Guideline for OSH practice within the Agriculture sector

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Dear readers and users of the "Guideline for OSH practice within the Agriculture sector",

I would like to address to you in my role as the project manager of the "AGROSH+" project, a project implemented by a consortium led by Romtens Foundation (Romania), and which included four other partners, namely: (1) UMFVBT – Victor Babeş University of Medicine and Pharmacy Timisoara (Romania); (2) PROLEPSIS – Institute of Preventive Medicine Environmental and Occupational Health (Greece); (3) WRC – Work Research Centre (Ireland); (4) FCBZR – Foundation "Center for Safety and Health at Work" (Bulgaria).

We got the idea of the project while researching the offers of OSH training courses' providers in Romania, when we realized that there are no such specific courses for the agriculture sector. Further research done with our colleagues in Greece, Ireland, Bulgaria and Spain led to similar findings, there are no such sector-specific OSH training courses, but only general courses. From this discovery, our project stemmed as a dual project, with a component for occupational medicine and one for occupational safety.

Therefore, our project aimed to enhance the available knowledge for occupational health and safety (OSH) experts and occupational medicine physicians who are providing their services to companies operating within the agriculture economic sector. As such, the project produced the curriculum and content for two training courses dedicated to these categories of specialists working in agriculture. In addition to these training courses, the consortium has also produced the "Guideline for OSH practice within the Agriculture sector", which is now offered to you. We do consider the Guideline as a practical instrument addressed mainly to employers, but also useful to occupational medicine physicians and safety experts. We hope that the recommendations included in this Guideline will show employers how to approach the performance of a risk assessment (by accredited experts), how to deal with the occurrence of occupational accidents and occupational diseases, as well as how to design and implement preventative measures for the companies they own and/or manage. More information about the project, the two training courses and other related resources, is available on project's website (www.agrosh.ro).

We hope that the information gathered by our project and provided within this Guideline will be of interest to you and that it will support you in your daily activities towards a safer working environment within companies active in the agriculture sector, and not only.

In the end, I would like to thank to Daniel, Crina, Elena, Richard, Ljupcho, Ekaterina, Pania and Dina, whose efforts made possible the implementation of the whole project.

Due to the fact that the Romtens Foundation will celebrate this December 20 years of existence, I am taking this opportunity to address to the users of the Guideline the invitation to visit our website and register for our foreseen activities.

With consideration,

Bucharest, September 2018

President of the Romtens Foundation

Theodor Haratau

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INTRODUCTION

WHAT THE GUIDELINE IS AND WHAT IT IS NOT

This 'Guideline for OSH practice within the Agriculture sector' (*the Guideline*) aims to provide support mostly to individual farmers, farm managers, farm administrators and owners and those who have a managerial function in any kind of farm or agriculture company. The material may also be useful to the farmers' associations, unions or employers' associations, as well as companies that provide equipment and services to companies in the sector. As a secondary objective the guideline should serve as a quick and handy practical tool for experts in OSH in Agriculture, experts such as safety experts, occupational physicians, and workplace health promotion experts whenever they seek support for providing services to companies in the agriculture sector.

The support this material provides is confined to the Occupational Safety and Health domain, encompassing all types of occupational medicine services and safety services provided to companies in the sector. The guideline targets agriculture as an economic sector as a whole, and hence considers (though to differing extents) all its subsectors: Aquaculture, Beekeeping – apiculture, Mollusc farming, Pisciculture (fish farming), Sericulture, Animal husbandry – Aviculture (poultry farming), Animal husbandry – Cattle, pigs and sheep, Crop production, Horticulture, and Forestry (Silviculture).

We should also state what the guideline is not. From a content perspective, it is not a replacement for textbooks and other scientific materials in the area (occupational medicine, OSH, workplace health promotion); experts in search of in-depth information in these domains should consult either our materials[1] or other textbooks. The Guideline is a practical instrument providing advice to employers in the agriculture sector, helping them to focus on the most important issues to consider when dealing with OSH. The Guideline should orientate them to both the critical issues to tackle and the possible sources of information for further advice and solutions.

USING THE GUIDELINE AND ITS RELATED MATERIALS

The Guideline has been produced as part of the project '*OSH+ for the European Agriculture sector - Stimulating growth in rural areas through capacity building for providers (and beneficiaries) of occupational medicine and OSH services*' (AGROSH+ in short. This project has been a two year effort (September 2016 – August 2018) of a consortium led by Romtens Foundation (Romania), and four other partners - UMFVBT – Victor Babeş University of Medicine and Pharmacy Timisoara (Romania); PROLEPSIS – Institute of Preventive Medicine Environmental and Occupational Health (Greece); WRC – Work Research Centre (Ireland); FCBZR – Foundation 'Center for Safety and Health at Work' (Bulgaria). The project received funding from the ERASMUS+ Programme 2016 Call in Romania.
AGROSH+ had two main objectives - to enhance the level of expertise (knowledge, skills and attitudes) of a number of OSH experts & occupational physicians); and to increase the level of information available to the overall community of OSH experts & Occupational physicians active in the agriculture sector. In order to achieve these two objectives AGROSH focused its activities in two areas:

[1] see the materials developed in the e-learning platform - http://www.agrosh.ro/?i=portal.en.elearning)

- It has produced the concept, the curriculum, training materials (manuals, presentation, individual and collective exercises), and it has delivered a training course for **occupational physicians** who provide services to the agricultural sector. The training course was delivered in English, was comprehensive (encompassing 16 different Modules), and was a blended course with face-to-face and e-learning components[2].
- It has produced the concept, the curriculum, training materials (Case Studies, manuals, presentation, individual collective exercises), and it has delivered a training course for **OSH Experts** who provide services to companies working in agriculture. This training course was also delivered through English language, was focused on **Risk Assessment** (with 7 different Case Studies), and was a blended course with face-to-face and e-learning components.

