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Foreword

The structure and functions of farms have evolved continuously. The first step was the delineation between owning land and producing on it, which started at the end of the 18th century. A second step was the transformation of family farms into agricultural enterprises during the 20th century. In the last years of the past century, agriculture was not considered as only dedicated to production, and farms have become invested in several functions (production, preservation of the natural environment and maintenance of the local rural environment). Sustainability is one of the major trends to be expected in the production systems of the future. The size of farms has grown continuously and is expected to grow, since the profit per animal decreases year after year. Exceptions will occur for farmers producing for niche markets (e.g. organic products) who will be able to get a higher return per animal. Farm animal breeding will be globalised more in the future. More and more conventional primary producers will have less control on the animals they breed: a few world-wide operating companies will provide the farmers with semen and embryos of selected breeds or propose hybrid lines. In addition, we may expect that smaller companies will provide limited niche markets for cattle, pig, poultry and possibly sheep and goat breeding. Farmers will also have less control on the marketing of their products. Global market, technological and societal developments may force production systems to change. Three main models have been worked out and they represent an extrapolation of today's reality into the future. In the first model (the conventional path) animal breeding and production will develop further towards a system similar to the current one. The emphasis is on production at a reasonable price. In the second model (the alternative path), the emphasis is on welfare, disease resistance, environment, niche markets (regional and special products). The consumers demands for quality food and societal needs are the main drive behind this scenario. The drive behind the third model (low cost path) is the demand of consumers for cheap and safe products in a global competitive market: the most effective technologies will be used under this intensive farming system. Paths one and three are mostly technical and do not respond to the emotional demands of food consumers. The latter will not be answered only by efficient marketing and the image of products but will also interfere with production systems on the long run. One aspect has been poorly considered: increasing human and animal wastes are produced due to a demographic increase. Their storage, elimination or recycling as fertilisers have to be included in the three agricultural models we described.

The three animal breeding models rely on very different production techniques and hence correspond to different health hazards. Among these hazards, parasites play an important role. Cattle, for example, may harbour, Trematodes (40 species), Cestodes (9 species), Nematodes (63 species), Acanthocephales (2 species), Hirudinids (2 species), Arthropods (78 species), and Protozoans (50 species) under a large variety of climates. Species checklists of parasites in other herbivores are of the same magnitude. Some of these parasites are mostly found in animals reared indoors (most of the Protozoans and a few Arthropods) whereas herbivores grazed on pastures are infected by Trematodes, Cestodes, Nematodes and a wide range of Arthropods. Extensification and a higher percentage of herbage in the feeding of herbivores should lead to the modification of the parasite fauna.

Chemotherapy has been used massively to prevent or cure parasitic diseases, with high success for decades, and has probably modified the existing parasitic fauna. The situation today is not as optimistic regarding control using drugs, since parasites (mostly Nematodes and Arthropods) build up resistance to these drugs. The massive use of chemotherapy may also lead to environmental damage by destroying useful non-target organisms. The selective use of drugs appears as a solution to control parasites and reduce environmental issues. Among the solutions of the alternative path, organic breeding is one of the most radical and organised system, which strongly limits the use of chemical drugs to control pathogens.

Sustainable development is development that meets the present needs without compromising the ability of future generations to meet their own needs. Sustainable agriculture aims at production systems that provide man with food in a balanced way. This means that farms are not production units isolated from the rest of the world. Their activity should respect and help to maintain the quality of the environment. This means that sustainable farms in the ideal should graze herbivores (extensification), use the help of chemicals as little as possible to maintain animal welfare and production, and participate in the safe recycling of their own animals wastes as well as human urban wastes. Data in all these directions are not available and some groups of parasites have been more intensely studied. The environment of animal breeding is changing, and among the existing knowledge, I chose parasites (mostly worms and insects), hosts (mostly ruminants), and farming practices (from conventional to organic farming) in relation to their estimated importance in a context of extensification. It was mentioned above that farmers will have reduced choices on the animal they breed and on the management of their flocks and herds. The choices will be extremely limited in the low cost path, more open in the conventional path, and completely open in the alternative path of breeding management. I think that switching from massive to critical use of chemicals and recycling of human urban wastes are highly determinant choices in agriculture. Organic agriculture is a prototype example of agriculture under constraints on the one hand, and on the demand of new solutions on the other hand. Several of the proposed solutions in organic farming might help to promote sustainability in animal breeding, whatever the path/model.

The following points will be studied:

(1) Agronomic use of urban wastes and parasitism;

(2) Intensification of anthelmintic treatments and the evolution of parasitism;

(3) Managing parasitism using selective treatments;

(4) Antiparasitic treatments and their consequences on the environment;

(5) Parasitism and the constraints of organic farming.

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Jacques Cabaret
INRA
Nouzilly, France