Appropriate animal health information systems for nomadic and transhumant livestock populations in Africa

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Summary: Nomadic and transhumant livestock comprise the normative mode of production in the arid and semi-arid regions of Africa. By adopting management practices with high human labor and informational input, pastoral societies have adapted to innately high environmental variability. The Western veterinary model, which developed under sedentary conditions of production, has been unable to address herd health problems in African pastoral regions. By soliciting the participation of pastoral people, however, it is possible to develop an animal health information system that is technically appropriate, economically viable and socially acceptable. The organizational structure of appropriate information systems can furnish the framework for animal health delivery under pastoral conditions.

KEYWORDS: Africa - Animal health delivery - Appropriate technology - Ethnoveterinary research - Information system - Nomadic - Pastoral - Rangeland - Transhumant - Veterinary anthropology - Veterinary auxiliary.

INTRODUCTION

The delivery of animal health services to nomadic and transhumant livestock populations in Africa has never been easy. Most of the difficulties can be traced to attempts to transfer an inappropriate Western veterinary model. Because "establishment" veterinary medicine in Africa has been imported largely from Europe and North America, it lacks mechanisms to function under nomadic and transhumant conditions.

There is no question that Western veterinary medicine works in the West: it improves the well-being of animals to the benefit of society-at-large and stands the test of many free-market economies. In recent years, the Western model has adapted to great social and economic change and responds to many autochthonous, animal-related concerns. However, no one should expect it to be capable of responding to livestock health problems under the unique conditions of nomadic and transhumant life.

After having worked with a number of pastoral societies, the authors conclude that the problem of appropriateness is central to the development of veterinary

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medicine in Africa. Western veterinarians working in Africa have often taken the view that nomadic management is unproductive and esoteric. In fact, it is at least as productive as Western ranching (9); unless it is better understood, little progress can be made on pastoral animal health delivery. The Western veterinary model is just too idiosyncratic to apply to African pastoral conditions.

The notion of appropriate technology is embedded in development jargon, where it usually refers to simple, small-scale, labor-intensive alternatives. While these attributes may be important, they are not the only factors that influence the success of veterinary medicine under African pastoral conditions. Getting the technology right is only part of the solution; making it compatible with cultural, economic, social and physical conditions is also necessary.

Animal health information systems can play an important role in the development of a veterinary model for African pastoral livestock populations. While the information systems themselves need to be compatible with African pastoral conditions, the information which they collect and process must also be appropriate; that is, useful to the future development of veterinary medicine.

This paper is based on a composite of the work undertaken by the Section of International Veterinary Medicine of Tufts School of Veterinary Medicine in the West African Sahel, the Horn of Africa, East Africa, and southern Africa. These regions are parts of the arid and semi-arid pastoral zone of sub-Saharan Africa that stretches in a continuous, curving band through Mauritania, to Somalia, Tanzania and Botswana. Because differences between countries and societies can be vast, the authors emphasize results that are appropriate to all or most pastoral situations. This is done with the hope that development work on other nomadic and transhumant livestock populations can progress without “re-inventing the wheel”.

WHAT ARE NOMADIC AND TRANSHUMANT LIVESTOCK?

This is a frequent topic of debate in academic circles. Pastoral is another word that refers to grazing animals raised under extensive conditions by traditional societies. The nouns “nomad” and “pastoralist” both refer to people who take animals out to graze on pasture. (Nomad derives from the Greek nomos, which means “pasture”, while pastoralist derives from the Latin pastor, a shepherd.) For our purposes in Africa, the nouns, pastoralist and nomad, as well as their adjectival forms, pastoral and nomadic, are interchangeable.

Mobility in the pursuit of pasture is a rational management strategy in highly variable ecosystems. It is a fundamental attribute, although not explicitly denoted by the words “pastoral” and “nomadic”’. Recent evidence shows that animal protein production per hectare from nomadic ecosystems equals or exceeds that from ranches (9). And in East Africa, nomadic production has been sustained for at least 2,000 years. This invalidates the romantic notion of unproductive nomads wandering aimlessly through the grasslands. (For an essay on nomadism in a historical context, see ref. 2.)

