Musculoskeletal disorders (MSDs) are the most common of occupational diseases in economically developed countries and in emerging countries, in the wake of economic globalisation (Roquelaure, 2015).

Agriculture is considered one of the sectors with the greatest occupational safety and health risks with a very high prevalence of accidents at work and occupational diseases, including MSDs. Globally, more than one third of the workforce is employed in the agricultural sector with different mechanisation levels. Moreover, a considerable amount of crop work is still manual. Different crops, such as vegetables, tubers, aromatic herbs and fruit trees, need different cultivation and harvesting methods and they have different production cycles (field and soil preparation, planting, sowing, cultivation, spraying, weeding, irrigation, fertiliser application, pruning, harvesting and selecting) (Boubaker et al., 2014; European Commission, 2015). These tasks have increased physical risks and could be associated with MSDs, for example upper limb stretching in fruit harvesting, bending down when sowing or weeding, bending or kneeling to pick products from low-growing plants, lifting and carrying heavy loads, driving machines for a long time and performing jobs that require pulling or pushing loads (Calvo et al., 2018).

In agriculture, all over the world, pathologies of the lower back are very common, followed in number by those affecting the upper limbs (upper limbs work-related musculoskeletal disorders, UL-WMSDs).

In Europe specifically, a high prevalence of pathologies has been found among agricultural workers, both in the lower back and in the upper limbs. They are due to excessive strain on the tissues (muscles, tendons, nerves and vessels) located near joints.

One of the most frequently occurring UL-WMSDs is carpal tunnel syndrome (CTS), which affects the wrist, followed by pathologies of the shoulder area (in particular rotator cuff syndrome), involving chronic pain and reduced ability to perform specific movements. Rotator cuff syndrome can lead to a reduction in working capacity, a reduced quality of life, stress and depression (Bosch, van der Molen and Frings-Dresen, 2018). Large numbers of people with epicondylitis (which affects the elbow) have also been reported.

The major upper limb work-related risk factors are repetitive movements, high force demand, awkward postures, high frequency, very low temperatures, insufficient recovery time, compression of muscle and tendon structures and vibration. The multifactorial aetiology of UL-WMSDs in agriculture poses several challenges concerning the risk assessment. The following series of elements are the main difficulties in carrying out a risk assessment (Montano, 2014):

- agricultural tasks and activities not being standardisable, varying according to daily and seasonal working needs, depending on different cultural phases;
- different gender, age, anthropometric characteristics and level of training of the workers;
- non-standard forms of employment;
- the wide variability of the working shift, also depending on environmental conditions;
- the morphological characteristics of the fields (size, structure and slope);
- the lack of economic resources to adopt preventive measures and to replace obsolete machinery and tractors, especially on small farms, widely spread throughout the territory.

All the critical issues listed above make risk assessment complicated. This implies that the assessors must have adequate experience and they must be trained in the use of risk assessment methods.
Occupational disease compensation systems in Italy and in Europe

Recommendation 2003/670/EC invites EU Member States to undertake a number of actions, introducing the European schedule in ‘Annex I — Occupational Diseases’¹ into their own legislation for the compensation and prevention of occupational diseases. The ones referred to in ‘Annex II — Diseases of suspected professional origin’ should also be monitored. The aim of the recommendation is to harmonise the definition, diagnosis, compensation system, prevention actions, collection and reporting of data on occupational diseases in EU Member States.

Since the adoption of the Recommendation, almost all Member States have established a list of occupational diseases, making changes, improvements, adding recognised pathologies or expanding the criteria for recognition; so, to date, there are many differences in the systems protecting against occupational diseases. Such differences could be related to:

- the reporting systems themselves (list of recognised diseases);
- the recognition criteria;
- the institutional context;
- claimants’ knowledge of these issues.

Consequently, the national lists are very heterogeneous in content, reflecting the differences² existing in each EU Member State in terms of legislation and choices concerning occupational disease compensation.

