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A PRACTICAL APPROACH OF TRACEABILITY IN THE WINE INDUSTRY

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Abstract

Traceability in the wine industry has an undeniable role in a quality assurance management system. It ensures that all manipulations of raw materials, ingredients and final products are recorded on specific documents, created especially to allow a rapid retrieval of the product history. The wine supply chain requires traceability from grape production to processing and wine distribution. Maintaining traceability records on specific documents has many benefits for both producers and consumers. A practical traceability system ensures: efficient process logistics, rapid decision making by the producers, but also provides the consumer confidence in the authenticity of wines and proper usage of approved oenological practices and safety procedures during production. In spite of the legal requirements for traceability systems, they are not widely applied in our wine industry and the documents involved are difficult to be maintained and updated. This paper proposes a series of specific documents to be used for a more efficient and practical system of traceability in the wine industry.

Key words: *traceability, wine, quality assurance management system.*

INTRODUCTION

Traceability is regulated by national law no. 150/2004 on food safety and feed, modified and completed by law no. 412/2004 and by Regulation (EC) no. 178/2002 of the European Parliament and of the Council of 28 January 2002, laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down the procedures regarding food safety. In accordance to legislation, operators must apply the food legal regulation at all stages of the wine supply chain, from the production and processing to transportation and distribution stages. Thus, operators are responsible by law for ensuring the traceability of products at all stages of the production, processing and distribution, including raw and auxiliary materials packaging materials and operating materials. Moreover, materials and oenological practices are specified by Commission Regulation (EC) no. 606/2009 of 10 July 2009 laying down certain detailed rules for implementing Council Regulation (EC) no. 479/2008 as regards the categories of grapevine products, oenological practices and the applicable restrictions.

However, "traceability means the ability to trace and follow a food, feed, food-producing animal or substance intended to be, or expected to be incorporated into a food or feed, through all stages of production, processing and distribution" (Legea nr 150/2004 si Legea 412/2004). Article 18 of Regulation (EC) no. 178/2002 refers explicitly to tasks of operators regarding traceability. According to Article 18 of Regulation (EC) no. 178/2002, winemaking operators must comply with the following rules:-traceability shall be established at all stages of production, processing and distribution.-winemaking operators shall be able to identify any person from whom they have been supplied with grapes, must, wine, or any oenological substance intended to be, or expected to be, incorporated into grapes, must or wines. -winemaking operators shall have in place systems and procedures which allow for this information to be made available to the competent authorities on demand.-winemaking operators shall have in place systems and procedures to identify the other businesses to which their products have been supplied. This information shall be made available to the competent authorities on demand.-winemaking products shall be adequately labeled or

identified to facilitate its traceability, through relevant documentation or information in accordance with the relevant requirements of more specific provisions.

MATERIALS AND METHODS

Implementation of traceability in wine industry implies the existence of correlated registration documents for each stage of production and distribution. For this reason all processes and technological operations must be recorded in specified documents, corresponding to each product stage.

Based on the specific technology of grape production to distribution it was considered necessary to create specific documents to achieve total traceability.

This tracking system was developed for a winery located in southern Romania, in the wine region 'Terasele Dunarii' where 500 tonnes of grapes of various varieties are processed yearly.

In order to implement a traceability system, the first issue to be resolved concerns the division of the entire surface in farms, physical blocks and parcels. It is also necessary that the division of the total area takes into account the grape varieties grown and specific climatic and edaphic conditions because the grapes are harvested and wine batches are formed based on the grape quality and characteristics. If the surfaces are not divided properly, the quality of the final products may be affected.

The specific documents deemed necessary to maintain a robust traceability system are hereafter presented.

Vineyard Record Keeping File. Necessary to record data from vineyard parcels, this document is a table that contains the following columns:

- **Date**;
- **Farm / Physical Block / Parcel (F/PB/P)** , same with batch of grapes and containing the number of a parcel from specified physical block and farm (eg. 1/221/4, which means F/PB/P); this is the most important key link for history retrieval;
- **Area (ha)** , referring to parcel;
- **Preformed works**, a column where specific operations performed in the vineyard are described;
- **Auxiliary materials** used, referring to fertilizers, pesticides and herbicides;
- **Dose**, referring to dose of the treatment material used;
- **Responsible**, who is the person who performed the work;
- **Observations**, another notes.

Grape Maturation Report. Necessary to record grape maturation evolution data from vineyard parcels, this document is helping to determine the optimal time to harvest; is the most critical decision of the grower and winemaker. Good quality of the grapes at harvest allows for a maximum potential in wine quality. Incomplete ripen grapes contain less sugar, very high acidity, harsh tannins and 'green' aromas. Overripen grapes may also lead to uncharacteristic flavor and low acidity. If the assessment is not done properly and harvest decision is not appropriate, wine quality may be affected (Zoecklein B.W., 2001).