Transhumant is a loan word from a French construction (transhumance) used in social science writing. Transhumant derives from the Latin trans meaning “across”
and *humus* meaning "earth". Literally speaking, it means "moving across the earth"; therefore, transhumant livestock populations are explicitly mobile. In conventional usage, transhumant also implies that the grazing migration has a seasonal pattern. In other words, herd migration may be limited to the summer or to a particular rainy season or other favorable grazing period. After the seasonal migration, the people and their animals return to a fixed location.

Many adjectives can modify the above definitions: sedentary and semi-sedentary, agropastoral, mixed and pure pastoral, and others. Most of these attribute a crop farming component to the productive enterprise. Sometimes a distinction is also made between nomadic pastoralism — which is seemingly a redundant term for African purposes — and transhumant pastoralism.

We prefer these definitions:

- in contrast to ranch populations, nomadic livestock are those which are grazed or browsed on natural vegetation using human labor and information-intensive management;

- transhumant livestock are a subset of nomadic populations that are seasonally grazed away from an identifiable "homesite".

Because pastoral management does not rely on fossil fuel consumption, nomadic and transhumant livestock can be considered forms of pre-industrial animal agriculture. This label is much more meaningful than the culturally biased concept of "primitive".

The practical value of a detailed classification of pastoral societies is questionable. The categoric definitions are fluid and lack consensus, and there are few rigorous demographic and economic data on most pastoral societies. Also, societies change over time, and not necessarily in any particular direction. For the epidemiologist working under pastoral conditions, classification is much less important than understanding the nature and role of mobility and other herd management techniques in the specific society.

Pastoral people and the societies to which they belong, their animals, and the land and its flora and fauna, are often described in a holistic context as a "system". Two examples are the Wodaabe system of the West African Sahel and the Masai system of the East African plains. While this is a useful concept that correctly implies a complex ecology, the authors have avoided pastoral systems labels in order to circumvent confusion with the term "animal health information system". Instead, reference is made to a "society", meaning a self-recognized group of people with many internal affinities, including language, culture, kinship, social relations and economy.

**OBJECTIVES OF AN ANIMAL HEALTH INFORMATION SYSTEM: THE CASE OF TRYPANOSOMIASIS**

Even looking beyond Africa, on a worldwide basis, animal health information from pastoral livestock is severely lacking. There are few technical papers on diseases and their patterns of occurrence in nomadic and transhumant herds. For example,
of the thousands of papers on African trypanosomiasis, there are very few that specifically define the extant conditions of pastoral management.

At least since colonial times, there has been a "shadow knowledge" that pastoralists modulate herd movement in tsetse-infested areas in order to reduce the prevalence of trypanosomiasis. However, the textbook paradigm is that tsetse exclude all but a few, mostly trypanotolerant, cattle from much of para-equatorial Africa (1). Little regard has been given to the inferior nutrition of treed savanna compared to grasslands, or the opportunity cost of animal vis-à-vis crop agriculture in wet ecosystems, or that pastoralists rather than cattle may be the scarce commodity. The geographic exclusivity of cattle and tsetse may be true, but the singularity of the trypanosomal cause is tenuous.

Given that tens of millions of dollars are spent annually on trypanosomiasis research (carried out mostly in the laboratory), and that often the intent of government policy is the suppression of pastoralism, it would seem of critical importance to quantify trypanosomiasis as a constraint under different regimes of pastoral management. As far as the authors know, this has never been attempted.

The first objective, then, of an appropriate animal health information system is to monitor the information necessary for rational pastoral development strategy. Such information includes animal disease status, health management factors, the use of animal health products and the activities of animal health workers.

The transhumant Fulbé of Burkina Faso recognize a number of diseases of cattle (14, 18). One is "wilseré", a word that embraces a variety of syndromes and includes trypanosomiasis as well as other pathologic entities. The Fulbé conceptualization of "wilseré" seems to derive from a process of elimination: diseases that can be diagnosed by their patterns of occurrence and vital and post-mortem signs and lesions are excluded. Some examples of excluded diseases are streptothricosis ("gugna"), rinderpest ("caara") and blackquarter ("baleeyel"). Trypanosomiasis and other diseases are retained in the "wilseré" category because their non-specific or protean manifestations make them difficult to diagnose (11, 18).