Although in most countries MSDs are treated as occupational diseases, in Spain and Finland some of them are recognised as accidents at work and this approach makes it impossible to find data in occupational diseases databases (EUROGIP, 2016).

The multifactorial dimension of MSDs is a further factor responsible for the differences in the detection of MSDs and the reporting system: Germany, Austria, Finland and Sweden study work-related and personal risk factors; in Belgium and Denmark the case is usually recognised only if the exact exposure criteria are met; Spain, France and Italy have a precise list of diseases and risk conditions.

Countries that have adopted a list of occupational diseases (Belgium, Spain, France and Italy) are those with the highest recognition rate of MSDs. Currently, in these countries alone, recognised MSDs represent 70 % of the total number of reported occupational illnesses, whereas in Germany, Austria, Denmark and Finland the rate is below 20 % (EU-OSHA, 2020).

As far as agriculture is concerned, employment terms are often non-standard and the work is carried out by daily, seasonal and migrant workers. In these conditions, there is a lack of health surveillance and recognition of occupational diseases, also on account of workers having inadequate knowledge about their rights. Consequently, statistical data are poor, occupational diseases are underreported and not recognised in all countries analysed, so it is difficult to compare and analyse the situations of Member States, especially for MSDs (Pancu, 2015). In conclusion, on account of the institutional differences between the national compensation and reporting systems used to register the cause of occupational diseases, the data available are not entirely comparable across Member States.

¹Annex I of Recommendation 2003/670/EC (https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32003H0670) indicates 10 occupational MSDs caused by biomechanical overload; Annex II discusses one which is suspected. In 2010, the International Labour Organization (ILO) updated the list, extending the range of MSDs to ‘other musculoskeletal disorders not mentioned in the preceding items where a direct link is established scientifically or determined by methods appropriate to national conditions and practice, between the exposure to risk factors arising from work activities and the musculoskeletal disorder(s) contracted by the worker’ (ILO, 2010).

²Differences arise from defining what an occupational disease is and in the related level of protection offered to the worker. About half of the Member States adopting a list of occupational diseases have a specific compensation system; in the others, the protection is common to non-occupational illnesses, depending on the national regulation basis. In Italy, recognition is automatic if the requirements of the lists meet in terms of diagnostic, administrative regularity and exposure; if the occupational risk is proven, the disease is recognised as of occupational origin even when other causes coexist. In addition, data reporting systems differ significantly between EU Member States; only some countries have developed policies to prevent occupational pathologies.
European data

Recognised diseases and related practices vary considerably between Member States. In any case, the available data suggest that MSDs are the most commonly recognised occupational diseases.

The prevalence of MSDs across European countries ranges widely. In 2015, 58 % of workers suffered from backache and muscular pain of the upper limbs according to the fifth and the sixth waves of the European Working Conditions Survey (Eurofound, 2010, 2015). The highest percentages were found in Finland (79 %), France (75 %) and Denmark (73 %) and the lowest percentages in Hungary (40 %), Ireland (46 %) and United Kingdom (52 %) (EU-OSHA, 2019a).

Comparing the data across EU Member States:
- the percentage of Austrian (EU-OSHA, 2019b) and French (EU-OSHA, 2019c) workers affected by MSDs is higher than the average;
- in Ireland the percentage of neck and upper limb diseases is the lowest (26.6 %);
- in Germany the percentage of workers affected by shoulder and upper limbs pain was lower (35 %) than the average (41 %). The German percentage decreased considerably from 2010 to 2015 (EU-OSHA, 2019d);
- in Italy this percentage was a little lower (50 %). In particular, 41 % of the workers suffered from muscular pain in the shoulders, the neck and/or the upper limbs (Eurofound, 2010, 2015).

