

**Towards a New Information System for Farm Management -
Changing the accounting system for better environmental reporting**

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TOWARDS A NEW INFORMATION SYSTEM FOR FARM MANAGEMENT

Changing the accounting system for better environmental reporting

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1. Introduction and problem statement

The management of information flows becomes increasingly important for creating continuity of farm firms and for protection of the environment. Traditional information management of Dutch farm firms depends heavily on ex post reporting on farm outputs, of product as well as environmental impacts. Ex post information have only limited significance for future planning and for forecasting developments in the business environment. Often, yearly fiscal reports provide the only basic information for farm planning.

Several developments urge for reorganisation of the information system:

- the need for regular reporting on outputs that harm the environment (as is the case with the output of manure in the hog chain);
- changes in the business structure due to larger scale in production (from farm firm to plc);
- changes in transaction and market structures, as is the case with the limitation of the role of traditional auctions and the decreasing role of co-ops and guaranteed purchase of output. Contracts, in stead of market and co-operative relationships are increasingly of importance for ensuring the continuity in business income.
- changes in consumer preferences and product-differentiation; these factors urge for the need of instruments to be better able to plan production and sales.

Farm-firms have only limited information available for planning and monitoring business output. The economic and natural environments urge for the need of reorganisation of the farm information-system. Especially the environment is demanding for regular data-exchange between governmental agencies and farm-firms, and between farm-firms and other participants in agricultural chains.

The problem that is addressed in this paper is on what aspects to reorganize the information system, to be better able to plan and monitor environmental impacts of the farm-firm.

Environmental measures in chains, supporting sustainability, rely on information of environmental impacts and their returns (see extensively: Bouma c.s. 1995). More specifically, information on environmental performance is of importance for different reasons (Bremmers, 2000):

- the introduction of obligatory environmental reports creates the necessity of disclosure of risks and returns throughout the chain. The governmental policy on sustainable development stimulates public reporting on environmental impacts.

- changes in product¹ configuration, because of environmental requirements, should be valued on available information with respect to the profitability of alternative product-configurations.
- environmental policy is directed at pollution prevention in early stages of the product chain and the avoidance of 'end-of-pipe'-measures. Since it can be expected that in practice environmental measures are taken more willingly if 'pollution prevention pays', environmental performance indicators should inform about the consequences of alternate environmental strategies (Bremmers, Hagelaar & De Regt, 1996).

The paper aims at confronting traditional (fiscal) reporting with the administrative requirements in modern farm management. It aims especially at formulating leading indicators for management and control with respect to environmental issues.

2. The traditional accounting system

Traditional accounting for the farm firm heavily depends on output figures that are directly related to:

- the ex-post profitability of the farm firm
- the management of production and waste flows.

Profit measurement should invoke precise, objective, timely and understandable business information (Merchant, 1998). The present disclosure of the ex-post profitability of farm firms has neo-classical economic theory as a basis. Neo-classical economic market-circumstances include the availability of homogeneous products, the absence of influence on prices and the existence of many suppliers and consumers. Performance-measurement instruments are therefore output-oriented and profit-related (Gerlowski, 1996). In many cases, there even is the absence of a pricing mechanism, because of obligatory sales to co-operative enterprises. This explains the, in accounting practice, anomalous valuation of stock against selling prices (Giesen & Van den Tempel, 1992). Profits are considered realised in the production stage, whereas in business practice, profits are considered to be made when produce is sold and/or delivered. Under neo-classical circumstances, technological differences between companies are anomalous. Business efforts are primarily concerned with the adjustment and control of production levels and costs. The definition of a business strategy is superfluous. Profit measurement, in a classical way with return on investment, has major defaults, that are addressed below (see among others Kaplan & Atkinson 1998, Morse & Zimmerman 1997).

First of all, profit measurement is a retrospective of a kind. So, only damages from past events that can be expressed in financial measures is included in profit figures. The *accounting concept of profit* is based on differences in equity, measured at the end of the fiscal, commercial or calendar year, after having made corrections for financial opportunity costs (owner's labour and interest on privately financed investments). The system of performance measurement lacks strategic (prospective) significance. Realised profits have only significance for determining the farmer's income and possible expenses and lack significance for decision making and environmental control.

