Dissertation

Eco Management and Audit Scheme (EMAS): An evaluation of success factors in the agricultural sector. The case of Italy’s Emilia Romagna region.

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Tutors
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Prof. Andrea Segrè
Research Objectives

- Evaluation of benefits and costs of Eco – Management and Audit Scheme (EMAS) implementation in the agricultural sector of Emilia Romagna region. Determination of its success factors.
EMAS within the European Union

Renewed Strategy of Sustainable Development of EU

Sustainable Consumption and Production

Eco – Management and Audit Scheme (EMAS)
Environmental Certification

✓ Certification is a procedure by which a third party gives written assurance that a product, process or service is in conformity with certain standards (certificate, certification body, third part)

✓ Certifications can be voluntary or mandatory, process-oriented or product-oriented.
Environmental Management Systems

Process – oriented certification:

Environmental Management System (EMS)

It is a method of incorporating environmental care throughout the corporate structure. The objective is to improve the environmental performance of organisations by committing themselves to evaluate and reduce their environmental impacts.

Main frameworks: EMAS  

ISO 14001
Implementing an Environmental Management System

Implementing an EMS is a comprehensive exercise that must integrate environmental issues into every aspect of business management.

The core of an Environmental Management System is the *continual improvement*.

EMSs are based on *Deming’s Plan-Do-Check-Act (PDCA)* management cycle.
EMS Continual improvement

- Continual improvement
- Environmental policy
- Planning
- Implementation and operation
- Checking
- Management review
EMAS Impact on Environment

- Improvements in environmental performance of the organizations
- Effective impacts on the local environment
- Small impacts on the global environment

(Source: EVER Project)
Benefits of EMAS

- Reduced costs for resources and waste management
- Regulatory relief
- Competitive advantage
- Risk minimisation
- Achieving regulatory compliance
- Improved relations with internal stakeholders
- Improved relations with external stakeholders
- Incentives
Costs of EMAS

External costs:
- costs for the external verifier;
- registration fees
- any additional external support from consultants
- ongoing implementation

Internal costs
- implementation costs
- maintenance costs
Incentives of Member States

- Regulatory relief
- Wider uptake through public procurement
- Funding support to organisations looking to register with EMAS
- Technical support
- Information support
The state of EMAS

EMAS registrations amounted to 4,347 organisations and 7,404 sites in March 2010.

Italy’s EMAS registration evolution
### Diffusion in the EU

<table>
<thead>
<tr>
<th>Member State</th>
<th>Number of registered agricultural farms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>1</td>
</tr>
<tr>
<td>Cyprus</td>
<td>1</td>
</tr>
<tr>
<td>Germany</td>
<td>30</td>
</tr>
<tr>
<td>Greece</td>
<td>1</td>
</tr>
<tr>
<td>Italy</td>
<td>24</td>
</tr>
<tr>
<td>Spain</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>58</strong></td>
</tr>
</tbody>
</table>

### Diffusion in Italy

<table>
<thead>
<tr>
<th>Regions of Italy</th>
<th>Number of agricultural registrations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emilia Romagna</td>
<td>10</td>
</tr>
<tr>
<td>Sicily</td>
<td>1</td>
</tr>
<tr>
<td>Veneto</td>
<td>1</td>
</tr>
<tr>
<td>Piedmont</td>
<td>1</td>
</tr>
<tr>
<td>Marche</td>
<td>2</td>
</tr>
<tr>
<td>Sardinia</td>
<td>6</td>
</tr>
<tr>
<td>Tuscany</td>
<td>1</td>
</tr>
<tr>
<td>Apulia</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>24</strong></td>
</tr>
</tbody>
</table>
Methodology

Two approaches are used for the purpose of the research:

the **first** is the analysis of the *general profile* of the organizations that have been involved in the scheme and their characteristics;

the **second** concerns the *Analytic Hierarchy Process* for the conduction of a Benefit/Cost Analysis with the purpose to establish the usefulness of the scheme from a business point of view in the agricultural sector.
Tools for the research

- Direct Interviews with the registered farms and consultants
- Support questionnaire
- Expert Choice software
Analytic Hierarchy Process

- **Multicriteria analysis**: It encompasses in a unique system *tangible* and *intangible* variables of a problem/issue, giving the possibility to the decisor to take them contemporaneously in account for the individuation of the solution.