The prevalence of MSDs in European countries was monitored by administering questionnaires, which showed, in the study sample, an overall prevalence of back pain equal to 46.1 %, while for neck/upper limb pain this was 44.6 %. The highest percentages of these diseases were observed in the agriculture/forestry and fishing sectors: 64 % low back and 67.3 % neck/upper limbs pathologies (Farioli et al., 2014).

In 2015, around 69 % of skilled workers in the agriculture, forestry and fishing sectors in EU countries reported one MSD or more, while in other sectors 52 % of workers reported this type of muscular pain (EU-OSHA, 2019a).

In Austria one of the highest percentages of MSDs is in the agriculture/forestry/fishing sector (EU-OSHA, 2019b).

In France, from 2002 to 2004, the percentage of women engaged in agricultural work who manifested CTS (in the age group 20-59 years) was 9.8 %, while in the general female population this was 4 %. For men the data were the following: 8.7 % in the general population and 10.6 % among agricultural workers (Bosch, van der Molen and Frings-Dresen, 2018).

In Finland (EU-OSHA, 2019e), there was a higher prevalence of pathologies affecting the neck and the upper limbs (67.7 %), mostly among manual workers employed in the agricultural, fisheries and related sectors.

Data from the United Kingdom (HSE, 2019) for the years 2016/2017 and 2018/2019 showed that the highest rates of work-related MSDs involved three sectors: (1) agriculture, forestry and fishing; (2) construction; and (3) human health and social work activities. The areas most affected were upper limbs or neck (41 %), back (40 %) and lower limbs (19 %). In agriculture there was a prevalence of self-reported MSDs of 2,500 out of 100,000 workers, while in the construction sector there was a lower prevalence.

Italian data on MSDs in agriculture

Analysing data from the Italian National Institute for Insurance against Accidents at Work (INAIL) regarding occupational diseases with confirmed professional aetiology in agriculture for the period 2014-2018, it can be pointed out that around 73-75 % of total cases regarded MSDs, while CTS cases (in Italy they are recorded as neurological diseases) amounted to 16-17 % (Figure 1).
The most common MSD-related pathology is back pain (hernias and other pathologies of the spine). Soft tissue disorders (tendinitis, tenosynovitis, epicondylitis, shoulder injuries, etc.) are also widely common, followed by arthropathies; a considerable number of CTS cases are also present (Figure 2).
Considering only biomechanical overload pathologies involving the upper limbs, it is clear that those affecting the shoulder are the most common. The joint areas of the hand and wrist are also heavily affected by pathologies, while the elbow is much less involved; other pathologies, affecting unspecified joint areas, follow.

Figure 3: UL-WMSDs in agriculture in Italy. Confirmed cases 2014-2018

Source: based on INAIL data (INAIL, 2020).

Risk assessment of UL-WMSDs

UL-WMSDs are work-related disorders due to biomechanical overload of the upper limbs caused by protracted movements and/or repeated efforts throughout the working day. There is a general consensus on the multifactorial nature of these diseases in modern societies. The link between these pathologies and several important aspects of work organisation has been reported in the scientific literature. EU-OSHA has produced many documents on MSD prevention (as reported in EU-OSHA, 2020).

Risk assessment requires the identification and quantification of many risk factors: frequency of actions, awkward postures of the upper limbs and lack of postural variation, exertion of force and inadequate recovery periods. The risk could also be enhanced by the presence of additional factors such as hand-arm vibrations and machine-paced work. The literature includes reports of many methods for determining and measuring risk arising from exposure to biomechanical overload of the upper limbs (Delleman et al., 2004; Stanton et al., 2004). These methods include semi-quantitative or quantitative approaches, e.g. the Strain Index, the HAL-ACGIH TLV (Hand Activity Level — American Conference of Governmental Industrial Hygienists — threshold limit value), the OCRA (Occupational Repetitive Actions) index and checklists to rapidly assess the issues.