¹ Product in a broad sense, including environmental impact of production and use.

Second, profit measurement lacks the inclusion of the *risk-level* as a significant part of business performance (compare Hardaker & Huirne, 1997). Risk levels, at which farmer's production is realised, are increasingly important because of the change in the consumer's perceptions and utility function. Factors that traditionally were excluded from the consumer's preference scheme, are included nowadays. Awareness has risen on food safety, due to recent crises in agribusiness produce, like BSE, swine fever and mouth and foot disease. Quality assurance takes a major role in processing. Systems like ISO 9000-series are implemented and HACCP is obligatory in the processing sector. Quality assurance can include environmental risks as negative product characteristics. So, from a TQM-point of view, profit as a performance criterion lacks managerial significance (see Noori & Radford, 1995).

Third, profit measurement is normally based on accounting data. Accounting data, like the valuation of assets on a balance sheet, are easily influenced (see Helfert, 1994). Higher valuation of assets (or lower depreciation) boost business income. Emphasis should therefore be placed on cash-flows, rather than on profits (Brealey & Myers, 1991). Cash-flows are not influenced by the specific accounting system, especially if they are calculated on a cash bases rather than on an accrual base. Environmental legislation and information requirements even strengthen the pressure for retrospective accounting information, thus hampering opportunities to reform the present information system and improve the management of *future* pollution.

Fourth, the *precision of profit measurement* is questioned when it comes to costing specific products. As business activities become more differentiated, overhead costs take a larger part of total business costs (Drury, 1992). Precise measurement of costs per unit is of viable importance for pricing, allocation and investment decisions. Costs are invoked partly by business activities elsewhere in the chain and are redistributed or charged to production outlets elsewhere.

The management of business relationships (by means of legal structures, contracts, covenants etc.) on the input- and output-side of corporations is of eminent importance with respect to the survival of food industry because of the impacts on profitability (for instance by means of ECR or TQM), safety (HACCP, TQM, legal standards) and stability of chain relationships. The increased demands from chain partners cause *cost allocation* problems (Barfield et al, 1994). Measurement of costs is of importance for the redistribution of business income in the chain too. Redistribution mechanisms can relocate costs (made for chain objectives like sustainability or quality assurance) between chain-partners (on the basis of expected gains from measures taken collectively, on equal responsibility or on the basis of 'pollution prevention pays'-principle). So, the adoption of suitable cost allocation mechanisms is hampered by inaccurate and delayed measurement of causal relationships with external (chain-) cost centers.

3. The (environmental) accounting system: its shortcomings

As to environmental accounting a similar analytical structure as in financial accounting is used for setting up the reporting system. In future, it can be expected that farm firms should provide an environmental report, similar to obligations in the private sector

elsewhere. The structure for environmental reporting is emerging from national as well as international rule-making and legislation, like the GRI-directives. The GRI-directives are intended to create an integral reporting structure for economic, social and environmental accounting (Bremmers, 2000).

Environmental reporting should include a chain-perspective, and be based on environmental care systems of the stages included in the production of food in agribusiness. As to the first national plan for environmental care in The Netherlands (1989), it is desirable for Dutch enterprises to self-regulate their relationship with the environment. Several principles were adopted: 'the pollution pays principle', internalisation, reduction at the source and the usage of best available techniques (Piet 1996). Environmental care should constitute an integrative part of business operations and include the closure of product flows from a chain-perspective. The shortcomings in present accounting systems can be illustrated with the problem of manure in agribusiness. Problems with respect to soil, water or air pollution, to which overproduction of nitrogen, ammonia and phosphates (not absorbed by natural production in crops or grasslands) contribute, have led to juridical intervention of Dutch authorities. The present accounting procedures are partly inadequate to account for intangible assets like hog production rights and contractual rights and obligations (Bremmers, 1995). Normally, contractual deposit rights are not accounted for, whereas intangible assets are depreciated immediately because of the application of the prudence principle. Side-effects on the quality of the environment and their opportunity costs, the effects on standards of living for those surrounding production facilities, are not disclosed.