This type of highly inclusive disease complex may be a common phenomenon in pastoral cultures. It makes an appearance also among the Kel Dinnik Twareg of Niger, who think that a multifaceted syndrome called "azani" is at the root of all camel diseases (19). In spite of an outstanding ability to describe many cattle and small stock diseases that correspond to Western nomenclature, the Twareg are quagmired in an all-embracing camel disease complex.

Therefore, a second objective for a pastoral animal health information system is to clarify culturally-bound disease complexes, both for the pastoralists and for personnel involved in animal health care delivery.

Trypanocidal drugs are widely but erratically distributed in the savanna regions of sub-Saharan Africa, and the demand of pastoralists for these drugs is strong. Trypanocides are not, however, used in a systematic way that would optimize their effectiveness. Moreover, ad hoc usage might enhance the development of drug resistant strains, which are common. "Wilseré" further complicates the picture by being understood by the dispensing animal health technicians (who are not Fulbé pastoralists) as trypanosomiasis only. The result is misuse and overuse; there is no knowledge of the economic benefit, if there is any, except that occasionally a clinically ill animal will be saved.
This illustrates the third objective: **to determine the technical and economic feasibility of addressing specific diseases** through epidemiological investigation, therapeutic or preventive field trials and cost-benefit analysis.

One of the newer methods of tsetse control is the placement of insecticide-treated cloth “screens” at strategic locations in pastoral habitats. To their peril, the flies are attracted to the blue color of the cloth. The devices can be highly effective for fly control but are not effective enough to achieve eradication. (There is ongoing testing of chemical attractants that would enhance their effectiveness.)

Screens were first tested in the early 1980s by an expatriate team in West Africa, with the idea that government animal health technicians would ultimately provide an anti-tsetse service. Later, in Kenya, staff at the International Centre for Insect Physiology and Ecology realized that pastoralists might be in the best position to monitor tsetse populations and place the traps. Accordingly, field trials were carried out with the participation of pastoralists.

The results of these trials are unknown to the authors, but the experience begs several questions. Even if the screens were effective at reducing losses, would the pastoralists think the extra labor worthwhile? Would a potentially dangerous insecticide be misused? And how much technical support (extension) from outside personnel would be required to introduce the activity and sustain it? These questions illustrate the fourth and fifth objectives of nomadic and transhumant livestock health information systems: **to test the social acceptability of animal health interventions and to give pastoralists an opportunity to participate in their own development.**

In the case of acute, epizootic diseases, an animal health information system might also provide red flag signals of outbreaks that require special assistance. However, the authors have not been impressed by the ability of any animal health information system — appropriate or not — to fulfil this objective under African pastoral conditions.

**DEFINING APPROPRIATENESS THROUGH VETERINARY ANTHROPOLOGY**

Although scientific inquiry has only recently influenced indigenous thought, and that but slightly, it is now generally accepted that pastoral societies have detailed knowledge, gained through experience, of animal health and production. Natural explanations, rather than supernatural or religious ones, are given for most disease processes. Even though indigenous knowledge may often seem unrigorous or misinformed, it is extensive, and the most satisfactory plan for developing an appropriate animal health information system is to elucidate this knowledge and build on it.

Veterinary anthropology, also known as ethnoveterinary research, is an interdisciplinary domain that seeks to obtain animal health information from pastoralists (6, 7, 8, 13, 14). The research is best carried out as a collaboration between veterinary epidemiologists and social scientists, and may require the assistance of an ecologist or geographer. Because of the complexity of pastoral management strategies and the high biotic variability of arid and semi-arid ecosystems, ethnoveterinary
researchers must become familiar with the pastoral societies they study, pastoral modes of production and the physical environments. Animal health data will be difficult to interpret without this understanding.

From the personnel standpoint, interdisciplinary work is expensive. Two or three researchers may be required to match the data output of a single disciplinary worker. However, it is possible for one person with extensive experience of nomadic and transhumant livestock to accomplish the task alone. An astute researcher who lacks sufficient practice can often obtain satisfactory results if he or she is supervised by someone with extensive pastoral experience.

The methods of information collection include sample surveys with questionnaires, open-ended interviews and participation in daily life. The authors have found that a combination of all three methods gives the best results. This is especially true in the early phases of research when it is desirable to obtain a holistic overview.

