# I.S. Project: a methodology of evaluation for integrated systems in agroindustrial sector

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**Abstract**
**A possible integration of Quality, Environment and Health & Safety Management represents an object of interest for scientific community, experts, category associations and companies.**
**The main problem of such integration is the characterization of critical points and non conformity in companies processes.**
**The aim of the research is to realize a tool for verifying the management of food safety and quality, the management of work place safety and environmental security in agro industry. In this way it will be possible to find out the points of weakness of the production system.**
**In order to analyze the processes of a company, a mechanism based on ten macro indicators has been planned. Every macro indicator is carried out answering to several questions through which the relevance of the problem for every company, the plant engineering and the organization is identified. Every answer has a score, 1 represents the most critical situation and 4 the best one. Using a simple algorithm, it is possible to evaluate every single macro indicator.**
**A "radar" diagram allows to identify the weakness and strength points of a company. The global safety level of a company is so represented by the surface of the diagram. Particularly the model has been applied to several kind of agroindustrial companies, above all dairies, stockbreeders and hazelnut growers. Several diagrams have been drawn using this methodology.**

**Keywords:** integrated management system, food quality, environment, work safety.

## Introduction

Agro-industry and agro-alimentary have always been sectors involving different activities and types of professions, as well as types of markets subject to numerous singled out critical points regarding safety and health (OHSAS 18001:1991) (injuries, professional illnesses), food quality and industrial activity's consequences to the environment (environmental impact) [5] . The goal of this research is to produce an instrument easily adaptable to every industry's characteristics, able to join the above stated three aspects defining a frame of the situation of the main existing issues in a simple and easily understandable way for all the individuals involved in the agro industrial trade.

## Material and methods

To realize this elaboration check-lists to gather data have been created and used. These check-lists are instruments for self evaluation which assure that important aspects are not neglected. The check-lists permit to verify carefully the status of implementation of health and safety, environment and product's quality norms, drawing the companies' picture in these fields. The files used for survey in some companies have been conceived to support the analysis of systemic safety of the anthropic environment in agro-industrial fields [6].

The check-lists are based on the European legislation in force and therefore they need to consider any eventual successive updating. In the compilation of the check-list all the types of professions and possible users on site have to be involved. It needs to be done every time that the purpose and the logistics of the working activities are modified.

In this research three check-lists have been created and elaborated: the first regarding the employees' health and safety aspects; the second regarding the food products' safety and quality. The last one is regarding the evaluation of the environmental aspects.

Every check-list has been divided into 10 macro-indicators or areas of observation and specific questions have been asked for each of these. In each macro-indicator there are three types of questions (or sub-areas of observation), based on:

- Relevance (meaning the importance given to each single aspect) [7];
- Management-Organization aspects (meaning the management of the aspect, i.e. assignment of duties and responsibilities and training of personnel);
- Technological-Structural aspects (meaning the suitability of machinery and environment).

Each question asked in the various macro-indicators verifies in a direct way if a particular legislative norm has been applied and/or respected or if there is the presence of a non conformity.

Four answers have been associated to each question and every answer has a value from "1" to "4"; the answers with the lowest value (1), correspond to situations that are not conform to, or do not respect the norm. The answers with the highest value (4) correspond to an optimal situation, respecting the procedures and legislative norms. The two answers with the medium values either identify the vicinity to the optimal condition (value 3) or to the worst condition (value 2).

*Analyzed Companies*
The editing of this elaboration in its experimental phase has been made possible thanks to the cooperation and aid of some firms in the-agro industrial sector in the Viterbo territory, in the centre of Italy. The captured data have been elaborated and published in an anonymous way not to recognize each single company.

For ease of use to each single farm was given an arbitrary name: Company "I", Company "II", Company "III" and Company "IV". Company I is a nuts manufacturer, with a working capacity of about 1000-1200 t/year of conventional product and 200-250 t/year of organic product. Company II is another nuts manufacturer. Its working capacity is about 2800-3000 t/year. The Company III's activity is meat manufacturing and sale. The company has been recently constructed. Company IV is a dairy produce company.