Environmental reporting at the present time is:

- segmented into information schemes concerning separate business processes and lacks the disclosure of causal relationships between participants in the chain (for instance the effect of fodder production and transport, water pollution, transport and noise).
- heavily determined by public regulations on disposal of waste and substances;
- developing in isolation from statements that concern the financial performance;
- lacks links with environmental performance within the chain.

4. Towards a new accounting system

On the basis of the foregoing remarks, the following requirements should be met with respect to an environmental accounting system:

- it should be integrated with the present financial accounting system, in that environmental impacts are registered and accounted for in financial as well as non-financial parameters (4.1);
- it should be prospective as well as provide with business information on past events (4.2);
- it should recognise the relationship with the environmental care system, that reaches beyond the limitations of the individual farm firm and is integrated in an environmental chain-management system (4.3).

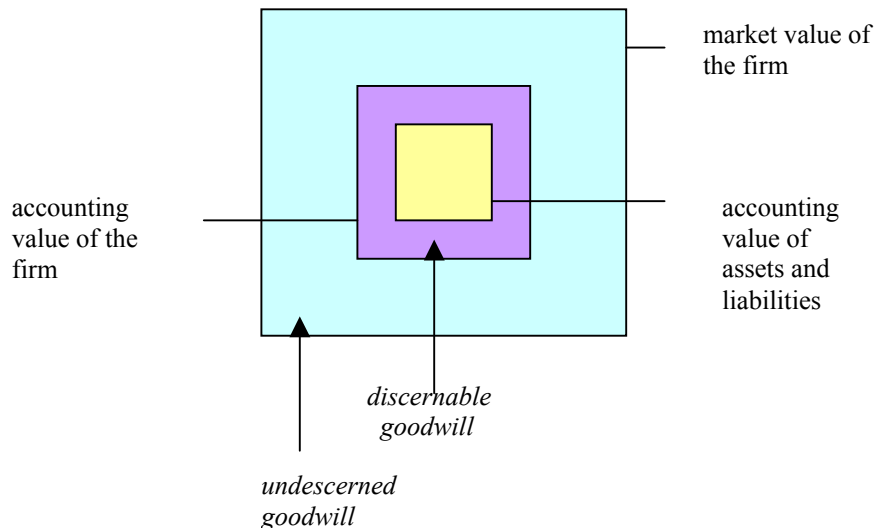
4.1 Redirection of managerial and financial accounting

To build a new environmental accounting system, the present financial and environmental registration systems should be reformed. Reform of financial accounting will have to focus on the following aspects:

- the assessment of the market value of the firm (whereas the present accounting system stresses the determination of the book value of assets and liabilities);
- connected with the previous statement, the assessment of intangible assets rather than adhering to the valuation of tangible and monetary assets and liabilities;
- reforming the cost allocation system, via functional allocation of costs to activity based costing systems;
- disconnecting the economic report from fiscal registration of business income and valuation;
- improving timeliness of information;
- serving not only the production function and control, but market-positioning and consumer wishes as well, using a multi-criteria performance measurement model;
- extension/inclusion of the director's report.

Assessment of the market value of the firm

The market value of the firm, rather than its book-value, gives a better understanding of the consequences of environmental impacts on the company's goodwill.



Existing (Dutch) accounting procedures and regulations limit the recognition in the balance sheet of goodwill to the intangible value of the firm discerned as *paid* for. Goodwill, derived from the implementation of environmental care, increased animal health and crop safety measures, the implementation of systems to reduce manure-disposal, as well as learning and training facilities of farm personnel, are often not recognised in the balance sheet. The market value of the farm firm includes these factors. By adopting an *economic concept of profit*, business income is defined as the change of market value of the firm over a certain period of time:

$$BI = \sum_{t=0}^n [CF_t : (1+r)^t] - \sum_{t=1}^{n-1} [CF_t : (1+r)^t]$$

BI = business income

CF_t = cash flow

r = cost of capital

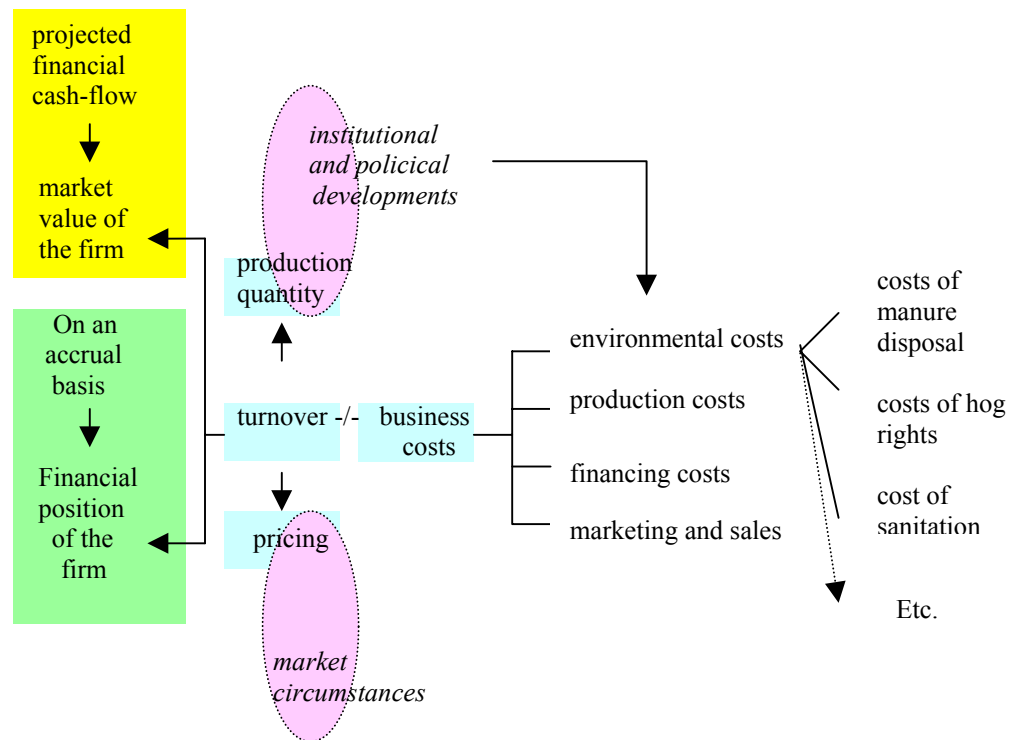
Under perfect market conditions, business income then equals the required rate of return on capital invested. The required rate of return includes charges for opportunity costs and business and financial risk (variations in cash flow as well as leverage effects). Taking the market value of the firm as a benchmark, improved sustainability of the farm-firm is recognised along two routes: the improvement of cash flow (depending on preferences of consumers) and reduction of the cost of capital.

Accounting for intangible assets

Taking the market value as a starting point, intangible assets can be better accounted for. Intangible assets include the introduction of a viable environmental care system in the organisation. It can reduce the possibilities to act opportunistically towards buyers of farm produce.

Restructuring the cost allocation system

A third possible improvement of the current accounting system, refers to the creation of costs centres with respect to impacts of the farm-firm outside the specific firm-boundaries. Current accounting for farm costs in most cases takes a categorical cost allocation scheme as a basis. The disadvantage of such a system is vested in the fact, that cost per functional activity or per activity (as is the case in activity based costing) are not discerned. Measurement of the environmental costs and of the cost-effectiveness of environmental measures cannot be realised in an appropriate manner, because of the fact that environmental care is not discerned as a *distinct* business area (scheme 1).



Scheme 1: Considering environmental care as a distinct business area

Disconnecting the economic and fiscal information systems

Fiscal reporting in the Netherlands and in other Anglo-Saxon countries depends on standards that are quite different from those applied in financial reports (Nobes & Parker, 1995). As to valuation of stock, fixed prices can be applied, thus underestimating their real value. Fiscally, the creation of provisions is restricted and heavily influenced by prudence. Fiscally, provisions lead to a decline of taxable income, whereas economically provisions are necessary for safeguarding the continuity of the firm. Fiscally, restrictions are made on the valuation and inclusion of intangible assets in the balance sheet. Economically, the registration of goodwill provides insight in the real financial position. Fiscally, deductions from business income are often cash-based, whereas costs in an economic sense are accrual-based most of the time. The difference between financial and fiscal goals, calls for the disconnection of the report structures, to be able to provide information that can serve as a basis for managerial decision making and control.

