and fully operational I&R System can be very important in epidemiological surveys of animal diseases and beneficial to contagious disease control. It can also be an essential component of an optional meat inspection programme regarding tracing back of animals contaminated with drug or chemical residues.

1. INTRODUCTION

Of the 18 Member Countries of the Regional Commission only 11 Delegates returned the completed questionnaire on animal identification. The 11 countries that submitted a report are Bahrain, Cyprus, Egypt, Iran, Lebanon, Libya, Kuwait, Oman, Qatar, Saudi Arabia and Turkey (Appendix I).

1.1. Registration of holdings

Only five (Cyprus, Lebanon, Oman, Qatar and Saudi Arabia) out of the eleven countries have a national based up to date list of all the animal species, i.e. cattle, small ruminants, pigs and registered horses. However, it should be noted that only Cyprus and Egypt have a large pig industry. In the other Islamic countries, there is no pig population or only a negligible quantity. The registration of holdings in Egypt is restricted to cattle, in Kuwait to cattle and horses, in Turkey to cattle and small ruminants and in Iran to horses.

Bahrain and Iran are planning official registration of all holdings.

1.2. Official animal identification

An official identification scheme is applied to all species in Turkey with ear tags for cattle, microchips for small ruminants and identification cards for race horses. Kuwait applies ear tags to cattle in the area of Sulabiya and inserts microchips in foals born since 1999. The marking of small ruminants is restricted to vaccinated animals.

Iran, Lebanon, Qatar and Turkey identify horses with certificates, Bahrain with freeze branding and Saudi Arabia applies electronic identification for registered horses.

Qatar applies ear tags to dairy cattle.
Cyprus is planning an official computerised Identification and Registration for cattle, sheep and goats based on EU Requirements, which will begin in 2000.

When importing animals all countries, except Egypt and Oman, require an official identification for imported animals.

1.3. Surveillance and monitoring

The Veterinary Services of all countries, except Libya, Lebanon, Oman and Saudi Arabia, regularly receive reports on post-mortem findings.

The majority of countries conducted abattoir surveys over the last three years for the detection of certain diseases, but only Cyprus, Saudi Arabia and Turkey are carrying out abattoir surveys for drug residues in meat.

Tracing back of any suspicious cases to the holding of origin is possible in all countries. In Kuwait, this is only possible in the area of Sulaibiya and Wafra.

In all countries, active field monitoring programmes exist for establishing the presence or the prevalence of certain diseases, such as scrapie, brucellosis, tuberculosis, leucosis, rinderpest, peste des petits ruminants, echinococcus and others. Sampling is conducted mainly randomly or on target populations on national basis.

All countries, except for Oman, recommend that appropriate steps be taken with the assistance of the OIE for the implementation of a harmonised registration and identification system in all the Member Countries of the Regional Commission for the Middle East.

2. IDENTIFICATION METHODS

Identification has always been carried out in order to denote the ownership of the animal. Owners have taken advantage of this for the management of their flocks for purposes such as feeding, breeding and milk yield recording.

Several types of animal marking have been used for many years, depending on the type of livestock and purpose of identification. There are two main categories:

**Indelible and permanent identification**, such as:
- Tattooing
- Freeze branding
- Horn branding
- Ear notching

**Identification with a carrier attached to the animal**, such as:
- Sketch cards
- Collars and tail bounds
- Ear tagging (metal or plastic)

The identification methods of the first category have the advantage of identifying the animal directly and are thus not easily open to fraud. However, due to the complicated and time consuming process of these methods and the fact that they can become increasingly difficult to read over time, they are inconvenient for nation-wide identification of livestock.

Sketch cards are not actually attached to the animal; they provide unique identification, but are only used by pedigree breed societies.

Collars and tail bounds are also a temporary identification method and are used on dairy farms for management purposes.

Ear tagging is the most widespread method of identification. Both metal and plastic tags are easy to apply. Metal tags seem to be more sturdy and durable, but the figures are very difficult to read. Plastic ear tags are large enough to apply the identification code, which can be easily read from a long distance. In addition, they cannot be re-used after removal.