- The AHP is a procedure for the representation of the decomposition of problems in a *hierarchic* way.
Analytic Hierarchy Process

Steps to solution

- **Pairwise comparison** under a given criterion to detect *relative intensity* of the elements
- These judgments are represented by *numbers*
- **Synthesis of judgements** to *derive priorities* among criteria
- Choose among *solution alternatives*.

Simple Hierarchy

Objectives /Criteria

Alternatives
# The fundamental scale of judgments

<table>
<thead>
<tr>
<th>Intensity of importance</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Equal importance</td>
</tr>
<tr>
<td>3</td>
<td>Weak importance of one over other</td>
</tr>
<tr>
<td>5</td>
<td>Essential or strong importance</td>
</tr>
<tr>
<td>7</td>
<td>Demonstrated importance</td>
</tr>
<tr>
<td>9</td>
<td>Absolute importance</td>
</tr>
<tr>
<td>2, 4, 6, 8</td>
<td>Intermediate values</td>
</tr>
<tr>
<td>Reciprocals of above numbers</td>
<td>$j$ has the reciprocal value when compared with $i$.</td>
</tr>
</tbody>
</table>
Analytic Hierarchy Process and Benefit/Cost Analysis

- Benefit/Cost analysis supplies the principles to guide resource allocation.

Achievement of two extensions of the traditional method.

1. Quantification of intangible, non-economic factors
2. Make explicit tradeoffs among decision criteria
Benefits Hierarchy

Benefits

Incentives
- Financial incentives
- Regulatory relief
- Public procurement advantages

Cost reduction
- Energy savings
- Resource efficiency
- Waste management

Competitive advantage
- Improved image
- Improved internal organization

Improved internal organization

Legal compliance

Improved internal organization

Customer satisfaction

Improved image

Market access

Improved internal organization

Customer satisfaction

Improved image

Market access

Improved internal organization

25/06/2010 - Rovena Preka
Costs Hierarchy

- Costs
  - External costs
    - Registration fee
    - Verification fees
    - External consultancy
    - Equipments
  - Internal costs
    - Staff training
    - Implementation
      - Environmental review
      - EMS development
      - Internal audit
      - Environmental statement
    - Maintenance

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Analytic Hierarchy Process and Benefit/Cost Analysis

Alternatives:
At the bottom level, the two alternatives are linked with each element

- Implement EMAS
- Not implement EMAS
### Pairwise matrices

**Benefits and Costs Hierarchy**

Compare the relative importance with respect to: Benefits

<table>
<thead>
<tr>
<th></th>
<th>Incentives</th>
<th>Cost reduction</th>
<th>Competitive advantage</th>
<th>Improved internal organization</th>
<th>Legal compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentives</td>
<td></td>
<td>3,0</td>
<td>(5,0)</td>
<td>(6,0)</td>
<td>(9,0)</td>
</tr>
<tr>
<td>Cost reduction</td>
<td></td>
<td></td>
<td>(7,0)</td>
<td>(7,0)</td>
<td>(9,0)</td>
</tr>
<tr>
<td>Competitive advantage</td>
<td></td>
<td></td>
<td></td>
<td>(3,0)</td>
<td>(4,0)</td>
</tr>
<tr>
<td>Improved internal organization</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(3,0)</td>
</tr>
<tr>
<td>Legal compliance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Incon: 0,08</td>
</tr>
</tbody>
</table>

Compare the relative importance with respect to: External Costs

<table>
<thead>
<tr>
<th></th>
<th>Registration fee</th>
<th>Validation and verification fees</th>
<th>External consultancy</th>
<th>Expenses for equipments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registration fee</td>
<td></td>
<td>(7,0)</td>
<td>(8,0)</td>
<td>(5,0)</td>
</tr>
<tr>
<td>Validation and verification fees</td>
<td></td>
<td></td>
<td>3,0</td>
<td></td>
</tr>
<tr>
<td>External consultancy</td>
<td></td>
<td></td>
<td>3,0</td>
<td></td>
</tr>
<tr>
<td>Expenses for equipments</td>
<td></td>
<td></td>
<td>Incon: 0,07</td>
<td></td>
</tr>
</tbody>
</table>
Analysis of the results – Characteristics of the registered farms