A request – The two areas of activity generated a large amount of materials crafted specifically for the two training courses. These materials and resources are available on the e-learning platform developed under the AGROSH+ framework and it is available for free to people who register with the project website. The project team and the authors of this Guideline recommend that reading the Guideline be done in conjunction with reviewing and considering the materials hosted on the e-learning platform. This advice concerns is especially relevant to OSH experts (occupational physicians or safety experts), as a wide range of training materials are available in the database. Obtaining free access to the materials needs registration with the e-learning database[3] and the provision information on the use of the downloaded materials (for more information, see www.agrosh.ro).

The Guideline mirrors the two training activities and should be regarded as an effort to address the final target group of OSH activities in the sector – OSH experts as well as individual farmers, farm managers, farm administrators and owners, farmers' associations (unions or employers' associations), as well as companies providing equipment and services to agriculture. However this latter group are targeted from a slightly different perspective, the Guideline aim not to train them but to orientate them when they to tackle OSH issues in their own company or farm.

HOW TO USE THE GUIDELINE

The perspective this Guideline takes is that in order for a responsible employer to manage effectively and efficiently an OSH system (be it a simple individual beekeeper or an automated slaughter house) two conditions need to be observed simultaneously:

- They need to understand the OSH implications of their own work;
- They need to use specialized and accredited OSH and occupational services.

The Guideline helps employers with both of these conditions; the six main chapters are the most important ones to be considered in terms of OSH management. At the end of each of these chapters there is a section in which clear recommendations are made for employers addressing the issue of how to practically address the topics of the Chapter and what to specifically look for when purchasing services from OSH and occupational medicine services providers.

The 1st Chapter '*The Agriculture economic sector – operations & timing, people, equipment and practices'* is an overview of the main features of the twelve subsectors of agriculture in the NACE

[2] The course has been accredited by the European Accreditation Council for Continuing Medical Education (EACCME®) with a maximum of 37 European CME credits (ECMEC®s).
[3] (http://www.agrosh.ro/?i=portal.en.elearning

classification[4] - Aquaculture, Beekeeping, Mollusc farming, Pisciculture, Sericulture, Animal husbandry (poultry, cattle, sheep and pigs), Crop production, Horticulture and Forestry. For each one of these, the authors have aimed to present the most relevant features in terms of operations & timing, people, equipment and practices. More detailed treatments of these areas are available on the project website.

The 2nd Chapter '*Employees in Agriculture'* summarises the main features of the workforce currently employed in agriculture across European countries. It focuses particularly in four vulnerable groups - women, migrant and seasonal workers, children and older people. The final section gives detailed recommendations for employers on the issues to be considered for managing OSH for these vulnerable groups.

The 3rd Chapter 'Occupational risks in agriculture' is one of the main pillars of the Guideline. It focuses on the most relevant examples of hazards in all categories of occupational risks, i.e. ergonomic, chemical, physical, biological, and psychosocial risks. The chapter also has a section on the risks of using agricultural equipment & machinery and a section on work related accident statistics at EU level and in some Member States. The chapter ends also with a practical advice for employers from the perspective of managing occupational risks.

The 4th Chapter 'Occupational diseases in agriculture', a large chapter, includes several sections addressing occupational diseases. First there is a section describing how the reporting of occupational diseases & work-related diseases is performed at European level. The few available EU statistics on occupational diseases (including statistics from the countries in the project) are presented subsequently. The largest part of the chapter focuses the most prevalent occupational diseases in agriculture with their main features presented; examples of occupational diseases specific for certain subsectors of agriculture are presented here as well as some indications of the preventive measures to combat them. The chapter closes with recommendations addressed to employers on how to prevent and how to tackle occupational diseases in their enterprises.

The Guideline ends with an Annex pointing to all relevant EU legislation on OSH and a selection of the most relevant legislation in the countries which were involved in the AGROSH+ project.

The Guideline takes into consideration the wide variability of agriculture as an economic sector, by considering the different working conditions and exposures to hazards (all risk factor categories are represented), the diverse work organisation models and practices (automated systems in modern poultry farms are approached as are independent beekeepers having their season-dependent individual working routines), as well as the wide variability of the enterprises in this sector (from one person-one farm to large enterprises). The guideline pays particular attention to the employees in agriculture and to the main features of the type of work they perform; climate and climate changes, the seasonality of much of the work, long working hours, remote working and repetitive and strenuous work as the norm and not the exception.

SOME CONSTRAINTS IN WRITING THE GUIDELINE

The authors aimed as much as possible to provide a European perspective on the data and information presented within the Guideline. However, some problems arise in relation to some of

[4] NACE – Nomenclature of Economic Activities

the domains covered by our Guideline. For example, in the 4th chapter the lack of a standardised system of gathering national data on occupational diseases means that is not possible to show comparative data for the agriculture sector. Even though a system does exist, the variability of the national lists of occupational diseases and variance in the methods of data collection preclude the generation of systematic reviews of diseases. In this regard the difference of between how national reporting systems for occupational diseases and occupational accidents report to EUROSTAT is relevant. While accidents at work data are easily available, even with sectoral breakdowns (e.g. agriculture ranks fourth for both fatal and non-fatal accidents[5], there is no such availability of data for statistics for occupational diseases.

A final word concerns the authors' efforts to capture national situations in the countries of the AGROSH+ project. As much use was made as possible of national data and examples where relevant throughout the Guideline.