Modern electronic technology also found its way to animal identification. Many countries add a bar-code to the plastic ear tag, which can be read with a hand-held scanner. Bar codes eliminate transcription errors, respond to the demands of high speed abattoirs for easy checking of the identities of a large number of animals and offer regulators for improving efficiency and effectiveness in disease control and recovery programmes (15).
The same advantage is also offered by the micro-chip method. A transponder programmed with an identification number is incorporated into the microchip, which can be implanted subcutaneously. The accidental loss of identity is thus significantly reduced.

Microchip implants are widely used in pets and horses. Microchipping is believed to be the best available system for identifying individual pets, as tattoos faded with time and collar tags could easily be lost (1). The microchip method is still problematic in livestock, due to the migration of the microchip inside the body of the animal. A large number of transponders can thus not be recovered in the abattoir from the carcasses destined for human consumption (2).

Another disadvantage of the microchip method is that the animals carrying it need an extra visible form of identification.

Microchips can also be incorporated into ear tags and collars. Transponders have also been incorporated into ceramic, stainless steel or plastic boluses, which can be inserted into the alimentary tract of the animals.

Appendix 2 presents a table evaluating each method of animal identification (2).

Blood typing is a valuable adjunct to natural and applied marks for horse identification. The technique has proven its worth in cases of questionable parentage. Another use of genetic blood determinates has been proposed for horses in segments of industry where deliberate fraud is especially prevalent, such as for race and show horses. This proposal suggests that a blood sample be taken from the foal at the time of identification by signal key, freeze marking or tattooing. This sample would be kept in a frozen or lyophilised state and used only if a question of identity arises. The advantage of this approach is the reduction in costs, as each horse will not have to be completely blood typed (12).

3. IDENTIFICATION AND REGISTRATION SYSTEM IN THE EUROPEAN UNION

The opening of the European market in 1993 liberalised trade among European countries and resulted in an increase in the volume of animals and animal products circulating between the Member States. The signing of the General Agreement on Tariffs and Trade (GATT) and the establishment of the World Trade Organization (WTO) have further extended this zone of trade (5).

The abolition of all veterinary border checks, which followed the introduction of the Single Market, also increased the hazards of the introduction and spread of highly contagious diseases. To limit this, a new strategy for disease prevention, control and eradication has been adopted by the European Union.

In this respect each individual Member State has to make all the necessary efforts to improve the health status of its animal population and ensure that only animals that fulfil certain conditions are sent from its territory to that of another Member State (7).

A substantial position among the measures taken is the application of an Identification and Registration System (I&R). Directive 92/102/EEC laid down the minimum requirements for the identification and registration of animals (6). The most important elements of this Directive are:

List of all holdings

The competent authority of each country has to maintain an up to date list of all holdings which keep animals.

Register of the holdings

Any keeper of animals (bovine or porcine) has to keep a register on the farm stating the number of animals present on the holding. This register shall also include an up-to-date record of all births, deaths and movements.

Regarding sheep or goats the keepers should keep a register including at least the total number of animals each year including also the number of female animals which are over 12 months or which have given birth on the holding and the movement of animals on at least the basis of batch movement stating their origin or destination and the date.
**Identification requirements**

All bovine shall be identified with an ear tag bearing an alphanumeric code which allows an individual identification of each animal along the holding on which it was born. The identification mark is to be applied at least within 30 days of the birth.

Animals other than bovine must be marked as soon as they leave the holding with an ear tag or tattoo making it possible to determine the holding from which they came.

The BSE crisis and the consequent destabilisation of the market in beef and beef products led to a re-establishment of a more efficient system of identification and registration of bovine animals, particularly with regard to their traceability. A new Council Regulation No. 820/97 was adopted in 1997, which laid down the requirements of a System for the Identification and Registration of bovine animals (8). Each Member State must be in a position to trace and account for the movements of each animal between holdings and also be able to determine the identity of any other animals with which it has been in contact. Relevant data must be maintained and available on request to other Member States.

