

Livestock Waste Management in East Asia IWMEA (GCP/RAS/215/WBG)

The World Bank

Global Environment Facility

The Food and Agriculture Organization

CoSiMo

Introduction, background and problem description

Pork consumption is expected to increase substantially during the next decades in the Asian regions. As a consequence, pig production will increase on specialized landless farms, resulting in more geographical concentrated livestock production. The limited total land area further complicates the problem of the increasing environmental burden. Especially, run-off from manure (regional nutrient imbalance), location of the farms, and inadequate manure storage capacity (suboptimal application) contribute to the problem.

Environmental policies aim at achieving sustainable solutions that balance farmer cost of compliance (profit) and pork consumption prices (people) with the environmental burden (planet). The present policy situation, however, can be characterized by slowly building up a sense of urgency, limited enforcement of the existing legislative framework, and last but not least a need for insight in the cost-effectiveness of alternative policies.

It is important to recognize that developing environmental policies is a dynamic long term process, whereby standards gradually will increase over time. This way, the farming community can adapt to new practices and meet standards that gradually become stricter. Danish and Dutch experiences illustrate how tightening existing measures are an inevitable part of environmental policy development. The major challenge is that the agricultural system and the environment are influenced by decisions taken by thousands of spatially dispersed individual farmers, who have to change their farming practices.

Aim of the project

This project aims at: (1) developing a simple computer based decision support tool that enables the assessment of alternative combinations of policies to manage livestock waste management in SE Asian countries and regions; and (2) assist the use of this tool among policy officers that advice competent authorities.

Description of the decision support tool

The project activities will be carried out in close cooperation with the users of the tool. Data collection and verification, as well as formulating alternative policy measures are crucial activities. To provide insight on the consequences of alternative (combinations of) policy instruments, a Cost of compliance Simulation Model (CoSiMo) will be developed. CoSiMo is a decision support tool that does focus on the farmer cost of compliance and determines expected consequences of alternative policy options. It does focus on policies that induce farmers to adopt environmental friendly practices, to remove farms to another location, or eventually closing farms. The cost effectiveness of these policies has to be evaluated in relation to the autonomous industry development towards less and larger farms.

Ultimately, CoSiMo supports the ranking of the cost-effectiveness of policies, for officers that do advice competent authorities. CoSiMo will be transparent and user friendly. It does not contain black boxes and is based on available data and expertise. CoSiMo is made up of modules, each module being an Excel page.

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Module pig industry structure

To enable efficient policy analysis, farms have to be classified in groups of typical farms according to size (small, medium, large, and very large) and access to land (fish pond) for manure application (full, partly, none). The present industry structure of a country or a region will be described by the number of farms (split up in the estimated number of farms located inside and outside areas with environmental problems) and pigs per farm type. Input parameters per farm type are the number of farms, nr of pigs per farm, and the total nr of pigs.

Module Cost of compliance for the six typical farms

The economics of pig farming for a country or a region will be characterized by calculating the average over all farms of the gross margin and investment costs per slaughter pig and per pig place. The calculated gross margin is based on a five year average for prices of meat and feed. Cost of feed, energy, labour, water, health care, manure management are included.

The use of farm practices (including standards and technologies) will be characterized per farm type. Per farm type, the expected per cent increase in production cost of adopting COP's will be estimated, thus enabling an assessment of the expected farmer reaction within a policy mix. This project activity is very crucial.

On the long term, an economic equilibrium balances the average long term average margin with the investment costs. A sufficient margin is required to be able paying back the investment costs within a certain time horizon. Public policies often lead to higher costs and thus a longer pay back period. The ambition is to fine tune these policies in such a way that farmers are capable to gradually adopt new farm practices (and technologies) over time without too disruptive shocks in both the economic and the ecological system.

Module farmer reactions

In this module, the time horizon that we consider (5 or 10 years) will be specified. The expected farmer's reactions will be specified for the scenario in which the public waste management policy remains unchanged for the given time horizon. Possible farmers reactions will be: (1) comply, (2) comply and expand, (3) comply and remove, (4) do not comply, (5) quit farming. For each farm type the expected percentage of farmers that react according to 1-5 has to be specified, summing up to 100 per cent for each farm type. Combining the data in this module with the data of the present pig industry structure enables calculating the expected development in industry size and structure for the autonomous development.