Following are the reports for each company in a radar graphic (figures 1 ÷ 4), constructed on the values reported in the check-lists and formulated on the answers to the macro-indicators' questions.

**Results**

*Company I*
From the radar graphic regarding working safety for the Company I is understandable that 5 macro-indicators out of 10 have been classified as weak points (Valuation of health and Safety risks; I.P.D. – Individual Protection Devices; Health surveillance and Monitoring). None of the 10 has been classified as a strong point.  The macro-indicator concerning the

I.P.D. has been classified as "Not acceptable" because during the valuation on the company site, not all the workers were equipped with I.P.D.
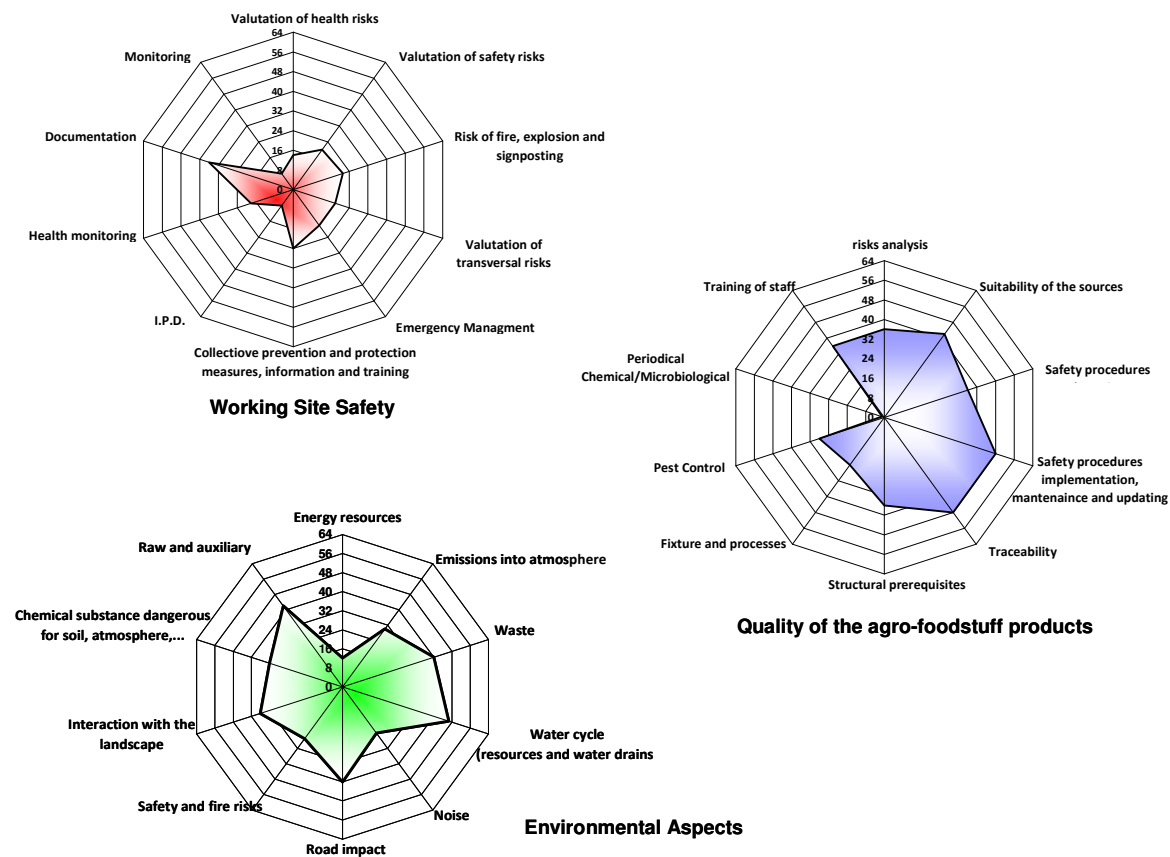