[5] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Fatal_and_non-fatal_accidents_at_work,_by_NACE_section,_EU-28,_2015_(%25_of_fatal_and_non-fatal_accidents)-AAW2018.png – website accessed on the 14th of August 2018)

CHAPTER 1 – THE AGRICULTURE SECTOR – OPERATIONS & TIMING, PEOPLE, EQUIPMENT AND PRACTICES

INTRODUCTION

Addressing the agricultural sector with occupational safety and health services and specific occupational medicine services is very important due to the fact that most of the people in the sector in Romania for example, (78%) work in micro-companies. These on one hand, do not spend much time searching for OSH information and services and on the other, are difficult to reach by national programs (60% of the people working in agriculture are self-employed – most of the time doing all kinds of jobs) (Sud Muntenia, 2013)
Another important reason is the fact that people working in the various agricultural subsectors are exposed to all kinds of occupational risks – sometimes not being aware of the consequences and of the preventive measures they should apply. Examples include ambient risks (powders, vibrations, high/low temperatures, direct sunlight, high levels of noise, etc.), posture-related risks, biological and chemical risks (pesticides, insecticides, vaccination sprayed or injected, etc.). The findings of different surveys (e.g. Sud Muntenia. 2013) show that there is still considerable scope to improve awareness of the need to use personal protective equipment and other preventive measures especially for workers on temporary contracts, in low-skilled jobs or with low education levels.
These being acknowledged, the present chapter gives a brief description of the twelve NACE defined subsectors of agriculture, for each included some general data related to work processes and timing, as well as the equipment/tools used for these operations, practices and/or the substances used.
As stated above, many people working in agriculture are self-employed and some of them have a low level of training or education, some are older or poorer people – sometimes working in 'subsistence agriculture' and some are part of a vulnerable social category (seasonal workers). Yet, even though not having a high level of formal training, they have practical experience on how and when work should be done and this makes them a valuable and trusted, and in many cases, the only resource. In most cases they form the small, private farms, in which the labour force consist only of the farmer and his/her family.

In contrast, in some farming operations (extensive/intensive farming) and on the specificity of tasks, the labour force is highly educated (e.g. aquaculture staff are trained in health and safety rules and procedures, because failure to properly manage operations could lead to economic loss) or even need to be very skilled persons (e.g. mechanised, automated, computerised farms).

There are also subsectors in which people only need training on the job – like in the case of sericulture or apiculture (people sometimes go to training courses organised by the local Agricultural Advisers), or in pig or sheep farms, where people are trained for various simple tasks and can get good results.

As a general rule, this means that traditional cycles of production and farming are based on longer production cycles and on people who are generally trained on the job, while for intensive farming which entail short cycles and mechanised and automated processes, more highly educated and trained personnel are likely to be seen.

AQUACULTURE

Aquaculture, a sub-sector of animal husbandry, is the farming of aquatic animals and plants using intensive or super intensive production, in fresh or salt water, in continuous flow or recirculating systems, in open or closed environments, with the aim of selling the aquaculture products.

Main Features

a. Operations & timing

In Romania, as elsewhere, aquaculture has been growing fast, thanks to an increasing demand for fish and shellfish and the falling reserves in the world's oceans and domestic freshwaters. Fish farming in super-intensive circulating systems are of much interest because, compared to raising fish in open ponds, it has the following advantages: it saves land and water resources, it can take place anywhere, it allows an increased level of control over the breeding environment, fish can be raised anytime during the year in optimum conditions, harvesting can take place anytime, and the output and revenues can be predicted more precisely. Operations carried out in RAS (recirculating aquaculture systems) are not seasonal.

b. Equipment and practices

The following types of equipment are used in a super-intensive RAS:

- Fish breeding tanks: square (1,5 x 1,5 x 0,7 m; V=1,125 m^3), circular(Ø=3 m; V=5,63 m^3), big-round(Ø 4 m; H=1,20 m; V=12,56 m^3), larvae trough (330 x 40 x 30 cm);
- Quality control equipment: Hanna multi-parameter;
- Water welling and recirculation equipment: submersible pump, recirculating pump, pump for water with solids;
- Solid removal equipment: drum filter (max capacity 350 mc/h)
- Food distribution equipment: bunker type feeder, belt feeder
- Oxygenation and aeration equipment: cryogenic tanks for liquefied gas, vaporizers, oxygen or air diffusers, aeration pumps, aerators fitted in the rearing tanks;
- Staff protective equipment: rubber overalls, rubber apron, rubber gloves, rubber boots.

BEEKEEPING – APICULTURE

Apiculture is the practice of keeping bees and manufacturing honey and beeswax; one major role of apiculture is plant pollination in the vicinity of beekeeping areas.

Main Features

a. Operations & timing

The annual cycle of a bee family is closely linked with the succession of seasons and the climate of the area where they are grown, as these characteristics influence the blossoming cycle. The season starts in autumn. The number of bees that survive winter, compared to the number of bees in autumn, depends on the beekeepers abilities and husbandry.

Maintenance operations include: preparing bees for winter, taking care of the bee families during winter, the cleansing flight, the spring revision, the main check-up of the bee family, stimulating feeding, enhancing the habitat, maintenance and exploitation, bee families' multiplication,

estimating the amount of bees and honey in a hive, food needed by bees in a hive for one year, and a breeding plan.

b. Equipment and practices

In order to make work easier and to prevent accidents, beekeepers use tools to examine a hive, to wire the frames, to fix the artificial combs and preserve spare combs, pollen collecting tools, honey extraction and conditioning tools, and wax extraction tools. They also use shelters for the bee families (stackable hives, vertical or horizontal hives, *RA-001*, made up of one box and two stores, bee pavilions). Beekeepers are also protected by special equipment, which includes hat and veil, coveralls, apron, and gloves. The chemicals used in beekeeping are Sulphur dioxide, naphthalene, paradichlorbenzene, a commercial product called 'Galezon', a commercial product called 'Galerin', and glacial acetic acid.

MOLLUSC FARMING

This consists of growing terrestrial molluscs, such as edible snails (heliciculture), marine molluscs (Ostrea, Mytilus, Pecten, Cardium) and freshwater mollusks (Anodonta and Unio).

Main Features

a. Operations & timing

Romania has registered a boom between 2003-2007, thanks to its temperate-continental climate, with more precipitation than in countries that have a tradition in snail farming (France, Italy, Spain, Greece) and a lower cost of labour. By late 2006, according to estimates by the Institute in Cherasco, Romania ranked 2nd in the world in terms of number of snail farms (more than 1500) and the area covered by them. All farms were privately owned, and production and management activities were carried out by members of the owners' families. Hired staff were rarely resorted to.

b. Equipment and practices

In snail farming, the following types of equipment are used:

- Protective equipment for the staff: overalls, robes, gloves;
- Tools for planting green crops: drill machine, tractor, miller;
- Materials that prevent the access of pests and do not allow snails to leave the farm: outer walls made of zinc-coated tin, pillars (wooden, iron, cement), Helitex net; iron net (plasticized or zinc-coated; 3-4mm), disinfector (containing a 10-15cm thick sponge impregnated with sodium hydroxide).