Improving timeliness of information

Fiscal reports, on which managerial decisions in a farm-firm are often based, are available only after a few months of the fiscal (calendar-) year. So, using the fiscal report as a guide for management's decision making lacks timeliness. Modern information technology is available to speed up information gathering, processing and usage. Especially with regard to environmental topics, because of the possible severe financial and ecological consequences, information should be made available on a weekly or even

daily basis. The foot and mouth-disease crisis has shown that information on animal welfare, (international) transports and health-measures is crucial for all firms involved in livestock-management.

Multi-criteria performance measurement

As to the financial accounting system a score-card approach can be applied. A scorecard recognises the links of financial information with key business areas that determine business outcome. Kaplan's balanced scorecard (Kaplan & Norton, 1970) especially considers: consumer (buyer-) satisfaction, learning and growth of the organisation and operational management and control.

The adoption of new business indicators should stress market-effectiveness of the organisation (Balogun & Hailey, 1997), as a response to:

- diminishing co-operative ties of production-units with processors; more and more, contractual relationships are established, in which product quality standards determine prices to be paid for intermediate and end-produce.
- increased required flexibility towards consumer wishes, because of fast changes in consumer demands and increased competition through technological advancement from abroad (such as is the case with gmo-production applications).

Instead of focusing on retrospective business outcomes from a financial perspective (sticking to lagging indicators like return on investment, solvency and liquidity, see especially Barry, 1995), a scorecard approach aims at providing insight in *leading* indicators for business strategy.

It is striking that environmental reporting lacks the same significance for business management as financial reporting. Principles for environmental accounting are established by the environmental task force of the FEE². Basic accounting principles (entity principle, accrual accounting, 'going concern', prudence and materiality) find their way in post-period accounting schemes for the environment.

Extension/inclusion of a director's report

The present financial report should be supplemented with an extension of the director's report (Bremmers, 1995). Because of increase of scale, farm-firms nowadays change their business structure into plc's. The director's report has to perform, depending on the size of the organisation, the functions of *discharge, limitation of personal liability, risk-assessment, linking-pin, as well as the provision of supplementary information* (Bremmers, 2000).