**Figure 1. Integrated management system for Company I: radar graphics**

On the contrary, Health Surveillance is executed only to fulfil law's obligation and often the competent doctor does not take part in the P.P.S. (Protective and Preventive Service) reunions. Finally, regarding the Monitoring of prevention and protection measures and of the documentation updating, this is sufficiently carried out but without following any criteria. From the check-list analysis regarding the quality of the agro-foodstuff products and from the relative radar graphic, it results a much better situation than the previous one. The analysis has singled out only 1 macro-indicator that can be classified as a weak point (the one concerning the periodical chemical/microbiological analysis) and 1 macro-indicator classified as a strong point (the application, maintenance and updating of safety procedures), with a value greater or equal to "48". Through the check-list regarding the environmental aspect valuation it is possible to single out 2 macro-indicators classified as weak (Energy resources and Noise) and none of the observation areas have been classified as  strong points. Analyzing the weak points, the macro-indicator concerning energy resources results not to be acceptable because no energy saving system is in use even though the company is considering the possibility of alternative and/or renewable energy source applications. Regarding the noise, meant as acoustic pollution toward the outside, not all the emission sources have been singled out but it needs to be said that this problem exists only for a few months throughout the year (working period).

*Company II*
From the elaboration of the check-list and from the relative radar graphic regarding working safety for the Company II is understandable that there are no macro-indicators resulting acceptable, therefore all the observation areas are classified as weak points. The situation regarding the radar for the quality of the agro-foodstuff products is similar to the previous one. There are, in fact, 9 weak points on which the company urgently needs to work to arrive as soon as possible to an acceptable situation for the competent authority but also for suppliers and consumers. Finally, from the elaboration of the check-list regarding the valuation of environmental aspects only 2 macro-indicators have been singled out and classified as weak points (Energy resources and interaction with the landscape). Studying in depth each weak point, the macro-indicator regarding the energy resources results not acceptable because Company II does not use any energy saving system even though it keeps itself informed about the possibility of alternative and/or renewable energy sources. Regarding the interaction with the landscape, the structural characteristic of the company presents considerable contrast points with the surrounding rural territory. To make these weak points able to reach a situation of acceptability the company should operate adopting an energy saving politic (e.g. the use of modular variation) and using, at least partially, alternative and/or renewable energy sources.
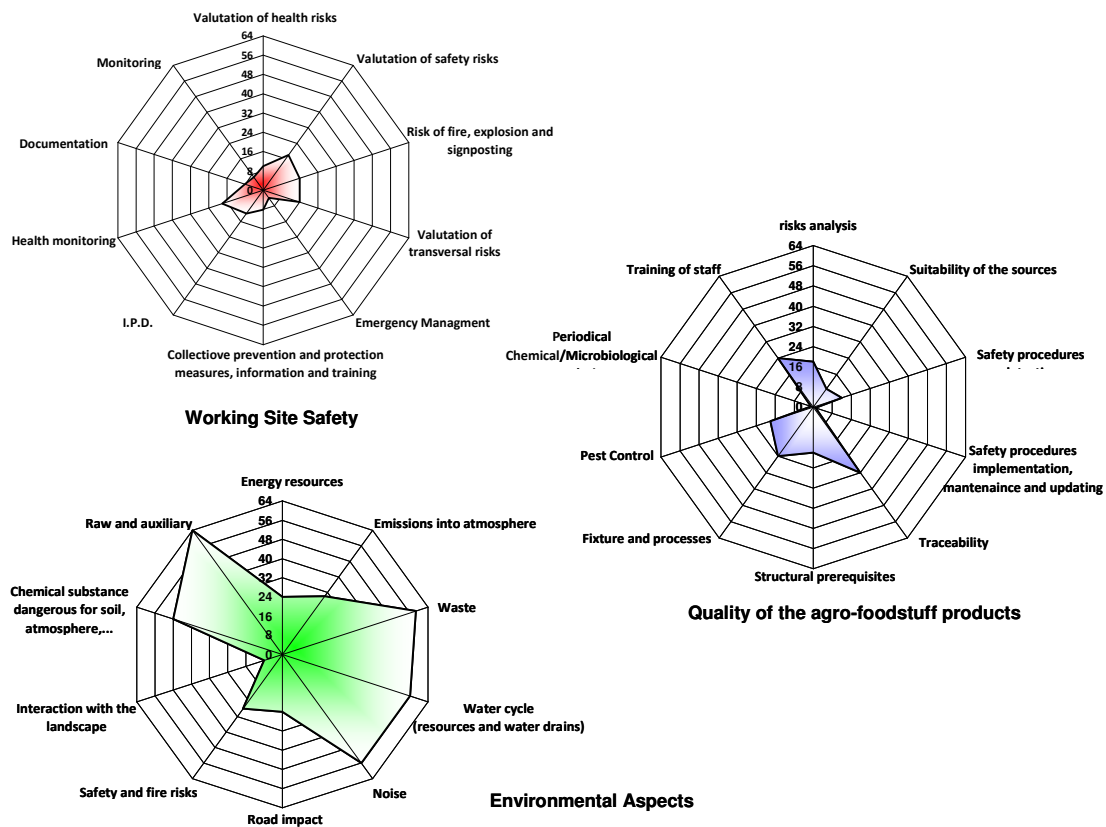