In terms of chemicals used on an outdoor full-cycle snail farm, the following are typically used:

- sodium hydroxide: a 10-15cm thick sponge is placed on a disinfection barrier; the disinfector is a 30-35cm deep hole, 2m long and 1.5m wide, in which a 5-10cm concrete layer is cast; it is used to disinfect the footwear and the wheels of the miller;
- nitrogen-based organic fertilizers (type 12/12/123): 50kg of nitrogen-based fertilizer for an area of 2000 square meters;
- malathion: used to combat pests: 50 kg granules per 2000 square meters.

PISCICULTURE (FISH FARMING)

Pisciculture is a branch of animal husbandry, which deals with breeding and multiplying fish in natural waters, ponds, stews, etc.

Main Features

a. Operations & timing

Fishing and fish farming, alongside fish processing and trading are activities that are carried out all across Europe. In Romania, there are isolated areas such as the Danube Delta and the Danube Gorges where fishing is a major activity, a source of jobs and income for the local population. Romania has an 843,700 hectare hydrographic network, which accounts for more than 3.5% of the country's surface.

Production cycles in a carp farm (ponds and stews), which are similar to other production cycles, include: preparing the pools/ponds for breeding, populating the fish ponds, carp breeding, rearing carp larvae, rearing alevins and fingerlings, rearing one-summer carps, raising carp for consumption, pond fishing, and preserving fish for consumption.

b. Equipment and practices

The typical equipment used by workers in fish farms includes:

- Personal protective equipment: rubber boots, rubber gloves, masks;
- Fishing tools: trawls, cast nets, seines;
- Equipment for fodder/feed distribution: boats (motor boats or rowboats)
- Tools for cutting vegetation that has grown in excess: mechanical mower.

In a full fish farming cycle, the following substances are used: slack lime, lime chloride, sodium chloride and superphosphate.

SERICULTURE

Sericulture deals with the study of the biology and technology of feeding, cultivating, rearing and improving all cocoon-producing species, from which natural silk is extracted.

Main Features

a. Operations & timing

Programming production cycles in sericulture are determined by the quantity of available leaves as a food source, which in turn influences the number of worms than can be reared in the context of the availability of appropriate accommodation, tools and equipment, bedding (perforated paper) and the labour force. The operations part of the production cycle in sericulture is concerned with producing food for silkworms, Bombyx mori egg incubation, the rearing of Bombyx mori larvae, cocooning which takes place either in the same room in which the rearing took place or in separated spaces (guided cocooning). Bombyx mori egg incubation and larvae rearing starts from around the 10th of April for a period of one month, while other seasonal activities should also include setting up a mulberry plantation and the maintenance operations over a 2 year cycle at minimum.

b. Equipment and practices

The tools used in sericulture include:

- Farming tools and equipment used in setting up and for the maintenance of a mulberry plantation
- Constructions and equipment for incubating silkworm eggs
- Constructions & equipment used for larvae rearing (i.e. heated sericulture halls, metallic racks, leamasi chopping machine, humidifier, technohigrograph, hamper, etc.)
- Other materials needed in a larvae rearing facility (i.e. paper bedding, wooden ladder for leaf harvesting, knives to chop the leaves, brooms, buckets and cleaning rags, etc.)
- Materials used for cocooning (i.e. double wooden grids, bunches of straws from cereals that have not been harvested by machines, etc.)

The substances used for disinfection in sericulture include formaldehyde, calcium oxide (whitewash), caustic soda (sodium hydroxide), bleach powder, chloramine, bromure of cetilpiridin, bluestone and chloramine.

ANIMAL HUSBANDRY – AVICULTURE (POULTRY FARMING)

Aviculture is the animal husbandry sector dealing with the biology of, races, feeding, breeding, improvement and selection of birds, with a view to optimizing breeding, rearing and production technologies in order to make the activity economically effective.

Main Features

a. Operations & timing

In poultry farming, the production cycle is largely influenced by the system for raising the birds as well as the way in which the birds are brought to market. The main factors influencing the production of meat or eggs are biological and environmental. The sector deals mainly with two age categories in poultry: young chickens/broilers (meat chicken, breeding chicks, replacement chicks) and adult chickens (laying hens for consumption, eggs or for incubation). There are two types of production: chickens used for breeding (light and heavy breeds) divided into pure lines, grandparent and parent farms; and production chickens (replacement chicks and egg-laying hens, but also meat chickens). There are also some special production categories such as turkeys, geese and ducks, with free feeding or fattening; guinea hens, pigeons, pheasants and partridges, birds bred and reared for ornamental purposes or as exhibits.

There are two types of maintenance systems in aviculture: extensive or traditional. Extensive systems may be peasant, semi-intensive or intensive household, while in extensive systems are classed as being intensive or industrial. In the extensive system, less attention is paid to birds and hygiene. In the semi-intensive and intensive systems, birds are subject to treatment and vaccination protocols, and shelters are rigorously cleaned as a means of preventing disease. In the intensive system, operations can take place anytime throughout the year, given that maintenance is done in shelters that eliminate the influence of external environmental factors on production.

b. Equipment and practices

Facilities and equipment differ, in keeping with the farming system used. They include sanitary filters and offices, veterinarian office and pharmacy, shelters for poultry, etc. This means ensuring the appropriate microclimatic conditions for adult birds (temperature 13-18 degrees C, humidity 55-

75%, light between 10-20 lx in adult chickens, air current speed 0.35-0.5 m/second, CO2 max 2500 ppm (hens), H2S max 10 ppm, NH3 max 26 ppm). The conditions for younger birds are different – the surrounding temperature must range between 20-32 degrees Celsius, and the air current speed should be 0.1-0.2 m/s. The biggest health and safety danger is the accumulation of harmful gas in the waste collection facility, where interventions can be carried out only using the proper equipment. Other equipment needs include lighting equipment, fans, heating devices, water spraying devices, incubation stations, and equipment for transporting the poultry inside the farm, equipment for preparing and distributing feed, drinking water facilities, a platform for depositing and stocking waste, equipment to carry and distribute the waste on the field, and personal protective equipment (overalls, coat, rubber boots, apron, robe and gloves).