The requirements of the I&R System of bovine animals comprise the following elements:

- double ear tags to identify animals individually
- computerised database
- animal passports
- individual register kept on the holding

### 3.1. Double ear tags to identify animals individually

An ear tag should be applied to each ear, both bearing the same unique identification code which shall identify also the Member State where the ear tag was applied, i.e. where the animal was born. Animals moving from one member country to another would not be retagged. Animals imported from third countries should be identified in compliance with the requirements of this Regulation and the original identification established by the third country shall be recorded.

The ear tags recommended by the European Commission shall be of flexible material, tamperproof, not reusable, and of a design which will remain attached to the animal without being harmful to it. They shall carry only non removable inscriptions. Member States may add to the ear tag further information such as barcode (9).

### 3.2. Computerised databases

Each Member Country has to establish a central computerised database on which all data concerning an animal shall be stored. It must contain at least the following information:

**For each animal:**

- identification code
- date of birth
- sex
- breed or colour of coat
- identification code of the mother
- identification code of the holding where born
- identification number of all holdings where the animal has been kept. That means recording of all movements the animal has done during its life.
- date of death or slaughtered

**For each holding:**

- an identification number
- name and address of the holder

### 3.3. Animal passport

The competent authority of the Member Countries shall issue a passport for each animal. The passport shall accompany the animal whenever it is moved until the day of slaughter.
3.4. Register on holdings

Each keeper of animals shall keep an up-to-date register on his holding regarding identification codes, births, deaths and movement of the animals.

Further Regulation set up detailed rules for the application of the Identification and Registration Systems, such as:

Commission Regulation 2630/97/EEC which lays down the rules regarding the minimum level of controls to be carried out in the framework of the system (10).

Commission Regulation 494/98/EEC which lays down administrative sanctions in the framework of the system (11).

4. IDENTIFICATION AND REGISTRATION SYSTEM AND EPIDEMIOLOGY

A national I&R System comprises not only the marking and identification of the animal population of a country. It is a complex system that also records relevant data with respect to movements from and within this population and consequently can provide all kinds of information regarding possible contacts of herds and animals.

Therefore, a reliable and efficient I&R System plays a large, although only indirect, role in disease surveillance and control.

The free movement of animals and animal products throughout the European Union and the General Agreement on Tariffs formed a new trade environment where the only legitimate non tariff trade barriers remain the standards for animal health, food safety and public health set or to be set by the Office International des Epizooties (OIE) and the Codex Alimentarius (5).

In this new trade environment, epidemiological surveys to substantiate disease freedom, minimal prevalence and localisation of disease are becoming increasingly important and require an infrastructure that can marshal the resources necessary to respond with a range of intervention strategies (14).

As decisions on animal health policy become more complex and the ramification of these decisions more far-reaching, veterinary administrators have a growing need for more quantitative and reliable information to provide the basis of their action.

The greatest limitation of specific disease monitoring systems in the past has been the concentration on data collection at the expense of prompt informative data analysis and interpretative reporting of results (16).

Modern electronic technology opened the way to the establishment of nationally based centre databases that can store and very rapidly retrieve all the information needed for the epidemiologist.

Individual surveillance soon produce a large bulk of data, depending on the population under study and the multiplicity of information recorded for each animal. Such data can be processed only by means of a computerised system (12).

While monitoring consists of passive routine observations on health in a given population without recording the identity of individual animals, surveillance is an active continuous investigation of a given population to detect the occurrence of disease. This means an intensive form of data recording including the identity of the diseased animal for all types of diseases, infectious and not infectious. It also means detecting changes in a population's health and is normally part of control programmes for specific diseases (21).

The exact knowledge of all the factors associated with the occurrence of a disease is the basis for an effective and successful control or eradication programme.

