Clean production agreement for dairy farmers in the South of Chile: a collaborative initiative of the government and farmers to improve environmental management

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Abstract

Clean Production Agreements (CPA) have been implemented for different economic activities (e.g. fish and pig farming) in Chile and other countries to improve their environmental performances. The objective of this tool is to generate a compromise between the public and private sector in order to achieve environmental goals which are ahead of the local legislation and normative. As a first step of this CPA for the dairy sector, a survey was carried out to evaluate environmental management on dairy farms in Southern Chile. Work is going on now in order to establish environmental goals which are agreed between the government and farmers' association representatives. The objective of this paper is to present the results of the survey carried out for the CPA and to identify issues where research, training and advice are required. The survey was carried out on pre-selected dairy farms located in the south of Chile during 2006. A questionnaire was developed to obtain informed estimates of environmental management on dairy farm. The survey yielded a total of 62 dairy farms with a herd size that varied between 50 and 800 cows farm^{-1} and a milk production of 140,000 to 6,000,000 l yr^{-1}. Data showed that the main environmental problems on farms were associated with manure management, where high volumes of slurry are generated due to the great contribution of rainfall water and clean water to the manure storage. Another important aspect is the management of inorganic wastes, mainly plastic. Information collected was used to show farmers the key environmental areas to be addressed and improved. A public-private committee was created to discuss the proposal for the CPA.

Introduction

The south of Chile (39º to 44º S; 71º to 73º W) has suitable climatic conditions and soil types for cattle production, which is based mainly on natural and improved pastures. The result being that 56% of the national cattle herd is concentrated in the south of Chile. These cattle produce 70% of the country's milk and 60% of its meat (INE, 2007). In addition, 80% of the dairy farmers are located in this area and they own 67% of the land dedicated to dairy production used nationally (Anrique, 1999). In recent years, Chilean dairy production systems have intensified, using more fertilisers and feeds. This has resulted in an increase of the milk and meat production, but at the same time large quantities of farm organic and inorganic wastes have been produced (e.g. slurries and plastic), which could cause pollution to the wider environment.

In Chile there is no specific legislation to control pollution on farms (e.g. manure management); however, normative has been implemented to protect water, soil and air. On the other hand, the Government has focused on pro-active initiatives to improve the environmental performance of production systems such as Clean Production Agreements (CPA). These initiatives have been signed with representatives from different economic activities (e.g. fish and pig farming) in Chile. The CPA has different stages, from the negotiation between the private and public sector and evaluation of the baseline, up to the agreement of issues to be improved and farm revisions. One of the most important steps of the CPA is the preliminary survey in order to establish a baseline for the production system and issues which are important to focus on, and where it is necessary to implement soft or hard technologies to improve their environmental status. CPAs aim to generate

a consensus between the public and private sector in order to achieve environmental goals which are ahead of the local legislation and normative. As a first step of this CPA, a survey was carried out to evaluate the environmental management on dairy farms in Southern Chile. Work is going on now in order to establish environmental goals which are agreed between the government and farmers' association representatives. The objective of this paper is to present the results of the survey for a CPA and to identify issues where research, training and advice are required.

Methodology

As a first step of the CPA, a survey was carried out on pre-selected dairy farms located in the south of Chile during 2006. The selection criterion was farms that belonged to a farmers' association. A questionnaire was developed to obtain informed estimates of environmental management on pre-selected farms, which was based on the Farm Assurance Scheme for Beef and Lamb (UK), and directives for National Standards for Animal Farm (Chile). In addition, surveys carried out from ADAS (UK) and INIA (Chile) and private Chilean companies were considered. Finally, the questionnaire was reviewed and approved by CPA board members, which represented the government and farmers.

The methodology used in this survey was a one to one question/answer questionnaire, visiting each farm. This type of approach gives the opportunities to check '*in situ*' any misunderstanding or misinterpretation of the questions, resulting in a good quality data. The cooperation received from the farmers involved in the survey, was a major factor in obtaining such a comprehensive data set.

During the farm visits, information such as farm identification, farm registry, farm management, and infrastructure was reviewed. In addition, the level of workers education and training on environmental issues was evaluated. The farm visit also allowed for checking of the equipment and technology used for waste management. Data was collected on farms evaluating manure and waste management. The data from the questionnaires were checked carefully detecting any potentially incorrect entries. Information was analysed on an annual basis using a computer spreadsheet (Microsoft Excel 7.0) linking the parameters surveyed.

Results and discussion

The survey yielded a total of 62 dairy farms with a herd size that varied between 50 and 800 cows farm^{-1} and a milk production of 140,000 to 6,000,000 l yr^{-1}. The farms had an average area of 266 ha (30 to 1,137 ha) where 70% of this land is used for productive purposes and the rest is mainly woodlands. Most of the dairy farms were all day grazing (*c.* 55%), however, some farms housed the cows partially during the winter period and in some cases farms had all day housing. Due to the survey characteristic, the number and selection of farms was not a statistical valid regional sample.