Risk assessment in agricultural activities is usually based on the analysis of the different tasks and their risk indices to identify which tasks lead to UL-WMSDs: for example, pruning and harvesting generally present more problems than fertilisation; the risk for the upper limbs depends on the frequency of gestures and on other factors, including elbow flexion/extension, lifting arms above the shoulders and a lack of recovery periods (Calvo et al., 2018).

The hand’s muscle strength and movement ability, including hand grip performance, can decrease following exposure to cold (Çakmak & Ergül, 2018). The risk due to upper limb repetitive movements
tends to increase with the worker’s skill in the specific task, as increasing levels of skill naturally increase the frequency of actions.

Studying work-related MDSs and the interrelationships of mechanical and organisational factors, risk assessment and management tools that can also be used by non-experts is the approach taken towards protecting workers from MSD protection.

The methodological approaches for assessing UL-WMSDs require standardisation to be reproducible because they are observation based. Postures of the elbow, wrist and hand seem to be quite difficult to observe correctly (Takala, 2010).

To standardise the use of the OCRA checklist, a national working group of INAIL-CONTARP was established; this will be discussed in the following section.

**INAIL-CONTARP good practices in risk assessment in agriculture: discussion of main results**

The main official Italian regulation in the area of occupational safety and health is Legislative Decree 81/2008, which relates to several directives, including Directive 90/269/CEE, concerning, among other risks, manual handling of loads.

To assess the risk related to manual handling, the above-mentioned Legislative Decree requires the application of technical standards and, in particular, the ISO 11228 series.

ISO 11228-3:2007 (ISO, 2007) recommends several methods including OCRA. The OCRA index (Colombini, Grieco and Occhipinti, 1998; Colombini, Occhipinti and Grieco, 2002) provides a detailed analysis of all the main mechanical and organisation risk factors for UL-WMSDs. It also uses a common language and it takes into account all of the repetitive tasks involved in complex or rotating work, estimating the whole risk exposure for workers. Finally, in epidemiological surveys, the OCRA index appears to be well related to health effects and the onset of specific pathologies. ISO/TR 12295:2014 (ISO, 2014) describes the application of the ISO 11228 series and explains the OCRA checklist, also mentioned in the ISO 11228-3:2007 standard (ISO, 2007) and derived from the OCRA index. This method was updated in 2011 (Colombini et al., 2011; Colombini, Occhipinti and Alvarez-Casado, 2013).

The OCRA checklist is a quantitative tool used for an initial screening of the risk associated with manual repetitive work. In recent years, it has also been used as an easier method for risk assessment of upper limb biomechanical overload (Colombini, Occhipinti and Fanti, 2005; Colombini et al., 2011): it allows the user to obtain a risk index that takes into consideration all the risk factors for the upper limbs highlighted by the technical literature. The OCRA checklist also allows the drawing up of a map of the risk for repetitive work. The map makes it possible to determine which proportion of the jobs or tasks can be classified as green (no risk), yellow (significant or borderline risk), red (medium risk) or purple (high risk).

INAIL-CONTARP has published two sets of data sheets (INAIL, 2012, 2014) concerning UL-WMSD risk in non-standardised repetitive tasks performed in manufacturing plants, handcrafts and agriculture, using the OCRA checklist. All data, for both arms, were obtained by direct observation of recorded working tasks.

The aim of these data sheets was to give technical indications to stakeholders (employers, occupational health professionals, workers’ safety representatives, prevention and protection professionals, occupational safety and health practitioners/ergonomists) in order to improve safety and health at work. It is important to remember that these data sheets are not a substitute for direct observation of working operations to assess the risk; however, they are a useful tool to evaluate all the aspects of every task described.