The sample frame is defined by ethnic group and geographic location. There may be two or more ethnic groups within one region and each may have different normative herd profiles, management techniques, economies and animal disease patterns. An interpreter is usually necessary but introduces additional risks of misunderstanding. The authors have found that it is best to have an experienced interpreter from the same ethnic group as the pastoralists, but this is not always possible. Cross-cultural problems are, of course, fewer if the researcher knows the interpreter well.

In an effort to obtain an abundance of data quickly, the impatient researcher may place too much reliance on questionnaires administered by hired surveyors. Eventually, the use of questionnaires may be appropriate to collect data for an animal health information system but, without the overview, data collected this way may be misinterpreted. For example, culturally-bound disease complexes such as "wilsere" may be mistaken for single disease entities.

It is also a mistake to make the interview session too brief. While there is no need for the researcher to integrate into the society or household in an anthropological sense, it is still necessary to build confidence through discourse. Time is also needed to observe and comprehend patterns of behavior. One to three days may be required at each nomadic camp or transhumant site, with several hours devoted to interviews each day.

An attempt should be made to define a normative herd in terms of numbers of each livestock species. Contrary to common opinion, an estimation of animal numbers can often be obtained simply by asking; visual verification, however, should be attempted. One should also be aware of the possibility of animals grazed or watered away from the camp. If animals are sent away only for the day or overnight, they should be included in the census.

Unless the relationship between ownership pattern and herd productivity is under investigation, animal ownership is ignored. First, if the herd is split for a season, the unobserved animals are considered to be of a separate herd. Second, so long as they are in the herd together, no distinction is made between animals that are owned, borrowed or consigned.

Many pastoral regions contain some atypically large herds owned by wealthy individuals. Whether these form part of the sample is less important than knowing they exist. Sometimes large herds are excluded on ideological grounds, when the
researcher believes that, in the midst of poverty, the wealthy should care for themselves. At other times large herds may be included for convenience, because many animals can be studied at one place. The authors have found, however, that the best information does not come from herders who are hired to care for large herds because management in such cases usually entails less observation of each animal.

There must be considerable awareness of seasonal variations. Data can be sorted into seasonal climatic categories, such as the early, mid- and late rainy and dry seasons, the short rains and the long rains, the hot and cold seasons, and so forth. Seasonal categories can also be developed by analyzing ambient temperature patterns or incremental rainfall (12). Also, pastoralists usually have their own seasonal categories into which data can be sorted. A dogmatic assignment of dates to each season should, however, be avoided, since interannual variations will affect the ecology and the timing of herd management activities.

Laboratory confirmation of field data is unimportant when starting ethnoveterinary studies; on a population basis, the results are meaningless until there is confidence that the sample is representative. Also, laboratory confirmation usually increases the logistical complexity of the work and adds another factor of uncertainty. Laboratory diagnostic tests and surveillance methods become more valuable after an animal health information system is established.

When the goal is to develop a continuously functioning animal health information system as an integral part of health delivery, the veterinary anthropological studies should be given an open-ended time commitment. Evolving the ethnoveterinary research into the information system itself will give the pastoralists the greatest opportunity to participate.

ESTABLISHING THE GEOGRAPHIC FRAMEWORK

Although information on ethnicity and seasonality is easily obtained, the geographic boundaries of the sample frame are problematic; except for such political divisions as district or province, geographic boundaries usually have been ignored.

However, when all three defining characteristics are known, it is possible to make concise, useful statements on pastoral animal health. For example: vitamin A deficiency is a major cattle production constraint for the Wodaabe of the pastoral habitat of central Niger (16). This statement can be quantified with prevalence data for nyctalopia during the late dry season, in May, combined with production-loss estimates obtained from the Wodaabe at the end of the early rainy season, in mid-July. Benefit:cost analysis for preventive intervention (over 100:1 when vitamin A powder is administered by the Wodaabe themselves) is then possible.

The authors have attempted geographic definition in two very different pastoral ecosystems. Earth surface features, vegetation and land-use patterns were considered in both cases. In spite of the importance attached to geographic boundaries, only a brief description of each experience is possible here.