**Figure 2. Integrated management system for Company II: radar graphics**

*Company III*

From the elaboration of the check-list and from the relative graphic regarding working safety in the agro-alimentary industries, 4 macro-indicators have been singled out and classified as weak points (Valuation of transversal risks; Emergency management; I.P.D. and Monitoring), while only 1 has been classified as strong point, the documentation. From the analysis of the safety and quality of agro-foodstuff products and from the relative radar graphic only 1 macro-indicator has been classified as a weak point (the one regarding the structural prerequisites). Two macro-indicators have been classified as strong points (application, maintenance and updating of safety procedures and traceability), with a value greater or equal to "48". Throughout the check-list of the environmental aspects valuation 4 macro-indicators have been singled out and classified as weak points (Energy resources; Noise; Safety and fire risks; interaction with the landscape) and 2 observation areas have been classified as strong points (Waste; Raw and auxiliary materials).
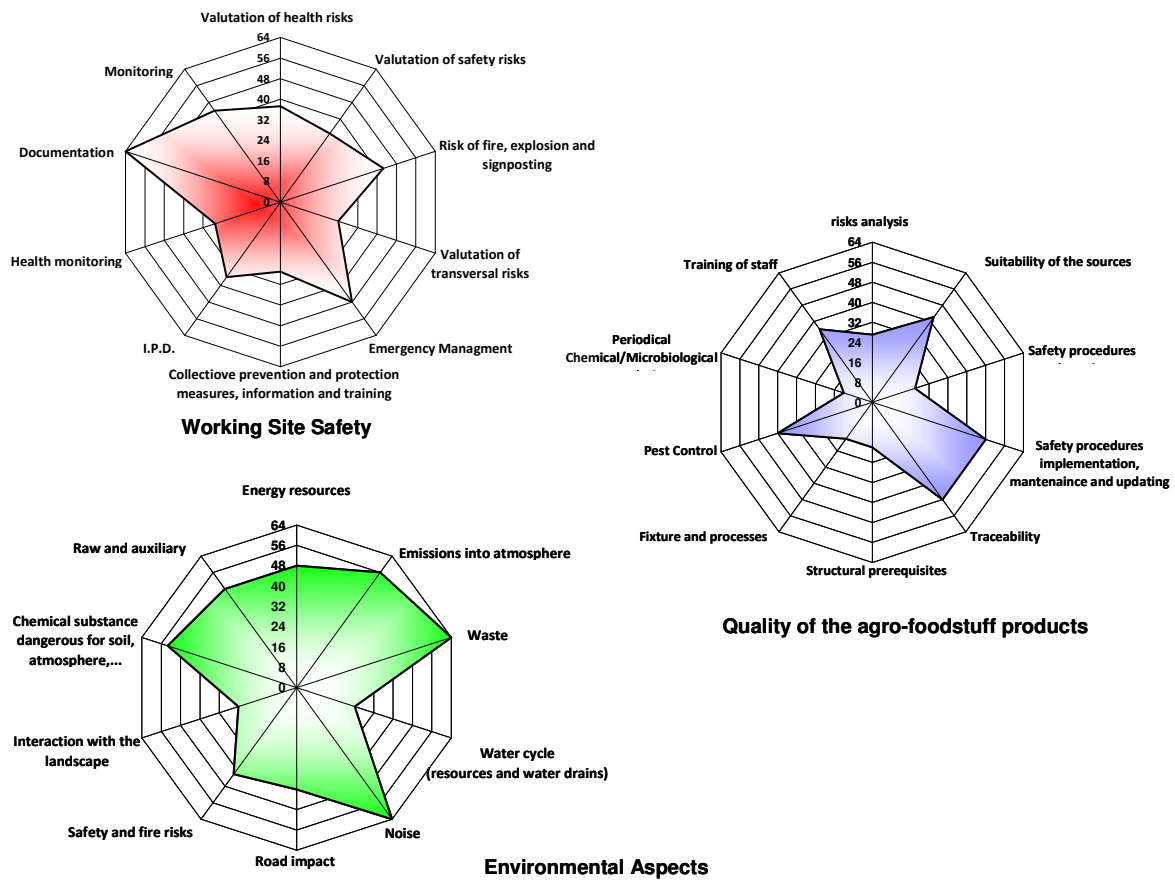