Next step is to estimate the farmer's reactions, when environmental (enforced) policies will be stricter. Alternative policy combinations should be defined using: (1) stricter manure application standards; (2) stricter standards for new farms to get permit; (3) removing farms; (4) closing farms (including possible farmer compensation); and (5) subsidies on environmental friendly policies. It is practical to formulate not more than two or three alternative combinations of policy measures for the given time horizon.

For each policy scenario, the expected farmer's reactions will be specified for each farm type, using the information in the cost of compliance module. It should be acknowledged that, given the lack of concrete data on how farmers do react to policy changes, the best we can do is to base the estimates on best professional judgment, reaching arbitrary but reasonable assumptions.

Module policy outcome

In this module we quantify the aggregate effect of expected farmer's reactions within the specified policy combinations, based on the data in the other three modules, and determine the expected

development in industry structure for a specified time horizon of 5 and 10 years for each policy mix. Formulating the expected policy outcome enables more soundly based policy choices. Although the problem of choice still remains when using CoSiMo, it helps to improve the quality of the policy making process. Policy analysis supports policy officials to provide competent authorities with underpinned advice. For most competent authorities, the required effort in learning to use decision support tools like CoSiMo will be too high. The CoSiMo tool is therefore aimed for use by policy officials.

Detailed description of Activities

The planned project activities are:

1. *Pig industry module*
 - 1.1 Collecting data per farm type (nr of farms, nr of pigs per farm, and if available: farmers age, access to land or fish ponds)
 - 1.2 Assessing expected growth of the industry for the given time horizon, using expert judgement¹
 - 1.3 Design of the excel page sheet

2. *Cost of compliance module*
 - 2.1 Calculating average gross margin and investment cost per slaughter pig and per pig place for a country or a region, using statistical information and expert information
 - 2.2 Characterize per farm type the use of farm practices and the extent to which they meet formulated COP's.
 - 2.3 Estimate per farm type, the expected per cent increase in production cost of adopting COP's
 - 2.4 Design of the excel page sheet

3. *Farmer reaction module*
 - 3.1 Policy officers formulate up to three alternative combinations of environmental policy measures that probably will be considered within the next few years for the country or region.
 - 3.2 Specify the expected farmer's reactions per farm type for each policy mix. It is crucial that this activity is performed by the policy officers themselves, supported by industry experts. By doing this, the capacity building process will be improved.
 - 3.2 Design of the excel page sheet

4. *Policy outcome module*
 - 4.1 Design of the excel page sheet
 - 4.2 CoSiMo training session aimed at formulating recommendations for adapting the first version of the COP's that was already formulated within the framework of the project.

Work plan and required inputs:

In each participating countries three training sessions will be conducted. Participation of the future users of CoSiMo is crucial for the project to be successful. The first session (February 2009) starts with a kick-off meeting in each country. In this meeting the aim of the project and the planned project activities will be presented and discussed. Furthermore, the first visit aims at getting the industry picture sharp, by evaluating and discussing already collected data for the pig industry module and the cost of compliance module. Probably, available public statistical data will be not sufficient. Some data can be purchased from private companies, and some data can be obtained from (international) industry experts.

¹ We need this figure for the farmer reaction module, to make a reasonable estimate of the % of expanding farmers.

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The second session (June 2009) aims at capacity building with respect to the interaction between farmers and environmental policies aimed at them. To fill the farmer's reactions module, policy officers will be supported in formulating up to three alternative combinations of environmental policy measures that probably will be considered within the next few years for the country or region. As already mentioned, it is crucial that this activity is performed by the policy officers themselves, supported by industry experts.

During the third and last session (September 2009) policy officers will be trained in using CoSiMo, by working on a set of recommendations for adapting the first version of the COP's that were already formulated within the framework of the project. These recommendations will be presented to the competent authorities.

Working sessions:

- February 09: to discuss the aim and activities of the project, to discuss with country policy officers and researchers on data required and data collection.
- June 09: to present the progress of the tool, to fill the farmers' reaction and support policy officers to formulate alternative combinations of policy
- September 09: to present the first version of CoSiMo and to train the users.