Every data sheet is numbered and contains a classification according to the Italian ‘Ateco code’ (statistical classification of economic activities) and a short description including a picture showing the

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2 For the recognition of an occupational disease, INAIL demands a risk assessment to its Advisory department for risk assessment and prevention, called CONTARP. It has the technical responsibility to detect useful elements for risk assessment and for the application of the rules concerning accidents, insurance and safety in the workplace.
Risk assessment of upper limb musculoskeletal disorders in agriculture: compared experiences

This classification helps users to easily find the activities of interest. For every task, the data sheet explains what is considered as the working cycle in the evaluation. In another section of the data sheet, the OCRA checklist intrinsic indices for both arms are reported, showing the colour corresponding to the risk ranges of the method used. The single risk factor scores (frequency, force, posture, repetitiveness and additional factors) are reported for the right and left upper limbs, together with a brief explanation of them (Figure 4).

Figure 4: Example of a data sheet (part 1)

Task description
The worker picks the apples from the tree and separates in different baskets the marketable apples from the unmarketable ones. He carries the baskets to the van floor and transfers the apples from the baskets to the crates.

Working cycle characteristic
A significant part of the cycle (5 minutes) is considered from the apple harvest to the transfer of the apples from the basket to the crates.

<table>
<thead>
<tr>
<th>OCRA checklist score</th>
<th>RANGE</th>
<th>RISK</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 7.5</td>
<td>GREEN</td>
<td>Acceptable risk</td>
</tr>
<tr>
<td>7.6 – 11.0</td>
<td>YELLOW</td>
<td>Very low risk</td>
</tr>
<tr>
<td>11.1 – 14.0</td>
<td>LIGHT RED</td>
<td>Medium-low risk</td>
</tr>
<tr>
<td>14.1 – 22.5</td>
<td>DARK RED</td>
<td>Medium risk</td>
</tr>
<tr>
<td>≥ 22.6</td>
<td>PURPLE</td>
<td>High risk</td>
</tr>
</tbody>
</table>

OCRA checklist score related to a task carried out for 8 hours

**RIGHT upper limb**

**LEFT upper limb**

- Frequency: very quick and identical movements (dynamic technical actions), of the right upper limb in the apples' harvest. The left arm carries out a very small number of dynamic technical actions in the apples' transfer to baskets and crates.
- Force: a moderate force level involves the right upper limb, in apple detaching from branches, although its duration is lower than 1/3 of the time of observed cycle.
- Postures: both arms are kept at about shoulder height, without support, for less than 1/3 (the right one) and for 1/10 (the left one) of the time. The right wrist keeps awkward postures for about 1/3 of the time of cycle. Both hands are in pinch/other incongruous handgrip for all the cycle.
- Additional factors: presence of jerky movements of the right upper limb.

Scores have been estimated supposing two 10-minute breaks, in addition to lunch break (Recovery multiplier: 1.33).

Source: revised and translated from INAIL (2012).
Each data sheet shows the risk for working scenarios for the task depending on the duration (2, 4, 6, 8 hours) according to the OCRA checklist. In every data sheet, specific protection and prevention actions are suggested in order to reduce the risk of UL-WMSDs (Figure 5). Protection and prevention actions concern three main areas:

- workplace layout and equipment;
- work organisation and procedures;
- work behaviour and training.

Data sheets concerning agriculture were obtained studying main manual working tasks on small farms, such as planting, pruning and harvesting, both in the field and in the greenhouse.

**Figure 5: Example of a data sheet (part 2)**

<table>
<thead>
<tr>
<th>Additional information on the analysed task</th>
</tr>
</thead>
<tbody>
<tr>
<td>The apple harvest is generally completed in the months of September and October, taking advantage of the meteorologically favourable days in a number directly related to the extension of the orchard and therefore to the number of plants, as well as the number of operators present. Consequently, the entire working day is devoted to this task.</td>
</tr>
<tr>
<td>The harvesting operation was completed on a plant of the golden variety, kept at about 2.5 - 3 m in height, arranged in a row and spaced about 6 m from the other plants. The orchard is located on a flat land.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Working scenarios</th>
<th><strong>Exposure related risk:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RIGHT upper limb</strong></td>
<td><img src="image" alt="Medium-low risk" /></td>
</tr>
<tr>
<td><strong>LEFT upper limb</strong></td>
<td><img src="image" alt="Acceptable risk" /></td>
</tr>
</tbody>
</table>

**Protection and prevention actions**

To facilitate the worker during the harvesting phase it is necessary to carry out interventions on the crop with the limitation in height of the plants; at the same time it is important to support the enlargement of the crown and to plant the trees at a suitable distance, favouring non-sloping surfaces.