**Figure 3. Integrated management system for Company III: radar graphics**

*Company IV*

Regarding working safety and products' quality in the agro-alimentary industries for Company IV there are no macro-indicators classified as weak. Regarding the quality, only the

products traceability is not in an optimal situation; this is because of a lack of information campaigns, from the company, regarding the matter defined in the CE 178/2002 regulation.

Finally, from the analyzed check-list and from the relative graphic regarding the environmental aspects, 8 macro-indicators have been classified as strong points and only 2 have been classified as weak points. The macro-indicators that did not reach a situation of strength are the ones regarding the road impact and the interaction with the landscape.
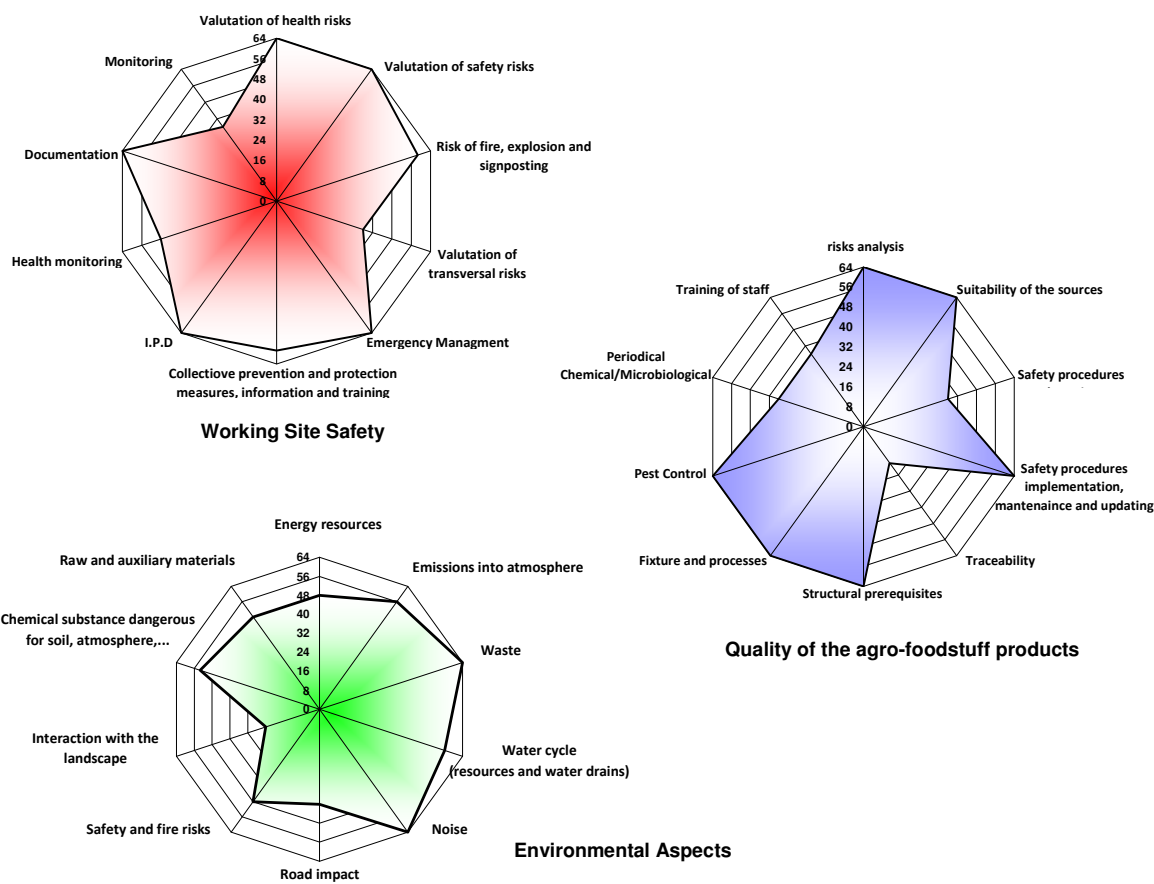
**Figure 4. Integrated management system for Company IV: radar graphics**

**Conclusions**

The methodology introduced in the present paper has been developed within the project PRIN 2005 "IS Project" (national coordinator Prof. Giorgio Zoppello, local coordinator Prof. Danilo Monarca).

The model described in this paper permits a synthetic description and a simple and clear visual approach of the farm technical aspects, referring to safety at work, product quality and the environmental effects related to the working activity.

The model has been developed in order to fit all the different kind of farms, trying to match the local farm typologies, typically of small or medium size, but also optimizing it for larger farms.

Furthermore, the radar diagram makes easier the individuation of the critical points.