Faugere et al, 1991 (13) described epidemiological investigations introduced in Senegal. This programme, known as "Pathology and Productivity of Small Ruminants in Senegal" (PPR Programme) was multidisciplinary, combining animal husbandry, pathology and micro economy. It had a modular structure organised around a central module for demographic survey (Appendix 3).

The demographic nucleus is the basic nucleus of a surveillance to which all others are linked. It contains information on each individual such as identity of the animal, birth, identity of the dam, entry on or departure from a farm.
This kind of information is often also needed for the period before an outbreak occurred, especially in the case of diseases with a long incubation period. In this case, the memory of the livestock farmer is not always very precise and reliable.

Experience in retrospective survey has shown that it is difficult to obtain reliable and precise information regarding neonatal mortality and abortions. However, even if no breeding information is recorded, a well functioning I&R System, which records dates of birth and identity of the dam can easily calculate the interval between parturition and may provide indications of early abortion or reproductive abnormalities.

A necessary part of any investigation of disease is the relationship of the diseased animals to the part of the population at risk, so that the importance of the disease can be assessed (21).

To determine the prevalence of a disease or to determine whether or not disease is present in a population, a simple random sampling is needed where each animal in the population being surveyed has an equal opportunity of being included in the sample. For purposes of objectivity and international recognition of the surveillance results, it is essential that a proper random sampling procedure be used.

A random sample may be selected by numbering each animal in the population (such as by ear tag numbers), writing these on slips of paper, mixing them in a hat and drawing the required number of slips from the hat to identify the members of the sample (4). The central database of an I&R System represents an electronic hat from where samples may randomly be selected.

More complicated are stratified sampling or multistage sampling where certain criteria determine the samples. Information concerning size, sex, distribution and age patterns in the population affected allows the epidemiologist not only to calculate an attack rate, but also potentially to calculate attack rates by age groups, sex and breed (12).

The significant role of national I&R Systems in the control of contagious diseases is presented schematically in Appendix 4.

If a contagious disease enters into a susceptible population and following its confirmation, certain measures such as isolation, removal and tendering of the entire or part of the flock, cleansing, disinfection, etc. will be taken on the farm.

In addition to these measures, but not of less importance, laboratory and on farm investigation should be carried out regarding the possible infection of other herds due to animal movement.

Furthermore, protection and surveillance zones will be established, aimed at a complete standstill of animal movement in order to limit further spread of the disease. Additional measures, such as pre-emptive removal of herds in the immediate vicinity of infected herds and ring vaccination can be taken.

The I&R System can provide reliable and rapid information of recorded contacts by forward and backward tracing of possibly infected herds and herds at risk.

However, the information provided is of less relevance with respect to disease transmission via other routes. It may be obvious that a reliable and efficient I&R System can be of great value in disease control, but is not a guarantee for success. Its role is indirect, by providing information; however, other factors are also important (17).

Mapping of disease outbreaks has always been a valued tool of veterinary administrators, but such maps have been laborious to produce and difficult to transport. Computer-based Geographic Information Systems (GIS) are now easy to use on a desktop computer and represent a new technology in veterinary epidemiology for reporting of animal disease information and the study and modelling of specific disease problems. GIS are computerised information systems that allow for the capture, storage, manipulation, analysis, display and reporting of geographically referenced data. Essentially, the technique is a combination of computerised mapping technology and Database Management Systems (DBMS), in which spatial data sets from diverse sources are managed and analysed (18).

Any information that is coded by location, such as country, province, district or latitude /longitude co-ordinates can be stored and manipulated in the GIS. This technology is important for epidemiological studies of specific diseases and allows rapid monitoring of highly contagious diseases that might cross international boundaries.

Geographical databases, which include boundary maps, topography, individual farm profiles, locations of all flocks and meat processing plants, sale yards and other animal aggregation points enable the investigator to find and list all features that meet certain criteria.
For example, a disease controller can identify all livestock units adjacent to an infected farm. Or he may generate buffer zones around or along certain features. He may also define all at risk properties within a given distance or along a transport route where it is known that infected animals have been driven. A database can also provide the relationship between the incidence of a disease and the geographical environment or animal density of an area, provided that a database exists where all animal holdings with their latitude/longitude ordinates are registered.