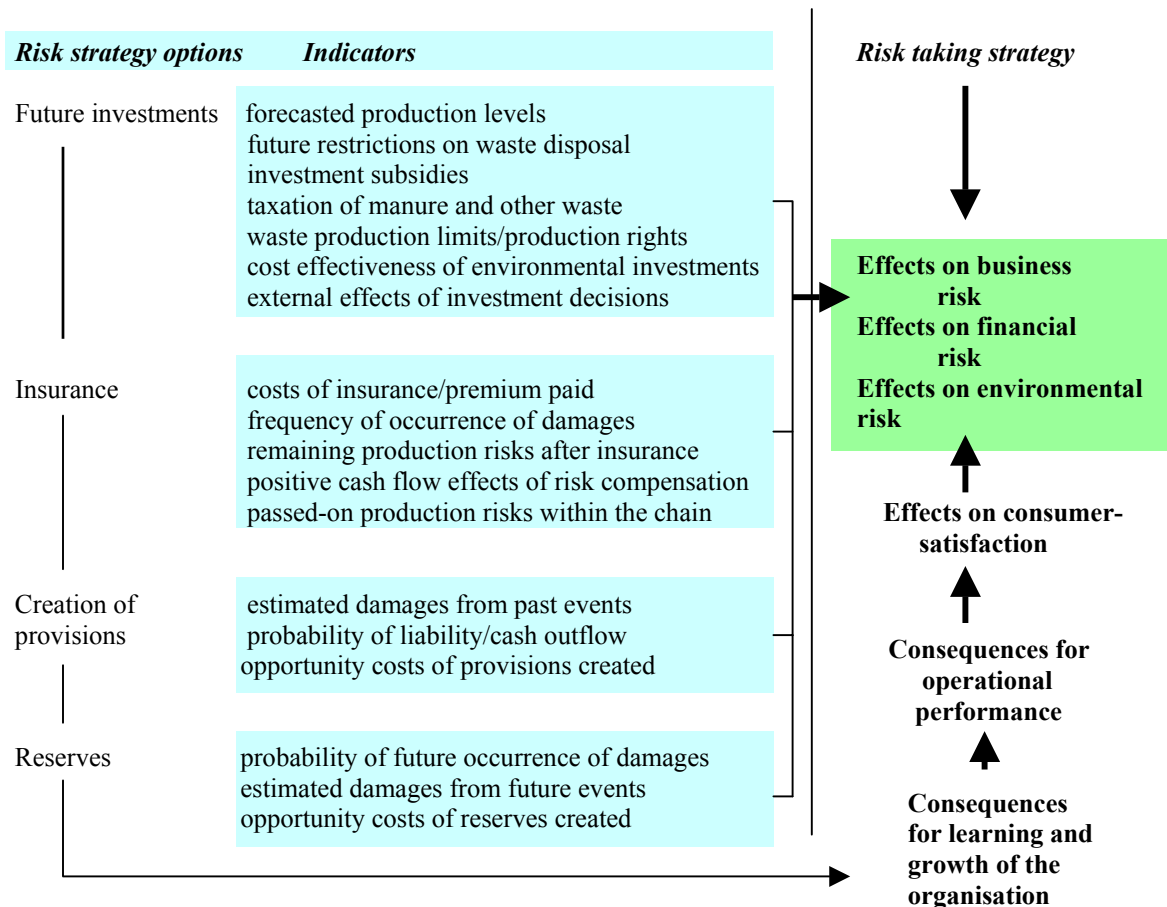
- the discharge function implicates the approval of management's decisions on behalf of the owners. Management (the agent) decides on the (environmental) risk strategy for the shareholders and other stakeholders in the firm (the principals). With increasing scale and increased complexity of the managerial decision making of the firm, information asymmetry ameliorates the importance of managerial reporting. Discharge closes the decision-gap (with respect to time and information-availability) that exists between the different stakeholders involved.
- with the risk-assessment function it is meant that the director's report should provide an opportunity for external stakeholders to assess the risks connected with

² European federation of accountants.

- participation in the venture. An environmental risk-strategy encompasses choosing between risk-taking on the one side and risk-reduction on the other. Risk reduction can be established by means of the creation of provisions and reserves, by means of the adjustment of business processes and/or by means of insurance.
- the linking pin function implies the integration of social, financial and environmental reporting. These external reports have strong interconnections (ppp-accounting). Social circumstances of people employed can improve because of environmental measures taken. Financial outcomes can benefit from increased environmental awareness ('pollution prevention pays').
 - provision of supplementary information is connected with the linking pin function. Additional information should be given on the non-financial aspects of corporate environmental influences, to include environmental performance in the reporting scheme of the organisation. So by means of the development of mixed performance indicators links can be established between the different items involved.

4.2 Prospective as well as retrospective information

Environmental information can act as a guide in managerial decision making. Prospective information is necessary to be able to implement a risk strategy with respect to the environment (Bouma et al, 1995). A risk strategy serves as a guide for planning and control. The different options in a risk strategy can be assessed by means of indicators, as are included in scheme 2.



Scheme 2: risk strategy options

4.3 Environmental care system

Environmental reporting should be based on an environmental care system. The EMAS-system stimulates the validation of environmental report as well as environmental care system (Braakhuis, 1995). The BS 7750 as well as the ISO-series do *not* include guidelines for environmental reporting, but EMAS does. EMAS encompasses (Braakhuis, 1995):