The data showed that the main environmental problems on farms were associated with manure management, where high volumes of slurry are generated due to the great contribution of rainfall water and clean water in the manure storage. This agrees with a previous survey on farm effluents carried out in the same area by Salazar et al. (2003). The main sources of dairy slurry production were rainfall water (contaminated and clean), cleaning water from parlour equipment and milk tank, faeces and urine and cleaning water from yards. In some farms, the clean water used for the cooling system was also diverted to the slurry storage. Brewer et al. (1999) in a survey carried out in dairy farms in the UK determined that the main sources of dirty water were from cleaning milk equipment and yards. However, contrary to the situation on Chilean farms, they mentioned that most of the farms had diverted clean roof water and drainage from outside clean yards to separate systems disposal.

All the farms used liquid slurry systems instead of solid ones as their main manure management method. Farmyard manure was mainly generated during calf rearing and managed separately, where it is stored for 12 months and applied to grass or crops once per year. Slurry farmers used surface broadcasting systems (100%), where the most common equipment was high-pressure irrigation systems and tank spreaders with a splash plate. Both techniques have the disadvantage of producing fine droplets that can be carried away by the wind and cause contamination of water courses and odour problems to neighbouring houses. In addition, surface applications have been commonly associated with the highest rates of ammonia losses and odours (e.g. Misselbrook et al., 1996). The use of low trajectory techniques (e.g. trailing hose, injection) can significantly reduce these emissions. However, in Chile such machinery is only recently available.

Most of the farms surveyed (81%) had storage to collect the effluents produced using earth bank lagoons (61%), concrete tanks (33%) or other type. Earth-banked lagoons are widely used because their low cost and can be easily modified or lined to avoid leaking. Nevertheless, this type of manure storage has been criticised because of the potential to pollute ground waters. Nowadays, farmers in Chile are investing in lining new or old manure storages using mainly high density polystyrene (HDPE) or PVC.

When comparing fertiliser and manure management on farms, it was found that most of the farms had good and controlled management for fertilisers (e.g. a plan for fertiliser application and farmers knew the application rate) (Table 1). However, for manures farmers usually did not know about manure management and there were no workers trained in this issue. This situation reflects the different attitude of farmers towards nutrients from manure compared to fertilisers., According to surveys on farms in USA and UK, farmers usually do not take into account the nutrient value of slurries applied to grass or crops. (Morse Meyer et al., 1997; Smith et al., 2001)

Another important aspect on the surveyed farms was the management of inorganic wastes, where the most important were used motor oil (1.1 l ha^{-1} yr^{-1}) and plastic (silage wrap/sheet, fertiliser and feeds bags, empty containers of pesticides, cleaning products for parlour equipment, and veterinary products). The main source of plastic waste was silage sheet, and it was estimated that an average of 1.9 kg ha^{-1} yr^{-1} are produced. In addition, other farm wastes such as paper from udder cleaning, tyres (0.06 unit ha^{-1} yr^{-1}), and vehicle batteries (0.01 unit ha^{-1} yr^{-1}) are produced. In general it was difficult to quantify them because farmers did not have registers. Farm wastes are usually burned, buried, re-used on the farm, recycled or sent to dump sites. Guidelines for disposal are only available for pesticide containers. BALSARI (personal comm.), based on data collected in some EU countries, reported values of 1.7 and 2.0 l ha^{-1} yr^{-1} of used motor oil for farms located in France and Italy, respectively. He also mentioned that farm wastes are mainly burnt, being also recycled or storage.

On 40% of the farms, the 'Chilean Standard for Animal Production (PABCO)' has been implemented, which gives guidelines about farm and animal management. On farms there were no Good Management Practices, ISO 9000 or 14000, HCCP or OHSAS 18000 implemented. These guidelines are used in other production systems (e.g. salmon farming). Only 6% of the farms had workers trained on environmental issues.

Information collected in this study was used to show farmers the key environmental areas that needed to be addressed and improved with the CPA. Data from the survey also allowed us to determine areas where research, technology transfer and training on environmental issues are needed in dairy farms. At present, a public–private committee is discussing the proposal for the CPA, which is expected to allow farmers to improve the environmental management on their farms.

Table 1: Comparison of fertiliser and manure management on surveyed dairy farms (% of farmers responding YES to the question)

Question	For fertilisers	For manure
Do you have a farm manager?	100%	29%
Has the manager receive training on this issue?	100%	18%
Dou you have a management plan?	81%	22%
Do you register information about application?	71%	14%
Do you know the rate used?	100%	27%
Do you calibrate your equipment before application?	100%	42%
Dou you analyse soil/manure before application?	98%	2%
Dou you take into account nutrient of manures?	33%	

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