A national I&R System can be regarded as a category of Animal Health Information System (AHIS) integrated with Emergency Response Systems (ERS) and Monitoring and Surveillance Systems (MOSS) (Appendix 5).

MOSS aim at collecting health and production related information at both animal and environmental level with respect to multifunctional or endemic diseases.

ERS aim at quickly providing information on predicted or expected disease incidence and patterns of spreading by using various data, mainly GIS.

Information by the I&R Systems can serve for both MOSS and ERS. Naturally, these systems can exist separately, but their integration is more cost effective and efficient. However, it is self evident that for successful integration, the I&R System should be reliable and efficient (17).

An EPIMAN-SF A decision-support computer system for managing a swine fever epidemic is working with certain categories of data (20).

1. Emergency-specific farm data that are entered on a continuous basis during the epidemic. They are associated with individual farms and will be entered according to the infection status of a farm.

2. Data not related to the emergency, such as farm location, ownership and livestock number.

3. Tracing data that enable accurate tracing of all contacts to identify the source of infection (tracing back) and to find secondary outbreaks (tracing forwards).

4. Control and surveillance data for the declaration of protection and surveillance zones.

Categories 2, 3 and 4 are provided by the I&R System.

An animal identification system is also an essential component of an optional meat inspection programme. Animal identification will make it much easier to trace the source of animals with drug or chemical residues. Without such a system, follow-up investigations are time consuming and therefore more costly. In many cases, the lack of identification makes it impossible to locate the source of the animal and the contamination.

Specific examples relating to the lack of animal identifications are stated by the United States Department of Agriculture (3). The annual violation rate in swine from the use of sulfamethazol fluctuated between 4 and 5% in the mid-1980s. Lack of identification has been a problem in about 25% of their violation. The traceback of these particular animals appears impossible [at this time] with between 60 and 100 possible producers. This residue could only be traced to 1 of 9 possible producers because of ID problems.

The same problem was also recorded in follow-up investigations involving culled dairy cows and veal calves due to lack of producer identification.

The Middle East is a geo-political region that constitutes a network of countries through which animal diseases move very easily from one country to another causing great economic losses. Some of the reasons for this situation are the following:

- a low standard of animal husbandry
- importation of animals without due safeguards
- the lack of continuing exchange of animal health information between neighbouring countries.

Nomadic herding involving mainly small ruminants and seasonal transhumance are widely practised. Ritual slaughter, which may involve millions of animals on special occasions, such as the Bairam, and a deep rooted traditional preference for home slaughter predominate in the region, resulting in deficient meat inspection and poor disease monitoring (19).
Applied I&R Systems are based on the cultural, economic, social and physical condition of western societies. They are not expected to respond to livestock management and problems of Asian or African countries. Although western animal production is adopted in several of these countries, a large number of their animal populations remain under nomadic conditions. Moreover, the organisational structure of their Veterinary Services is not identical to that of European countries.

Efforts should thus be made for the development of a model appropriate for these countries, which will be compatible with their monitoring and surveillance models and animal health information systems, and which will correspond to their economic realities.