Indeed, once the observation areas belonging to the three type of check-list have been classified, the surface values of all the radar diagrams described in the article can be calculated. These values can be utilized as instrument to classify, instead of the macro-

indicator conditions, the general farm conditions related to safety at work, agri-food product quality and environmental aspects.

In order to do so, a minimum value of acceptance has been fixed. This value equals to the value of the area of a hypothetical graph, where for each observation area has been assigned a numeric index corresponding to "27" (which is the acceptance value for each macro-indicator, obtained giving to the three observation sub-areas the average value of "3" that is, in a "1" to "4" scale, the value corresponding to the optimal situation). From the elaboration it results a limit value of minimum acceptance equal to "2142".

Comparing this value with the respective values obtained from the radar graphs related to safety at work, product quality and environmental aspects, it is possible to individuate for each type of macro-indicator (safety at work, product quality and environmental aspects) which farms have an acceptable general situation.

The check-lists have been tested on farms of the mentioned sectors.

In conclusion, farms that reach an acceptable situation have excellent bases for the implementation of an integrated management system for Quality, Environment, Health and Safety, due to the intrinsic ability of utilize all the synergies (documents, review process, audit, improvement), guarantying the maximum efficiency and reducing the costs.

The proposed approach can be easily extended to other management systems like Social Responsibility and Information.

**References**

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