- **Business orientation**: experimental, didactic farms, ethical farms / not traditional agricultural activity (expt 2)
- **Size**: Micro, small, medium
- **Other certifications**: all organizations have ISO 14001 and only one doesn’t have ISO 9001; Only 2 out of 10 are organic production.

● **Motivations for EMAS registration**
1. Incentives from Emilia Romagna region (L.R. 33/2002) – only 2 haven’t benefited
2. Virtuous farms – experimental and demostrative reasons.
Analysis of the results – Benefits Hierarchy

Benefits

- Incentives (L: 051)
  - Financial incentives (L: 778)
  - Regulatory relief (L: 111)
  - Public procurement advantages (L: 111)
- Cost reduction (L: 030)
  - Energy savings (L: 571)
  - Resource efficiency (L: 143)
  - Waste management (L: 286)
- Competitive advantage (L: 157)
  - Improved image (L: 742)
  - Market access (L: 075)
  - Customer Satisfaction (L: 183)
- Improved internal organization (L: 266)
- Legal compliance (L: 496)

Alternatives

<table>
<thead>
<tr>
<th>Implement EMAS</th>
<th>Not implement EMAS</th>
</tr>
</thead>
<tbody>
<tr>
<td>880</td>
<td>120</td>
</tr>
</tbody>
</table>
## Analysis of the results – Benefits Hierarchy

**Priorities with respect to:**

**Benefits**

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal compliance</td>
<td>496</td>
</tr>
<tr>
<td>Improved internal organization</td>
<td>266</td>
</tr>
<tr>
<td>Competitive advantage</td>
<td>157</td>
</tr>
<tr>
<td>Incentives</td>
<td>51</td>
</tr>
<tr>
<td>Cost reduction</td>
<td>30</td>
</tr>
</tbody>
</table>

Inconsistency = 0.08 with 0 missing judgments.

- **Legal compliance** is the most important benefit followed by Improved internal organization.
Analysis of the results – Benefits Hierarchy

Priorities with respect to:

Benefits
  > Competitive advantage

- Improved image, 0.742
- Customer Satisfaction, 0.183
- Market access, 0.075

Inconsistency = 0.04
with 0 missing judgments.

- Improved image contributes the most on the Competitive advantage
Analysis of the results – Benefits Hierarchy

Priorities with respect to:

Benefits
  > Incentives

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial incentives</td>
<td>778</td>
</tr>
<tr>
<td>Regulatory relief</td>
<td>111</td>
</tr>
<tr>
<td>Public procurement advantages</td>
<td>111</td>
</tr>
</tbody>
</table>

Inconsistency = 0, 
with 0 missing judgments.

- **Financial incentives** are the most appreciated among Incentives
Analysis of the results: Benefits Hierarchy

Priorities with respect to:

Benefits
> Cost reduction

Energy savings, 571
Waste management, 286
Resource efficiency, 143

Inconsistency = 0,
with 0 missing judgments.

- Energy savings contribute the most on the cost reduction.
Analysis of the results – Benefits Hierarchy

Synthesis: Summary

Synthesis with respect to: Benefits

Overall Inconsistency = 0.07

<table>
<thead>
<tr>
<th>Implement EMAS</th>
<th>0.88</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not implement EMAS</td>
<td>0.12</td>
</tr>
</tbody>
</table>

❖ The intensity of benefits is high if **EMAS is implemented**
Analysis of the results – Costs Hierarchy

- **External Costs (L: 875)**
  - Registration fee (L: 43)
  - Validation and verification fees (L: 288)
  - External consultancy (L: 518)
  - Expenses for equipments (L: 151)