REFERENCES


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<td>to Question 3 is</td>
<td>cattle</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>No, does any plan</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
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</tr>
<tr>
<td>exist for official</td>
<td>pigs</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>registration of</td>
<td>registered horses</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
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<td>any of these holdings?</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td><strong>Is an official</strong></td>
<td>cattle</td>
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<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>dairy cattle</td>
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<td>No</td>
<td>No</td>
<td>No</td>
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<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
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<td>scheme applied for any of the</td>
<td>pigs</td>
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<td>No</td>
<td>No</td>
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<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
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<td>following species?</td>
<td>registered horses</td>
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<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
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Conf. OIE 1999
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<th>Iran</th>
<th>Kuwait</th>
<th>Lebanon</th>
<th>Libya</th>
<th>Oman</th>
<th>Qatar</th>
<th>Saudi Arabia</th>
<th>Turkey</th>
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</thead>
<tbody>
<tr>
<td>7</td>
<td>If the answer to Question 6 is Yes, what kind of identification is being used?</td>
<td>cattle freeze branding</td>
<td>eartags (ind) eartags (ind)</td>
<td>eartags eartags for vaccinated animals</td>
<td>eartags eartags</td>
<td>eartags</td>
<td>eartags</td>
<td>eartags chips</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>registered horses branding</td>
<td>n.a. certificate</td>
<td>microchips</td>
<td>id. cards</td>
<td>certificate</td>
<td>electronic</td>
<td>id. cards</td>
<td></td>
<td></td>
<td></td>
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<td>8</td>
<td>When importing animals from other countries do you require that the animals be officially identified?</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>9</td>
<td>Do the Veterinary Services of your country regularly receive reports of the post-mortem findings at the abattoirs?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>10</td>
<td>Have your Veterinary Services conducted any abattoir survey for the detection of certain diseases over the last 3 years?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>11</td>
<td>If the answer to Question 10 is Yes, please indicate for which diseases</td>
<td>Bovine TB ECC FMD/TB EBL PAST ECC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Are your Veterinary Services carrying out any abattoir survey for drug residues in the meat?</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>13</td>
<td>If the answer to both Questions 10 and 12, or to either of them, is Yes, is it possible to trace back any suspicious case to the holding of origin?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Does any active field monitoring programme exist in your country to establish the presence of certain diseases or to estimate their prevalence?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
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- 196 -
<table>
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<th>Iran</th>
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<th>Oman</th>
<th>Qatar</th>
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<th>Turkey</th>
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<tr>
<td>15</td>
<td>BR</td>
<td>SCR</td>
<td>RP</td>
<td>RP</td>
<td>FMD</td>
<td>BR</td>
<td>BR</td>
<td>BR</td>
<td>TH</td>
<td>BR</td>
<td>FMD</td>
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<tr>
<td>If the answer to Question 14 is Yes, please indicate for which diseases</td>
<td>TB</td>
<td>BR</td>
<td>FMD</td>
<td>FMD</td>
<td>BR</td>
<td>BR</td>
<td>BR</td>
<td>BR</td>
<td>SW</td>
<td>BR</td>
<td>BR</td>
</tr>
<tr>
<td>16</td>
<td>randomly</td>
<td>all</td>
<td>randomly</td>
<td>national</td>
<td>randomly</td>
<td>national</td>
<td>randomly</td>
<td>randomly</td>
<td>randomly</td>
<td>randomly</td>
<td>target</td>
</tr>
<tr>
<td>If the answer to Question 14 is Yes, is sampling conducted on a national basis/regional basis randomly/on targeted basis?</td>
<td>TB</td>
<td>BR</td>
<td>EBL</td>
<td>random</td>
<td>TB</td>
<td>national</td>
<td>TB</td>
<td>national</td>
<td>national</td>
<td>national</td>
<td>target</td>
</tr>
<tr>
<td>17</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Do you recommend that appropriate steps be taken with assistance of OIE for the implementation of a harmonised registration and identification system in all the Member Countries of the Regional Commission for the Middle East?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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</tbody>
</table>

BR = brucellosis, CCPP = contagious caprine pleuropneumonia, EBL = enzootic bovine leukosis, ECC = echinococcosis/hydatidosis, FMD = foot and mouth disease, GUM = gumboro, IBR = infectious bovine rhinotracheitis, LC = leucosis, LSD = lumpy skin disease, OWS = Old World screwworm, PAST = pasteurellosis, PPR = peste des petits ruminants, RP = rinderpest, RVF = Rift Valley fever, SAL = salmonellosis, SCR = scrapie, SW = screwworm, TB = tuberculosis, TH = theileriosis.
Appendix 2