With adequate breaks, recovery times and daily activity in this task performed for less than 4 hours, risks for the right limb could be mild/very slight, risks for the left limb are very mild/acceptable.

**Source:** revised and translated from INAIL (2012).

The risk assessment needs careful examination of each work process cycle, exhaustively considering the modes and the working times, as well as the tools and equipment used. The acquisition of data related to the characteristics of the cycle is an essential part of the evaluation process, as are the correct execution and subsequent analysis of videos of the cycle. The purpose is a punctual risk assessment that takes into account the critical aspects of each risk factor examined (frequency of actions, exertion of force, etc.), minimising the possibility of under- or overestimating the risk. Knowledge of the evaluation method therefore allows objective results to be obtained, avoiding distortions due to defective approaches or subjectivity. Therefore, the evaluators should be very capable of using the method; to this aim, they should be adequately trained and they should continuously update their knowledge of the assessment method, in many production contexts, including agriculture.
Because of the difficulty determined by a lack of standardisation of agricultural activities, it is very important to share criteria to make the evaluation homogeneous, focusing on the following critical elements: use of tools, identification of technical actions, force, posture and cycle time.

For this reason, INAIL-CONTARP has established an internal standardisation network, that is, a working group to improve intra- and inter-observer\(^4\) reproducibility in the application of the OCRA checklist (Guerrera et al., 2018). The network records videos about specific repetitive working tasks and evaluates them using the OCRA checklist in periodic meetings. Risk assessment performed by every participant is compared and the results are analysed by everyone to obtain an agreed intrinsic risk index.

At the end of each assessment session (monthly sessions are recommended), the working group draws up a report containing practical indications for the correct application of the method (ISO 11228-3:2007 and ISO/TR 12295:2014); during the comparison, all of these indications are shared between the members of the group. Moreover, it is also possible to share knowledge and constantly update the group on technical innovations. Another advantage of this experience is that the circuit can be conducted remotely through electronic devices, simply by sharing a video recorded by a member of the group. Participation in the working group has also allowed the methods of filming the video to be refined for the purpose of technical analysis. It must be remembered that it is always necessary to acquire consent for the use of the images. Consent must be acquired from both the company and the workers filmed according to the General Data Protection Regulation (EU Regulation 2016/279) on the protection of natural persons with regard to the processing of personal data.

Consequently, network meetings are training sessions that allow participants to discuss and harmonise the observation and evaluation of every risk factor. This network assures:

- continuous quality improvement in the application of the method;
- continuous updating of technical standards and reports;
- continuous review of the scientific literature and new proposals on the assessment methods.

New data sheets, including those on agriculture working tasks, are an output of these network sessions and they will be published.

The INAIL-CONTARP network is also developing a simple and effective tool that will allow the perception of biomechanical risk in all working sectors. In fact, in many working sectors this risk is underestimated because it is wrongly related only to the frequency of actions (e.g. in assembly lines). Many tasks, instead, especially in agriculture, may not be carried out with handling at high frequency but may have other risk factors, such as awkward postures and/or repetitiveness. In this perspective, the responsive web application can help not only employers and safety and health managers but also workers and their representatives to identify the presence of risk with an easy tool.

The application is organised in four different sections:

- in the first section there are simple questions clarified by images and videos that increase the user’s awareness of the specific risk;
- the second section includes practical examples of tasks analysed by the working group and the risk data sheets described previously, divided by sector and task;
- the third section contains the main references, including documents, laws, specific technical standards and good practices;
- the fourth section comprises a glossary related to both the contents of the responsive web application and the methodologies of risk assessment.