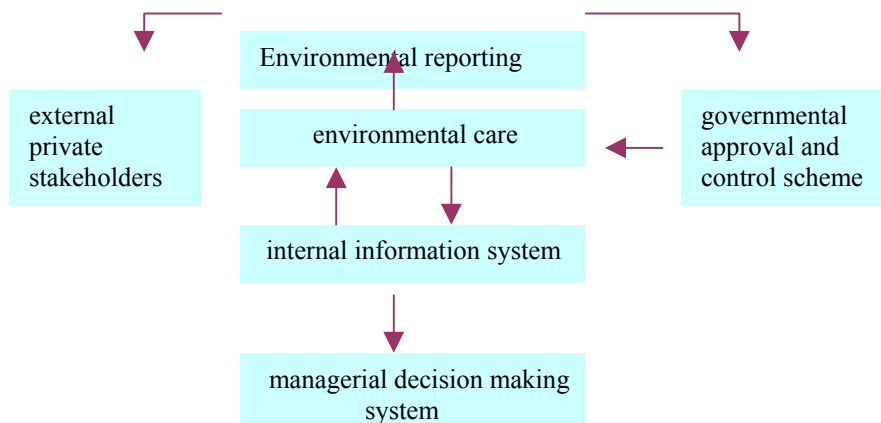
- the development of an environmental care system;
- auditing on a regular (3-yearly) basis;
- environmental reporting at regular intervals;
- verification of the environmental report.

A complete environmental care system includes the following elements (Bremmers, 2000):

- commitment: environmental statement by the firm's top level executives;
- compliance: adjustment of business processes, training of personnel, development;
- control: regular measurements of environmental impact, registration and auditing;
- communication: internal and external reporting.

The actual scope in developing an environmental care system is determined by the size of the organisation, the characteristics of its processes and the substance of environmental impacts (Van Koppen & Hagelaar, 1998). It can range from simple measures for good housekeeping to system's re-design.

Basic for environmental care is the development of a viable internal information system, encompassing the key areas of environmental influences. In Dutch external environmental reports, a vital component of the report is the description of the care system (ch. 12 of the Dutch Environmental Care Act). If environmental care is introduced in the organisation, an environmental permit will be granted that only encompasses main outlines. It includes mainly managerial *targets* and limits the restrictions on managerial decision making with respect to the environment. In general, the connection between the internal information system, environmental care and reporting can be visualised as follows (scheme 3).



Scheme 3: The connection between environmental care and reporting

The internal information system serves as a starting-point for reorganising business processes, for internal control, for decision making and communicating within a supply chain and for chain control.

5. Summary and final remarks

In this paper, the central question was on what aspects the corporate information system at a farm-level should be reorganised, to be better able to plan and monitor its environmental impacts. The traditional system, based on fiscal reporting, was confronted with new administrative requirements. Traditional accounting is heavily based on the measurement of ex-post profitability of the farm firm and the management of production and waste flows. Profit measurement doesn't provide the farm firm with precise, objective, timely and understandable business information. It is retrospective of nature, risk is not discerned as a constitutive element to deal with in formulating business strategy, it is based on accounting data that are easily influenced and cost allocation problems emerge. Environmental accounting takes very much the present system of financial accounting, with all its failures, as a guideline. Instead, it should include a chain perspective and be based on developing environmental care systems. At the present time it is segmented into accounting for environmental impacts of different business functions, heavily determined by public regulations, developing in isolation from financial accounting information systems and lacks links with environmental performance within the chain. Especially to create links with financial accounting, the financial reporting system itself should be modified:

- environmental impacts should be registered and accounted for separately as well as in financial terms;
- it should not only provide retrospective information, but provide a basis for future decision-making and for decision-making for the future;
- it should recognise the relationship with the environmental (chain-) environmental care system.

To be able to provide integrated information, the financial accounting system should be reorganised. It should be able to assess the market value of the firm, thus adopting a prospective perspective, to discern effects on the goodwill of the farm-firm. This is especially of importance, since farm-firms progressively will modify their function within business society. It can be expected that functions like preservation of landscape, recreation and ecological sustainability will gain in significance. The traditional function of production of primary inputs will lose value, because of increased opportunity costs of resources employed. This will especially be the case in heavily populated countries, like The Netherlands. To provide prospective information that is market-based, a multi-criteria scheme of performance measurement can be adopted, linking environmental indicators on estimated outcomes of alternate strategies to the financial position of the firm. Environmental reporting has a double-function of informing stakeholders on past events on the one side and supporting the decision making process of management on the other. The environmental care system itself should not be developed in isolation, but in the environmental context in which the risk-strategy is applied. By integrating

environmental care systems with those of chain-partners upstream and downstream, a better understanding can be obtained of the consequences of managerial options. Because of increased scale and complexity of business activities, the task of improving the information system should be taken at hand within the next few years.

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