Extract from memorandum by the Ministry of Agriculture, Fisheries and Food (2)

Animal identification systems

<table>
<thead>
<tr>
<th>Method</th>
<th>Security</th>
<th>Durability</th>
<th>Clarity</th>
<th>Ease of application</th>
<th>Welfare</th>
<th>Cost</th>
<th>Consumer safety</th>
<th>Industry acceptance</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ear tags - metal</td>
<td>3</td>
<td>4 can be cut out</td>
<td>3</td>
<td>3</td>
<td>4 slight initial discomfort</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 remain undamaged</td>
<td></td>
<td>3</td>
<td>2 % infection</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>but do rip out</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- plastic</td>
<td>2</td>
<td>2 can be easily</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>30</td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td>3 up to 15 %</td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
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<td>lost annually</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Tattooing</td>
<td>5</td>
<td>4 wears away in time</td>
<td>1</td>
<td>1 only readable for three years or so</td>
<td>2 initial discomfort</td>
<td>3</td>
<td>1 penny per animal after initial outlay</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Freeze branding</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>28</td>
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<tr>
<td>Sketch card</td>
<td>5</td>
<td>4 cards get lost/</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>28</td>
</tr>
<tr>
<td></td>
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</tr>
<tr>
<td>Ear notching</td>
<td>4</td>
<td>3 wears out and</td>
<td>5 if code known</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>2</td>
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<td></td>
<td></td>
<td>grows out</td>
<td>0 if not</td>
<td></td>
<td></td>
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<td>3</td>
<td>3</td>
<td>4</td>
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<td>5</td>
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<td></td>
<td></td>
<td>grows out</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Paint marking</td>
<td>2</td>
<td>poor, can be clipped</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>10 pence per animal</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>out</td>
<td></td>
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Score 0 to 5 (0 = poor, 5 = excellent)
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<tr>
<th></th>
<th>Security</th>
<th>Durability</th>
<th>Clarity</th>
<th>Ease of application</th>
<th>Welfare</th>
<th>Cost</th>
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<th>Total</th>
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<tbody>
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<td><strong>Electronic</strong></td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>- tags</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>if no reader then can repeat number on tag</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(as plastic tags)</td>
<td>(as plastic tags)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>chip in tag in ear</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>likely to become more popular with markets/abattoirs</td>
<td></td>
</tr>
<tr>
<td>- implants</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>with reader 0 without</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>19-24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>untested-possibly 3-4 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>risk of migration</td>
<td></td>
</tr>
</tbody>
</table>

Score 0 to 5 (0 = poor, 5 = excellent)
Appendix 3

Modules of the Pathology and Productivity of Small Ruminants Programme in Senegal which can assist epidemiology (13)

- milking
- cause of death
- feed supplementation
- disease outbreaks
- housing and feeding
- respiratory diseases
- serology of respiratory diseases
- serology of breeding diseases
- growth
- body condition
- examination of facies
Use of I&R System in Notifiable Disease Control (17)

START

DISEASE INTRODUCTION

- NO

LIFT CONTAINMENT AND DISEASE CONTROL MEASURES

- YES

DISEASE CONTROL MEASURES

DISEASE SITUATION

LABORATORY INVESTIGATIONS

ON-FARM INVESTIGATIONS

FARM CONTAINMENT

DISEASE CONFIRMATION

NO

YES

FARM RELATED MEASURES

STRATEGIC MEASURES

REMOVAL DESTRUCTION AND CLEANSING

LIFT CONTAINMENT AND DISEASE CONTROL MEASURES

ON-FARM INVESTIGATIONS

OTHER POSSIBLY INFECTED HERDS/HERDS AT RISK

I & R

LABORATORY INVESTIGATIONS

(SERO) EPIDEMIOLOGICAL INQUIRY

PROTECTION SURVEILLANCE ZONES

PRE-EMPTIVE REMOVAL

RING VACCINATION
Interrelation between identification and recording system, monitoring and surveillance and emergency response system (17)