ANIMAL HUSBANDRY – CATTLE

Cattle Farming refers to the field that studies the biology, breed specialization, feeding, breeding, improving and selecting cattle (bovines), with a view to optimizing breeding, rearing and production technologies in order to render the activity economically effective.

Main Features

a. Operations & timing

The production cycle in cattle farming is influenced by the production and maintenance system. Irrespective of the production system used (traditional, household or industrial), the level of exploitation can be extensive, semi-intensive and intensive. The level of intensiveness grows in keeping with the level of production and profits.

The operations carried out in cattle farming depend on the type of system used. The traditional method (extensive) takes the longest because the number of cattle per farm is low (1-10 head), the herd is improved through empirical, phenotypic selection, calving takes places in the spring-summer seasons, technical equipment is scarce, etc. The household system (mixed - both traditional and industrial exploitation) operates based on a closed production cycle system, with a higher number of cattle (10-200 cows), increasing the mechanization level of technological processes, which in turn leads to a higher production of milk and bigger profits. The industrial system is based on principles of concentration, specialization and integration of production, modern exploitation technologies and the intensive exploitation of a biological material that has a big genetic value, complex mechanization of all production processes, computerization and automation of some technological processes. These farms have a minimum of 200 cows (mostly over 500) and a birth rate over 90%, with a 13 month gap between calving sessions.

b. Equipment and practices

Equipment differs depending on the type of farming as well as on the type of activity within the sector (e.g. laboratories for preserving and processing semen and storing artificial insemination equipment, sanitary-veterinary filters for intensive and meat cattle farms). In most situations, the tools and equipment are needed for waste evacuation, fodder and water distribution, lighting, silos and warehouses, haystacks, milking and milk preservation equipment, and personal protective equipment for the workers.

ANIMAL HUSBANDRY – SHEEP FARMING

Sheep farming refers to the field that studies the biology, breed specialization, feeding, breeding, improving and selecting sheep, with a view to optimising breeding, rearing and production technologies and rendering the economic activity effective.

Main Features

a. Operations & timing

The production cycles start in autumn, in September-November (depending on the geographic area) when sheep breed. The gestation period lasts 5 months, and lambing takes place in spring, from February to April. For specialized breeds, a breeding season can be set up for spring, especially in sheep reared for meat and milk. In this case, production takes place mainly in winter. After lambing, lambs are breastfed for either a few days or for up to 3-4 months, depending on the type of production desired. After weaning the lambs, the sheep are milked until August-September. It is important that weaning occurs 2-3 weeks before resuming the production cycle, for sheep to have time to recover. In the case of sheep raised for meat, the same cycle is followed, but the sheep are not milked and the weaned lambs will form separate herds and will be fattened for meat.

In terms of equipment and practices, these are more or less the same as in the case of cattle.

ANIMAL HUSBANDRY – PIG FARMING

Pig farming refers to the study of the biology, breed specialization, feeding, breeding and improving the selection of pigs with a view to optimizing raising, maintenance and production techniques, and thus render the activity economically effective.

Main Features

a. Operations & timing

Depending on the systems used for raising the pigs, and on the type of meat to be produced (pork, mixed and fat or lard), operations are specific to each sector and can be carried out anytime, as pigs are raised in shelters where there is no influence of external environmental factors. In the intensive – industrial system, the following activities take place:

- breeding (boars and sows are kept and prepared for breeding and gestation - 110 days);
- maternity (lactating sows and piglets - 30 days old);
- youth (from the moment they are weaned up to the age of 2 months and the weight of 30 kg);
- fattening (3 to 6 months and reformed adults);

In semi-intensive and extensive (household) systems, stationary periods are longer, except for gestation, because breeding utilisation and growth intensity indexes are 20-30% lower.

In terms of equipment and practices, these are more or less the same as those for cattle production.

CROP PRODUCTION (ALL PLANTS)

Crop production (sometimes called agro-phytotechny) is a technological science, closely related to biology and ecology, with two main components - agrotechnics and phytotechny. Agrotechnics is the science that studies how soil works and how the production system works, i.e. vegetation factors related to crops production, rotation of crops and weeds control & preventive measures in an agro-ecosystem (12).

Phytotechny is an agricultural science that aims to establish the optimal technological schemes for the cultivation of plants in the phytotechnic range (large crops), in relation to plant biology, climatic, edaphic and technological conditions, with the purpose of obtaining high quality and large crops to be used for human food and for feeding animals, together with the management of the vegetal waste problem, while also observing the surrounding environment protection measures (2).

Main Features

a. Operations & timing

The groups of plants part of the current phytotechnic range are cereals (corn, rye, barley, oats, maize, buckwheat, sorghum, millet), legumes for beans (peas, beans, soya, lentils, garbanzo, fava beans, lupin, peanuts), oil plants (sunflower, corn poppy, flax for oil, mustard, castor-oil, rapeseed, saffron), textile plants (cotton, flax for fibres/linen, hemp), root plants (potatoes, sugar beet, chicory), medicinal and aromatic plants, tobacco and hop (2).

