7. Policy related benefits

Community added value and contribution to EU policies

Ruminant livestock production in the EU has been under political and social pressure to decrease pollution and environmental damage arising from agriculture, and to improve the health and well-being of the animals themselves. At the same time, there are equally strong pressures in the EU to find acceptable alternatives to growth-promoting antibiotics, which have now been phased out from the end of 2005. This project addressed the need to find socially and economically acceptable solutions to the ruminant livestock production problems, particularly in view of imminent ban on growth promoting antimicrobials.

The project brought together four academic partners and two commercial partners from different parts of the EU and Switzerland in a project that created a common resource – a collection of new plants and plant-derived materials – that has been shared by the partners and will subsequently be available to other researchers. The action of making the common resource provided a synergy within the consortium that would have been difficult to achieve with individual members. Further synergy arose from the complementary skills of the partners. Partner 1 was expert in protein metabolism and measuring effects on ciliate protozoa, partner 2 in microbial protein synthesis, partner 3 in methane formation, and partner 4 in bloat and dairying. The commercial partners were also complementary: one focuses on plant extracts and spices, the other on novel herbs and tropical plants. Together, they covered a broad range of market opportunities. The different geographical locations enabled the collection to be tested under agricultural conditions typical of continental-climate countries (partner 2), Mediterranean countries (partner 3), and north Atlantic countries (Partner 4), using local breeds.

The different aspects of ruminal fermentation that were examined impinge on several EU-wide policies associated with ruminant livestock production. An essential component of the 2000 reform of the CAP was to improve the environmental impact of agriculture by changing farming practices. The EU is committed to achieving an 8% reduction in greenhouse gas emissions by 2010. Methane and nitrous oxide cause about 25% of the greenhouse effects. Crucially, rumen fermentation causes more than 20% of the methane produced in the EU; manure causes a further 5%. Nitrous oxide, which has 310 times the global warmimg potential of CO_2, is formed by bacteria from N-containing materials deposited on the land. Thus, finding sustainable means of decreasing methane formation and improving N retention in ruminants would contribute significantly to EU policies on global warmimg. N-rich excreta also pose a threat to groundwater pollution. Nitrate is formed by leaching, contributing to concentrations in ground water of agricultural areas which exceed the 50 mg/l target set by the Drinking Water Directive (COMM(2000) 477). Decreasing nitrate leaching forms part of the implementation of Codes of Good Agricultural Practice arising from the Nitrate Directive (91/676/EC). A successful outcome in terms of N retention by ruminants would lead also to a decreased reliance on conventional protein supplementation, which would be compatible with CAP policy on extensification of beef production. Ruminants are a vital component of sustainable agriculture and rural development, the latter which is defined as “the second pillar of the CAP”. Many of the more disadvantaged rural areas are high lands with no prospect of utilising the land except for rough pasture. That in turn means that any production from these lands is dependent on ruminants. To be competitive, the rural livestock producer

presently has to use protein supplements for his animals. A successful outcome to the proposed project would lessen the ruminant livestock industry's dependence on (mainly imported) protein supplements. Furthermore, the strategy presented in the proposal would lead to products compatible with organic farming, which forms a component of various Commission commitments, such as AGENDA 21. The proposal addresses problems of animal health and welfare, by searching for materials that lessen the dangers of bloat and lactic acidosis.

Food safety and quality is an increasingly important consideration for agricultural production, and is recognised in AGENDA 2000 as "a fundamental obligation". Thus the use of chemicals, including growth-promoting antibiotics, in the food chain, is becoming increasingly unacceptable to the consumer and is in some cases banned. This project will explore means of replacing the benefits of the growth-promoting and health- and welfare-improving feed additives in a sustainable and healthy way. The proposed project may also lead indirectly to increased diversity in the crops used in agriculture, or even in forestry, if for example a new type of plant proves to be a useful feed additive.

In terms of all these considerations, the project has been successful. Novel plants, not used previously in animal feeding, have been identified which may decrease nitrogen pollution by slowing protein breakdown in the rumen: these include both new plants which inhibit the proteolytic breakdown of feed protein and others which inhibit the bacteriolytic activity of rumen ciliate protozoa. Other plants were found which may improve animal welfare by suppressing lactic acidosis. In all cases, the plants can be grown throughout the EU and would represent a new crop for farmers. Other target areas met with limited success. The methane inhibitors identified in the collection had minor effects, while no satisfactory inhibitor of bloat formation was found.