Unfortunately, grape maturity assessment is difficult to perform, due to the involvement of several factors and the necessity to measure several physico-chemical parameters, that are not always directly correlated (Coombe B.G., 1992; Robinson S.P. and Davies C., 2000).

This document is kept for each parcel and contains the following identification elements:

- **Variety**;
- **Vintage**;
- **Farm / Physical Block / Parcel**, a code which is linked with Vineyard Record Keeping and Harvest Delivery records.

In addition to the identification elements, this document contains sets of analyzes of grapes from that parcel (**Date**; **Sugars**, in g/l; **Total Acidity**, in g/100 ml tartaric acid, **pH**, **Brix**, **Brix*pH²** index, **Brix/TA** index and% v/v **estimated alcohol**).

Harvest Delivery Note. It is a document that must contain the following identification elements: **Document number**; **Variety**; **Farm / Physical Block / Parcel**; **Estimated quantity (kg)** ; **Real quantity (kg)** . This document accompanies the grapes to the wine cellar and used for tracking and accounting records. The estimated quantity is evaluated at the flowering stage and is used for planning in the cellar ahead of harvest.

Quantitative Grape Receiving Report. It is a tracking document used to link the small grape

batches delivered to the winery with full batches of grapes resulted from several small grape baches and used for a batch of wine. The report contains the following columns:

- **Date/Time**;
- **No. of Delivery note**;
- **Variety**;
- **Harvest mode**;
- **Grape batches** (F/ PB/P);
- **Variety purity (%)** ;
- **Sanitary state of the grapes** (% of the sane and affected grapes);
- **Quantity of small batch** (kg);
- **Total amount per full batch** (kg);
- **Full batch code**. It is used to determine the quantity of grapes used per batch of must/wine.

Qualitative Grape Receiving Report. It is a quality control document for full batches. It contains the following identification elements:

- **No. of document / Date;**
- **Variety / Assortment**;
- **Vintage**;
- **Full batch code**;
- **Total amount of grapes (kg)** ;
- **Variety purity (%)** ;
- **Sanitary state of grapes (%)** ;
- **Harvest method**;

This document is drawn up after cold settling occurs and should contain almost all analyses which can be made. Basic analyses are grouped as following:

- **Sensory analysis of must** (Appearance; Color; Odor; Taste;).
- **Physico-chemical analysis of must** (Yeast Assimilable Nitrogen; Total acidity, g/l tartaric acid (pH=7); Sugars; Density; pH; Brix; Index Brix*pH^2; Index Brix/Ta; Turbidity;).
- **Analysis performed after corrections** (Acidification; Enrichment of sugar; Total acidity, g/l tartaric acid (pH=7); Sugars, refractometrically; Density; pH; Brix; Index Brix*pH^2; Index Brix/Ta;).

Winemaking Batch Sheet. This is the main document that includes the process interventions performed during all stages of winemaking. The document contains the **full batch** code and the following columns:

- **Process / Technological operation;**
- **Date and time;**
- **Inputs;**
- **Outputs;**
- **Differences;**
- **Measurement unit;**
- **Initial tank no.;**
- **Final tank no.;**
- **Lees tank no.;**
- **Oenological materials used, concentrations, parameters, analyses, etc**.

This document shows the history of any wine and allows the oenologist to find at any moment each stage of the applied technology.

Blending Report. It is a document that is drawn when the oenologist wants to make a blend. This document serves both as tracking sheet and a file for the accounting department. It includes the following identification elements:

- **No. of document / date;**
- **New batch code;**
- **Variety / Assortment;**
- Initial **Quantities** and **Batches** from which the blend was formed.

Additional information may be **tank numbers** of the used batches and **alcohol concentration** (v/v) of the blend.

Bottling Report. This documents is filled when wine is ready for bottling. It contains the following identification elements:

- **Internal batch number;**
- **External batch:**No. of document / date;
- **Variety / Assortment;**
- **Vintage.**

Contains two tables. First table contains: Input quantity (liters); Effective quantity (liters); Loss (liters); Bottling recipient capacity (litri); No. of bottling recipients used; No. of Samples; The second table contain: Materials used; Manufacturer; Batches; Quantity of materials (in pieces); Outgoing finished products (pieces); Loss (pieces); Samples materials (pieces).

This report may contain a section for comments.