Operations specific to crops produced in large areas, such as maize, corn, sunflower (all annual crops) include crop rotation, soil preparation, fertilisation, seeding, irrigation, maintenance works (for controlling weeds, diseases, fungi and pests) and harvesting. For potatoes, the activities are more or less the same, with seeding replaced by the preparation and planting of tubercles. Soil preparation can be done in the autumn or in the spring, depending on the crop.

b. Equipment and practices

The main equipment used in crop production are:

- machinery, tools for soil preparation: plough, harrow, spike harrow, drag harrow, disk harrow, rotator, subsoiler, cultivator, rotary tiller, shanks;
- equipment and machinery for seeding and planting: cultivator, digger, EPC-4, MPCI-6, 4 SABP-62,5 machines or 6 SAD-75, MPC-2 aggregated with a tractor L-445, mechanical seed drills;
- terrestrial or air machinery and/or equipment (helicopter) used to apply phytosanitary treatments;
- machinery, equipment and tools for harvesting: trailed or self-propelled harvesters, bale wrappers, hay rake, hay tedder, hay forks, plough, machines MSC-1, MSC-2, MSC-130, E-649, MSCRE-1, MTV4, combines CRC1 and E684;
- individual protective equipment for the application of Phyto-sanitary products: rubber boots, disposable overall, nytril rubber gloves, mask, protective goggles and hat.

The types of chemical products used in crop production are fertilizers, herbicides, fungicides, insecticides, insecto-fungicides, desiccants and foliar treatments.

HORTICULTURE

Horticulture involves many biological practical sciences, dealing with the morphology, biology, ecology, technology of species and varieties of fruit trees, vines, flowers and the processing of horticultural products.

Main Features

a. Operations & timing

When choosing the land for setting up an orchard or a vineyard environmental and socio-economic factors are taken into consideration (6). For example, the steps for setting up an apple orchard involve choosing the land, preparing the soil, planting operations, soil maintenance and weed combatting operations, grafting cuttings to form the crown and to produce young fruit bearing branches, fertilization in the established orchards, irrigation, norming the load, phytosanitary works, and fruit harvesting.

These types of operations occur in most orchards, while for vineyards the main agrophytotechnical measures are preparing the soil, preparing the vines for planting, planting the vines, maintenance after planting, maintenance of fruiting vines, grape harvesting.

b. Equipment and practices

The main types of equipment used in horticulture are machines used to work the land, tools used in semi-mechanized cutting and/or cutting tools, manual tools used to work the land, machines for dusting and spraying, tools needed for preparing solutions, steel reinforced stairs with opening limitation devices, baskets, protective equipment (i.e. goggles, gloves, cap/hood, proper footwear and clothes). The chemical products used in horticulture include chemical fertilizers, herbicides to combat weeds, chemicals to combat diseases and pests, and hormonal products to balance the amount of fruit in trees.

FORESTRY (SILVICULTURE)

Forestry - Silviculture is concerned with the science and practice of creating, managing, using, preserving and repairing forests and associated resources (trees, shrubbery, sub-shrubs), with the aim of providing goods and services to the population.

Main Features

a. Operations & timing

Forestry has two components: *Silvology* or *Silvobiology* (the understanding of natural forest ecosystems and the design of forestry systems) and Silvotechnics (methods of preserving, repairing and exploiting forests). The process flow for obtaining seedlings and for setting up a new species has not changed for many years and mainly takes place in nurseries. Weeds and pests are combated using chemical or mechanical methods applied to the soil, seeds or vegetation. The activities carried out in solaria to obtain seedlings are cone harvesting, preparing the soil, Ditch seeding (in spring - early May, and planting. After this stage, direct seeding is done in spring, in beds, followed by natural growth (regeneration), brush maintenance, and forestry regimes and treatments.

b. Equipment and practices

The equipment used in forestry include:

- Knives for harvesting cones, scissors for singling seedlings in nurseries;
- hedging knives, specialised scissors, axes;
- manual tools (shovels, pickaxes, specialised rakes) or machines used for working the land, seeding and harvesting;
- cleaning can be done with axes, saws and portable mechanical machines;
- protective equipment depends on the type of activity that is carried out; e.g. in cutting operations, workers must wear a helmet, gloves, goggles, earplugs, protective trousers, boots and so on

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CHAPTER 2 – EMPLOYEES IN AGRICULTURE

INTRODUCTION

The Agricultural sector comprises 4% of total employment in the EU and has remained relatively stable in the past decade. In terms of self-employment, 61% of agricultural workers report that they work for themselves, and about 26% of them report having no other alternatives for work when choosing to work within this sector. Furthermore, almost 1 in 2 (48%) employees in agriculture are self-employed without other employees. Agricultural employees are exposed to a multitude of posture-related, biological, chemical and environmental risks, and score 76 (out of 100) in the Physical Environment Index, which comprises 13 indicators related to specific physical hazards (strong vibrations, lifting, carrying, inhalation of chemicals, etc.); lower than the EU28 mean of 84/100. This is also exacerbated by the fact that only 12% of employees of the agricultural sector report that they not always use personal protective equipment (PPE). Similarly, they score the lowest 67/100 (EU28 average 71/100) at the Working Time Quality index, which comprises 4 dimensions; working hours (longer/shorter work hours), atypical work time (weekend, evening, night), working time arrangements (who sets working hours, informed in advance of changes to work schedule) and flexibility (taking time off, work during free time) (Eurofound, 2017).
Only about 1 in 3 employees in agriculture (31%) report the existence of an OSH delegate or committee; this is the lowest percentage of all other occupational sectors in EU28 (58% average). Due to this lack of proper health and safety and work-life balance information, they most commonly reporta greater incidence of poor health (low/upper backache, limb/joint pain, overall fatigue and sleeping problems) (Eurofound, 2017).
As a working environment, the Agriculture sector can potentially pose many different risks to a worker, which could be more profound in marginalized or disenfranchised demographic groups. In developed countries in particular, vulnerable groups in agriculture have been largely ignored by public health professionals and policies, and thus the specific health needs of these different populations have largely gone unmet.

Vulnerability is a concept with many possible definitions depending on the context. While the WHO has developed a definition of vulnerability for environmental hazards and disasters, a similar definition has not been developed specifically for workers, much less in the agricultural sector. Despite this lack of a concrete working definition, there are some widely understood characteristics that describe what comprises a vulnerable population. The European Parliament provides a definition for vulnerable populations in relation to occupational health, stating that a vulnerable population is more likely to be exposed to certain risks compared to the general working population. These risks are classified as either endogenous or exogenous (Belin et al, 2011). Endogenous risks are risks to which members of a group are exposed by virtue of their inherent characteristics (e.g. physical size, age, medical conditions). Exogenous factors relate to risks from of the nature or type of work a group are more likely to be involved in (e.g. pesticides, proximity to animals, heat or cold exposure).