The value of the collection itself, and the body of information assembled on the collection, has been recognised in many ways. A Framework 6 project, 'REPLACE', has been commissioned to investigate the same collection for applications in other aspects of ruminant health and nutrition, and also in pigs, poultry and aquaculture. International interest within Europe has been intense, although the partners felt constrained by Intellectual Property requirements in dealing with many approached from companies interested either in joining the consortium or finding out more about the results generaqted by the consortium. Major interest has been noted in Australia and China, where researchers intend to begin Asian and Australian Rumen-up equivalents. Dr Wallace will be involved in advising these consortia.

Quality of life and health

Resistance to antibiotics in human pathogens is one of the greatest of all threats to human health. The appearance of resistant pathogens is correlated with the extent of antibiotics use, so, because 48% of all antimicrobials manufactured are used in farm animals either for therapeutic purposes or as growth promoters, there is an imperative to decrease their use. The EC Scientific Steering Committee on Antimicrobial Resistance recommended in May 1999 that antimicrobials as growth promoters "should be phased out as soon as possible and ultimately abolished." The results of this project should lead to the introduction of natural growth promoters (the proteolysis and protozoal inhibitors in particular), which provide economic benefit to farmers, while avoiding the threat of antibiotic resistance transfer. Furthermore, the farmer will be working daily with natural products rather than chemicals, with consequent benefits for his health. The success rate of the project, in which about 5%

of the 500 samples had potential as feed additives for at least one of the target applications, should also encourage others to investigate the almost boundless potential of the plant kingdom in enhancing the quality of life and health of both animal and human populations.

Product quality and food safety should be improved by uptake of the results of the project, because chemical inputs to the food chain will be avoided. Chemical growth promoters inevitably lead to residues in animal products and in animal wastes. Although withdrawal periods are recommended before slaughter, consumer confidence would be enhanced by knowing that such chemicals were not used in the first place. The EC aims to promote organic farming, partly for this reason and partly for environmental concerns. This proposal is consistent with increased organic farming. The impact of the the most promising of the new materials on product quality have been assessed in the project, and preliminary safety assessments have been made on half a dozen more which did not feature in the final selection.

Employment

Unemployment in several rural areas of the EU, particularly in Southern Spain and Southern Italy, exceeds 20% of the population. Any measures which stabilise employment in these areas will be welcome. The products arising from this project should help that stabilisation, by avoiding the need for protein supplementation and increasing the profitability of livestock production. These disadvantaged regions will be suitable for the cultivation of the new plant materials as cash crops, which could create employment. An example of a new plant which has been exploited in this way is *Yucca schidigera*, which has been used increasingly as a feed additive during the last 10 years: its cultivation in Southern California and Northern Mexico has transformed local employment. The agronomic properties of the candidate materials in the study have been assessed by experts for their possible impact on rural development and employment. The crucial next step in implementing such technology transfer will be to undertake many more field trials. The trials carried out within Rumen-up, although successful, could not provide sufficient confidence for industry (either agriculture or biotechnology) to apply the technology immediately. Many more trials are required.

Environmental objectives

EU agricultural policy is now closely linked to EU environmental policy. The proposal addressed two of the main environmental issues associated with animal agriculture, namely global warming - caused in part by methane - and nitrogen pollution of ground waters. If methane emissions were to be inhibited, the Environmental Protection Agency predicts that methane concentrations in the upper atmosphere, which are increasing exponentially at present, would be stabilised. Nitrate concentrations in groundwater in certain parts of the EU, such as the Netherlands, are so high that the prospect of them meeting the recommendations of the Drinking Water Directive are slim, and all means need to be taken to try to achieve the 50 g/l objective. Some plant samples did inhibit methane formation, though weakly and with an effectiveness that did not persist; nevertheless, this is the first time that a plant material has ever been shown to inhibit methanogenesis. We hope that the results of Rumen-up will form a starting point for others hoping to achieve the extremely important objective of decreasing methane emissions from ruminants. The plants that improve N retention clearly worked and have the potential,

if used in a widespread manner, to decrease nitrogenous emissions from animal production.

Diversification and diversity
The results of the project offer many opportunities to cultivate new plant species as new crops incorporated into local or national integrated farming systems, thus also increasing the diversity of crops used in agriculture and better utilising biological resources. The technology will be particulary suitable for transfer to less developed regions.

The vulnerability of rural agriculture should be reduced by the decreased dependence on expensive protein supplements, and possibly also by the introduction of a new crop. The application of the new technology should be sustainable, and indeed should enhance the sustainability of agriculture in general, because the on-farm system would give more integration of crop and animal production.

Policy implications. The development of natural alternatives will lessen the economic impact of and improve acceptance by farmers of the EU SCAN ban on antimicrobial growth promoters.