In Burkina Faso, indigenous animal health information was systematically collected in a tsetse-endemic area over a seven-month period (14, 18). The pastoralists were
transhumant Fulbé who reared cattle and hired farm laborers from another ethnic group to cultivate small plots of millet. They moved seasonally up to 25 km, from small villages near their farms to the banks of the Nouao tributary of the White Volta River. Since Nouao received relatively high rainfall for a pastoral environment (800 mm), it was assumed that systemic variability (for example, of rainfall and biomass) would be relatively low.

The sample was determined in collaboration with a social geographer. It was reduced by 50% by restricting the study to only one bank of the river, and was further reduced to 15% of 250 Fulbé households that were located in a line of villages situated perpendicular to the river. This was done to account for variability related to proximity to the river. The sample represented 375 sq km (or 750 sq km, if both banks were included) of riverine and tallgrass savanna. The 750 sq km represented 38% of the area of a development project, but no attempt was made to make the sample conform to this, as the influence of the river would have been obscured.

The second example came from the northern Sahelian grassland of the Republic of Niger (12, 17), a region of low mean annual rainfall (280 mm) and high systemic variability. Two ethnic groups, the transhumant Kel Dinnik (Twareg) and the nomadic Wodaabe (Fulani), comprised over 90% of the pastoral population, with the Twareg predominating.

"Ground-truthed" biomass measurements were combined with systematic aerial reconnaissance and satellite data (NOAA, AVHRR and Landsat) to define the geographic limits of dry season pasture. This was a major research effort that required the collaboration of epidemiologists, ecologists and physical geographers over a seven-year period. A rainfall model for drought early warning was developed from data on human and animal populations, biomass, carrying capacity and rainfall.

The geographic limits for the model are shown in Fig. 1. They formed the boundaries of a pastoral habitat that contained most of the biomass on which the pastoral livestock of the region were sustained. By defining a zone of uniform ecological conditions and monitoring the herds of 30 to 40 nuclear families, it became possible to obtain implications on animal disease and treatment interventions for a large geographic area.

The Niger experience demonstrates the value of an epidemiological component to integrated pastoral development, where it has too often been overlooked. Future research should aim to simplify this approach in order to extend it to other animal health projects. By eliminating trial and error and substituting systematic aerial reconnaissance with a single census, in two to four years it should be possible to obtain valid results less expensively.

Once geographic boundaries are defined, people need to be organized to move information in and out of the field in ways that are sustainable and have a measurable economic impact.

MAKING THE SYSTEM OPERATIONAL

While the ecological research was in progress in Niger, an animal health information system called "Vetscout" was under development (15). Vetscout collected
data from six grazing areas in the pastoral habitat and three in the rainy season grazing zone. Data were collected separately for each species of livestock: camels, cattle, sheep, goats and donkeys.

Field implementation of Vetscout was carried out by Twareg and Wodaabe pastoralists who had returned to herding after a ten-day training session for veterinary auxiliaries (VAs, barefoot vets, veterinary scouts, et al.) (3, 10, 15). Without going into detail, it should be noted that this short period was a deliberate attempt to avoid potential conflicts due to prolonged absence from kinfolk and herding responsibilities. Several years of social science research had been undertaken before

FIG. 1

Map of Niger with locations of the study area, meteorological stations and boundaries of the pastoral habitat
this decision was reached (4). The short period was also intended to avoid any expectations of a salaried government position at the end of the training. The Vetscouts operated as private agents and were expected to charge for their animal health care services.

Vetscout had the dual role of collecting treatment data (in other words, of monitoring the scale of their activities) and of indicating disease occurrence by the number of cases treated. While Vetscout did not exactly give disease incidence rates, it did provide a good indication of relative frequencies and seasonality. Eight disease categories were recognized: respiratory illness, diarrhoea, internal parasites, external parasites, conjunctivitis, wounds, rinderpest and "others". Although ethnoveterinary studies had been undertaken, and the complexities of Twareg and Wodaabe veterinary concepts were known (5, 19), the authors chose to initiate the information system with this simple disease classification.

Record-keeping was done on specially designed forms with pictograms to illustrate each treatment. Two examples are shown in Fig. 2. Each time a syndrome was encountered and treated, the Vetscout would place a slash in the appropriate box. Reporting forms were collected monthly and collated at a centrally located government livestock service facility. Data were entered into a computerised database that produced monthly reports and special reports for any specified time period. One trained government employee supported the system for 55 Vetscouts who were spread over an area of about 50,000 sq km (17). The sample they covered was only a small fraction of the total area.