Because vulnerability is so closely tied to context and societal norms, persons who are vulnerable in one region may not be vulnerable in another. Depending on the demographic makeup of any given country, the populations that can be considered vulnerable might vary, and assessment of the health and safety needs of different groups may need to be adapted. Furthermore, aspects of vulnerability may overlap, rendering the assessment of vulnerability much more complex. For example, the

elderly tend also to have chronic conditions, migrants may generally have lower socioeconomic status, or an individual at risk can be a woman, migrant, and elderly employee all at once.
The vulnerable groups discussed in this chapter face special risks associated with age, gender, low socioeconomic status, ethnicity, race, culture, or religious beliefs. The demographic composition of these groups can vary widely depending on the specific location; however, many are common to all industrialized agricultural countries with similar agricultural systems. Specific groups covered in this chapter include women, migrant and seasonal workers, the elderly, and children/youth. Each section briefly presents the main reasons for and the risk factors contributing to each group's vulnerability status. Following this, the chapter includes recommendations and actions for employers of the agricultural sector which can assist them in ensuring adequate occupational health and safety levels for more vulnerable employees.

WOMEN

Women working in agriculture are a generally underrepresented group with regards to services, training, and data collection. This is partly due to the fact that women do not constitute the majority of agricultural workers. According to the Food and Agriculture Organisation of the United Nations (FAO), the proportion of the agricultural labour force that is female is less than 50% for the world as a whole and for all the usual country groups. Overall, using the weighted measure, women are only 42.2% of the agricultural labour force (Quisumbing et al., 2014). In Europe, women are also increasingly and extensively involved in agricultural labour, although this sector is predominantly male-dominated (65%). Anaverage of around 30% of farms across the EU are being managed by women (European Commission, 2015; Eurofound, 2017).

The main reason for women's vulnerability in agricultural settings is ensuring that they have adequate protection for reproductive health. Strenuous workload, proximity to livestock and exposure to chemicals can result in dangerous consequences such as infertility, miscarriages, or birth defects (Donham & Thelin, 2016). Carbon monoxide, nitrate toxicity, oxytocin, and prostaglandin exposures are hazardous to pregnant women who work in agriculture and/or their unborn foetuses. Contracting any zoonotic or environmental infection, including brucellosis, Q fever, or Listeria, may cause abortion. Pregnant women working with cattle, sheep, and goats need to be especially aware of this risk.
Lifting heavy loads, something very common when working in agriculture, is also a threat to pregnant women.From a biomechanical perspective, important changes that occur during pregnancy include changes in anthropometric characteristics (increase in overall mass of the body and in particular the upper body, changes in the location of the centre of mass, increased abdominal girth, and changes in spinal curvature during pregnancy); increased joint laxity and potential spinal instability; and changes in balance control (Waters et al. 2014).
Pesticide exposure during pregnancy is another major danger to pregnant women. Chemical components used in pesticides, such as atrazine, carbaryl, and 2,4-D are associated with a 20–40% relative increase in risk for spontaneous abortion in pregnant women. Pesticides belonging to the triazine, thiocarbamate, or phenoxy acetic acid chemical families were also associated with moderately increased risks (Arbuckle et al, 2001).
Women working in agriculture are more prone to anxiety and depression than their male counterparts. This can be explained by a number of factors, most notably attributed to chronic stress associated with the social, emotional, and physical well-being of family members (Donham & Thelin, 2016). Women often lead 'triple-duty lives', where they often not only do farm work, but are also the primary caretakers of the family, and may supplement with additional income working off the

farm. This increases fatigue, which can result in higher levels of stress, anxiety, and potentially the onset of depression.

MIGRANT AND SEASONAL FARM WORKERS

Developed western countries depend highly on migrant and seasonal farm workers (MSFWs) to conduct farm work. MSFWs move from farm to farm as seasons and labour demands change with production cycles. They often return to their home countries in the off season. 13% of all workers in the EU28 are of foreign origin or foreign background. The EU employs 4.5 million MSFWs; about 500,000 of these are from outside the EU (Donham & Thelin, 2016; Eurofound, 2017). For Europe and Australia, the percentage of MSFWs in the agricultural workforce is somewhat lower than in the US. MSFWs are frequently segregated into low-paid, unskilled and precarious employment, hired to do the hardest and most unhealthy jobs and experience long working days (Kasimis & Papadopoulos, 2005).
Unlike other vulnerable groups, the factors that render MSFWs vulnerable are often exogenous rather than endogenous. Employers must consider why otherwise healthy adults working in agriculture could be considered a vulnerable population. The literature discusses primarily concerns regarding the social circumstances of migrant workers. Barriers to occupational health for MSFWs include:

- Language and cultural barriers;
- Lack of training;
- Lack of understanding of OSH law and procedures in their country of work;
- Mental distress;
- Inadequate living conditions;
- Insufficient access to healthcare.

The most basic of barriers is the understanding and use of language. Firstly, they are likely unable to understand most safety instructions if they are not presented clearly or in their native language. Secondly, they are incapable of reporting or seeking help for a medical issue or emergency. Furthermore, they may feel powerless, unable to complain of hazards due to the fear of losing their jobs or fear of deportation. (Donham & Thelin, 2016) This ultimately results in a greater possibility for exploitation and a lack of empowerment which prevents them from seeking medical or legal help. Lack of knowledge of the culture in the recipient country, MSFWs may have few opportunities to seek alternative work on other farms, and even fewer in other sectors of the economy should they want to look for safer work or additional income.