- **Internal Costs (L: 125)**
  - Staff training (L: 166)
  - Implementation (L: 761)
    - Environmental review (L: 250)
    - EMS development (L: 250)
    - Internal audit (L: 250)
    - Environmental statement (L: 250)
  - Maintainance (L: 73)

**Alternatives**

<table>
<thead>
<tr>
<th>Implement EMAS</th>
<th>Not implement EMAS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>,811</td>
</tr>
<tr>
<td></td>
<td>,189</td>
</tr>
</tbody>
</table>
### Priorities with respect to:

**Costs**

<table>
<thead>
<tr>
<th>Costs</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>External</td>
<td>875</td>
</tr>
<tr>
<td>Internal</td>
<td>125</td>
</tr>
</tbody>
</table>

*Inconsistency = 0,*

*with 0 missing judgments.*

- **External costs** contribute the most to the global costs.
### Analysis of the results – Costs Hierarchy

<table>
<thead>
<tr>
<th>Priorities with respect to:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Costs</td>
<td></td>
</tr>
<tr>
<td>&gt;External Costs</td>
<td></td>
</tr>
</tbody>
</table>

| External consultancy      | ,518  |
| Validation and verification fees | ,288 |
| Expenses for equipments   | ,151  |
| Registration fee          | ,043  |

Inconsistency = 0.07

with 0 missing judgments.

- Among external costs, external consultancy is the most challenging one.
### Analysis of the results – Costs Hierarchy

**Priorities with respect to:**

Costs

- Internal Costs

<table>
<thead>
<tr>
<th>Implementation</th>
<th>761</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff training</td>
<td>166</td>
</tr>
<tr>
<td>Maintainance</td>
<td>073</td>
</tr>
</tbody>
</table>

Inconsistency = 0.07

with 0 missing judgments.

- Implementation of the scheme is the most demanding for the internal costs.
Analysis of the results – Costs Hierarchy

Priorities with respect to:

- Costs
  - >Internal Costs
  - >Implementation

<table>
<thead>
<tr>
<th>Priority</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental review</td>
<td>250</td>
</tr>
<tr>
<td>EMS development</td>
<td>250</td>
</tr>
<tr>
<td>Internal audit</td>
<td>250</td>
</tr>
<tr>
<td>Environmental statement</td>
<td>250</td>
</tr>
</tbody>
</table>

Inconsistency = 0,
with 0 missing judgments.

- All the stages of the implementation have the same intensity.
Analysis of the results – Costs Hierarchy

Synthesis with respect to: Costs

<table>
<thead>
<tr>
<th></th>
<th>Overall Inconsistency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implement EMAS</td>
<td>0.811</td>
</tr>
<tr>
<td>Not implement EMAS</td>
<td>0.189</td>
</tr>
</tbody>
</table>

- Implementing the scheme causes more costs than non implementing it.
Analysis of the results – Solution of the problem

<table>
<thead>
<tr>
<th>Composite weights</th>
<th>Combined judgment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits</td>
<td></td>
</tr>
<tr>
<td>Implement</td>
<td>0,880</td>
</tr>
<tr>
<td>Not Implement</td>
<td>0,120</td>
</tr>
<tr>
<td>Costs</td>
<td></td>
</tr>
<tr>
<td>Implement</td>
<td>0,811</td>
</tr>
<tr>
<td>Not Implement</td>
<td>0,189</td>
</tr>
<tr>
<td>Benefits/Cost ratio</td>
<td></td>
</tr>
<tr>
<td>Implement</td>
<td>0,880 / 0,811 = 1,09</td>
</tr>
<tr>
<td>Not Implement</td>
<td>0,120 / 0,189 = 0,63</td>
</tr>
</tbody>
</table>

Implementing EMAS has a higher Benefit/Cost ratio, so it is the best solution for an organization.
Conclusions

- The registered agricultural farms are not standard or traditional agricultural farms.
- The AHP model suggests that *Implementation of EMAS is the best solution*, but with a low positive percentage, meaning that the decision should be taken identifying success factors within the own context.
- Among Benefits legal compliance is the most important one followed by improved internal organization (typical of agriculture); while among costs, the external ones (fees and consultancy) are the most challenging.
Thank you for your attention!