Vetscout fulfilled the objectives discussed above for an animal health information system. For the government, it proved to be a cost-effective method for animal disease surveillance because all field recording was done by Vetscouts. Vetscout was also an

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**FIG. 2**

Pictograms communicating disease and treatment and allowing the tabulation of cases seen by veterinary auxiliaries — writing in left box is Tifinagh, a script used by the Twareg
important stock inventory tool that gave greater precision to the procurement and
distribution requirements for animal health commodities.

A post-project evaluation of Vetscout indicated that a majority of the Vetscouts
continued to operate without supervision so long as they could obtain animal health
commodities to sell in the field. This can be a problem because all commodities are
imported and neither the government nor private sector sources has routine
procurement mechanisms.

The greatest problem for the future collection of animal health information will
be to institutionalize the flow of completed report forms to the central analysis unit.
The experience of the authors indicates that this would be accomplished most easily
through regional markets and veterinary posts, where the government livestock service
is already installed.

CONCLUSION

Appropriate animal health information systems for nomadic and transhumant
livestock populations probably cannot be sustained at a local level only. Pastoral people are generally aware of the disease processes that affect local animal
populations and they keep themselves informed by word-of-mouth communication.
Therefore, even though an economically efficient information system could be
developed, it would not offer much of an advantage or incentive to continue at the
local level.

On the other hand, a large government-operated system is hardly sustainable. Regardless of how budgetary priorities for animal health are determined, experience indicates that, for political reasons if nothing else, animal health activities always receive lower priority than “basic needs”. Also, given the current international emphasis on economic restructuring and the reduction of recurrent costs in African
countries, an animal health information system would collapse if it remained
dependent on public sector operation and financing.

The crux is to find a way to make large animal health programs sustainable by
building on multiple local initiatives, while rewarding local participation by improving
the productivity of pastoral herds. The objectives and activities described in this paper
were developed with this strategy in mind.

It is time to rethink animal health delivery to nomadic and transhumant livestock
populations on which, except for the control of a few viral diseases, veterinary
medicine has had little impact. In the future, appropriate large-scale information
systems with grass-roots participation may be the avenue to better veterinary service
for pastoral societies.

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SYSTÈMES D’INFORMATIONS ZOO-SANITAIRES ADAPTÉS AU NOMADISME ET À LA TRANSHUMANCE EN AFRIQUE. — A.E. Sollod et C. Stem.

Résumé: Le nomadisme et la transhumance constituent le mode d’élevage traditionnel des régions arides et semi-arides d’Afrique. En adoptant des pratiques qui impliquent une somme de travail considérable et nécessitent de nombreuses informations, les sociétés pastorales se sont adaptées à la forte variabilité de l’environnement. Le modèle vétérinaire occidental, qui s’est développé dans des conditions de production sédentaires, n’a pas pu répondre aux problèmes sanitaires du cheptel des régions pastorales africaines. Si l’on obtient le concours des populations pastorales, il est cependant possible de développer un système d’informations zoo-sanitaires techniquement adapté, économiquement viable et socialement acceptable. La structure des systèmes d’informations adaptés peut fournir un cadre à l’organisation de la santé animale dans l’élevage pastoral.


SISTEMAS DE INFORMACIONES ZOOSANITARIAS ADAPTADOS AL NOMADISMO Y LA TRANSHUMANCIA EN ÁFRICA. — A.E. Sollod y C. Stem.

Resumen: El nomadismo y la transhumancia constituyen el modo normal de producción en las regiones áridas y semiaridas de Africa. Adoptando prácticas que suponen una cantidad de trabajo considerable y requieren numerosas informaciones, las sociedades pastorales se han adaptado a la gran variabilidad del medio ambiente. El modelo veterinario occidental, que se ha desarrollado en condiciones de producción sedentarias, no ha podido responder a los problemas sanitarios de los rebaños en las regiones pastorales africanas. No obstante, si se obtiene la cooperación de las poblaciones pastorales, resulta posible desarrollar un sistema de informaciones zoosanitarias técnicamente adecuado, económicamente viable y socialmente aceptable. La estructura de los sistemas de informaciones adaptados puede ofrecer un marco para la organización de la sanidad animal en condiciones pastorales.


REFERENCES