Declaration of conformity. It is the document that accompanies the delivered goods Mandatory information which appears on this document is:

- No. of document / date;
- Beneficiary;
- Invoice / Delivery note no. / date;
- Brand / Class of quality / Variety / Assortment;
- Batches of wines delivered;

- Analysis reports;

This document may contain a text by the manufacturer assumes the responsibility that the products comply with the law.

Delivery Note or/ with Invoice. Proof of sales and purchases of goods.

RESULTS AND DISCUSSIONS

The result of wine traceability chain is drawn through a flow chart in figure 1.

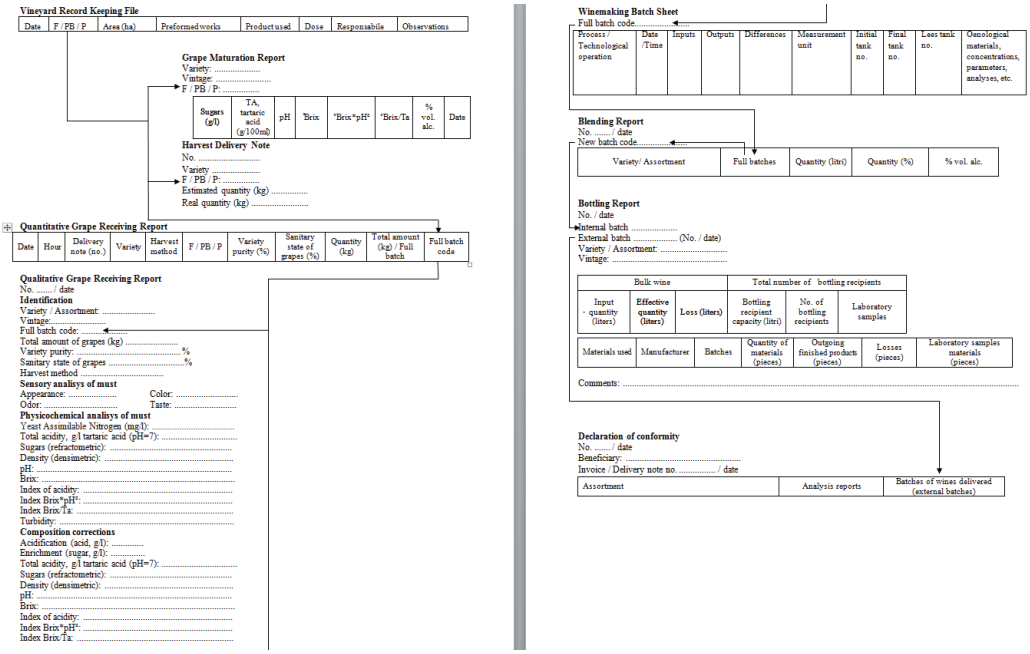

Figure 1. Flow chart of traceability at all stages of the production, processing and distribution.

CONCLUSIONS

A traceability system for a medium-size cellar was proposed and the system documents were drawn and presented. The system improves the management in vineyards and cellars, by retrieval history of a parcel and / or a product.

The usage of these system documents to maintain traceability in wine production units improves the quality management, by ensuring that the raw and auxiliary materials are of quality, the practices are also recorded and controlled, so that the resulted wines are safe and of the expected level of the designed quality.

Also, traceability documents are and important part of the product recall procedure. They contain information which allows us to detect certain deviations from the normal process which may make the final product unsafe or of a lower quality than the one expected by the consumer. In case of identifying any safety or quality issue during the process of winemaking, storage or bottling, based on these easy-to-use documents we can quickly and surely withdraw from the market that particular batches, with minimal financial effort.

This model has the advantage against tracking computer programs, that enables centralized view of history on winemaking batch sheet which is displayed directly on the wine container. So the oenologists can find out at any time the wine history.

Another advantage is that the operations performed are written in winemaking batch sheet by the cellar foremen at the moment of operation performing and thus is not possible to forget to update the winemaking batch sheet. In the case of a software, updates can be forgotten with major consequences.

Also, these winemaking sheets posted on the tanks provide quick information and allow for

an efficient decision making. Viewing the results of regular analyses on these records gives the oenologists valuable information regarding the stability of wine, for example, or what wines to take for more detailed tests in the view of creating commercial blends.

These documents can also be maintained and updated by using software programs that works with sheets and can create databases (i.e. Excel software). Such documents can be updated in real time or weekly, so that, all the information appearing on tanks, can also be maintained on computer.

This type of tracking also provides information to be used to establish the cost of wine and the price. Accountants can use these data to calculate prices and to classify in accordance to the price each batch of wine.

Last but not least, the fact that the team leaders is required to write down all the technological operations performed, makes them more quality oriented and responsible for the work done.

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