This application will allow a greater homogeneity at various stages of the risk assessment and a better understanding of biomechanical risk by employers, workers, workplace representatives and those responsible for safety and health in the workplace. The users of this tool can verify the presence of

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\(^4\) Every observational method, such as the OCRA checklist, needs to follow intra-observer and inter-observer quality standards in order to respect the criteria of validity and repeatability. Intra-observer is the degree to which measurements taken by the same observer are consistent; inter-observer is the degree to which measurements taken by different observers are similar. In fact, this is one of the purposes of the internal standardisation network.
upper limb risk factors in their workplace in a final report generated by the application. Depending on
the results, the report indicates the critical points to be investigated. The users can also consult the risk
data sheets corresponding to their job to investigate their working situation in more detail and
understand the possible prevention and protection actions to be undertaken. The web application
cannot, in any way, replace risk assessment in accordance with the current legislation and the technical
standards of reference; however, it offers a simplified approach to understanding occupational risks.

Concerning the Italian agricultural working situation, consisting of small and very small, often family-
run, farms, a simple application can help to identify the main sources of hazard in agricultural tasks.

**Transferability of INAIL-CONTARP experiences to EU Member States**

The published sets of data sheets concerning UL-WMSD risk in non-standardised repetitive tasks
performed using the OCRA checklist could offer a replicable model for every EU Member State and is
suitable to assess biomechanical risks in all non-standard agricultural tasks. These data sheets cannot
substitute for direct observation of working operations, but they provide technical advice to employers,
occupational health professionals and ergonomists in order to improve safety and health at work.

The structure of every data sheet was realised by INAIL-CONTARP experts as a simple sheet that is
easy to use and to understand, including by untrained people.

In every data sheet, specific protection and prevention actions are suggested to reduce the UL-WMSD
risk. Protection and prevention actions concerning three risk areas could facilitate the compliance to
every EU regulation or could suggest safety and health improvements in workplaces.

The digital database available in the application will include all data sheets.

A standardisation network is suggested to improve intra- and inter-observer method reproducibility. To
implement a standardisation network, operators must have a good knowledge of biomechanical risk
assessment and related methods. In fact, the INAIL study, carried out for 4 years, allowed a comparison
between peers and led to a real homogeneity in risk assessment. This had never been done before in
Italy and the methodology used could be transferred to other public and private European groups of
specific risk assessors in agriculture.

**Conclusions**

In Europe and Italy, MSDs are continuously increasing. Specifically, pathologies related to the upper
limbs are widespread in various sectors and, particularly in agriculture, characterised by the seasonality
of activities and by a wide variety of manual tasks.

The characteristics of this sector and the large number of occupational diseases reported led INAIL-
CONTARP to assess the risk of many non-standardisable repetitive tasks, reported in two monographs
of risk data sheets, using the OCRA checklist method, reported in ISO 11228-3 and ISO/TR 12295.
This method has proved to be reliable and allows users to draw up a map of the risk for repetitive work.

To implement the risk assessment, an internal standardisation network was created. The purpose was
to improve intra- and inter-observer method reproducibility. This network project ensures a
homogeneous risk assessment among all the participants, allowing users to evaluate the most
problematic risk factors on the basis of shared considerations. This network has improved the quality
of the application of the method ensuring continuous training of assessors and their updating on
technical standards, reports and scientific literature.

To increase awareness of the specific risk in the work environment, the group is still producing new
data sheets on agricultural tasks and also developing a responsive web application to give technical
indications, information and knowledge to employers, workers and safety and health representatives in
the workplace. The implementation of this kind of network allows assessors to reach and maintain
similar levels of technical knowledge within each group and provides information and knowledge to
stakeholders.
Risk assessment of upper limb musculoskeletal disorders in agriculture: compared experiences

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Risk assessment of upper limb musculoskeletal disorders in agriculture: compared experiences


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