Housing may be located close to fields where pesticides are stored and applied, creating exposure risk through contamination of the local premises, air, and water (McCauley et al., 2001). Lack of potable water and sanitary toilet and bathing facilities are often a concern in these establishments as well. MSFWs who rent a living space on the local market may also be relegated to less than standard housing, as they look for low-rent facilities as wages are minimal and they want to save money to bring back home (Donham & Thelin, 2016). MSFWs face increased risks of contracting diseases, such as tuberculosis, as well as potentially spreading diseases to other workers if they reside in shared living spaces (Schenker, 2010).
Mental distress can also be an occupational risk factor for MSFWs. Extended mental health problems can lead to the development or exacerbation of chronic health conditions, violence, or substance abuse. Stressors that can lead to increased risk of depression and anxiety among MSFWs include (Magaña & Hovey, 2003):

- Uprooting, separation from nuclear and extended family or community and cultural origins;
- Adapting to a host culture, language barriers;
- Low and unpredictable income, fear of deportation;
- Discriminatory treatment, inadequate housing;

CHILDREN

Child labour is first and foremost illegal and thus, much like with undocumented migrants, it is difficult to obtain accurate data on child labour in agricultural settings. Often times these children will not be 'employees' of the farm, but instead work on family farms aiding relatives in farm work. As a result, they often become exposed to many of the same occupational risks that adults face, yet with fewer protections. Children working in agriculture are at a higher risk of injuries and accidents from a wide variety of machinery, biological, physical, chemical, dust, ergonomic, welfare/hygiene and psychosocial hazards, as well as long hours of work and poor living conditions (Donham & Thelin, 2016; Hurst, 2007; International Labour Organisation, 2006; NIOSH 2003).
They are smaller, have less experience and coordination, do not have protective equipment suited to their body sizes, and they do not have the agency or awareness to realize the severity of their work. One major concern, which acts as a unique risk factor, is that children, especially very young ones, engage in developmentally-appropriate exploratory behaviours fundamentally different than those of adults. Specifically, through their hand-to mouth, object-to-mouth behaviours and ingestion of various small items, they can unintentionally increase their risk of exposure to dangerous chemicals and other hazards. Their smaller body mass and still developing organs make them more susceptible to the effects of chemicals in far smaller amounts than would be hazardous for an adult.
Heavy duty machinery and tools are considered to be safety hazards by international standards and policies, which advise extreme caution during operation. Using machinery and tools can be detrimental to young agricultural workers' development, since they experience growth of their organs and musculoskeletal systems, and their bodies are in a constant state of change, making them more likely to be harmed or injured during strenuous or physically demanding work.

OLDER WORKERS

The majority of EU farmers are older than 55 years and only 6% are younger than 35 years old. Almost one-third of all farmers are above the normal retirement age of 65 (EU Commission, 2015). The risk for fatal injuries increases at age 55. Older workers are inherently vulnerable because of their age, and this vulnerability increases as the age of the worker advances. Tissue degeneration, possible chronic diseases, fatigue and loss of other functions are common issues affecting older workers. Agriculture work is viewed as a way of life rather than as a profession, and so older workers often continue to work under poor physical and cognitive condition far past retirement age.
Degenerative osteoarthritis (OA) is a common chronic issue of older farmers. It is associated with the aging process and heredity, and exacerbated by long-term heavy workloads. The strenuous requirements of farm work may contribute to the development of OA. Specific risk factors include repeated lifting of heavy weights, kneeling, bending, squatting, long work hours, starting heavy work as a young person and continuing into years well past usual age of retirement (Mitchell et al., 2008)
Older workers farmers are more likely to be on medications to treat chronic or degenerative conditions. Multiple drugs used to treat a wide range of chronic and acute diseases can affect a person's orientation and coordination, which can lead to an increased risk of impaired balance, falls

and motor vehicle collisions. An additional concern with regards to medication is decreased levels of adherence, particularly when there are many different medications prescribed. Lack of adherence to physician recommendations can also increase the likelihood of physiological disturbances that could lead to accidents and injuries.

RECOMMENDATIONS FOR EMPLOYERS

Risk factors often overlap in vulnerable populations and it is important to assess both endogenous and exogenous dimensions, in order to accurately address the full health and safety needs of the employee. While exogenous factors could be more easily ameliorated, since the hazard can simply be removed, endogenous factors are more difficult to address and may require specific work adaptations or recommendations of additional precautions or changes within the agricultural setting. Therefore, it is critical for employers, OSH experts and occupational physicians to be aware of the limitations and barriers a vulnerable employee faces while working in agriculture, in order to minimize occupational risks. Because of the broad spectrum of vulnerabilities a worker can have, it is important for agricultural employers to become well acquainted with the demographics of the population they are working with. Employers could consider some questions which could help them with changing or adapting the working environment in order to promote occupational health and safety standards and practices of their employees. Questions employers can ask themselves include, for example:

- What is the age/sex stratification of the worker population?
- What is the financial situation of this population?
- What are the main countries of origin of the workers?
    - What religion do they practice? Does it affect their daily life in some ways?
    - What is their native language? Do they understand occupational health information?
    - What ideas about health and safety do their cultures possess?
- What type of agricultural work is this population more likely to participate in, according to their demographic characteristics?

It is imperative that employers in agriculture know about the dangers posed by chemicals in the workplace and take the necessary measures to ensure the safe handling of such materials (e.g. purchase and maintenance of proper equipment, adequate storage areas), while also providing the required training to their employees on how to work with these materials (e.g. using equipment, washing clothes/hands properly) and make sure that they follow the safety precautions. This is particularly important when dealing with vulnerable employees, as each population group has specific needs.
Being aware of the cultural and ethnic backgrounds of foreign workers can ameliorate some of the hazards this population faces, particularly when dealing with specific OSH matters. Working alongside a culturally competent OSH expert or physician can help establish good communication between the employer and the workers and reduce safety hazards attributed to this issue. Ensuring adequate housing conditions, while not easy, should be a concern for employers. If an establishment is provided, the employer must ensure that proper hygiene levels are maintained, hazardous materials are not within close proximity, and that facilities (plumbing, heating) are functioning properly.

For minors working or living in the agricultural setting, the most effective interventions is hazard removal and implementing effective supervisory structures. This involves employer and parental education on safety measures for children, or the use of an OSH expert to inspect the farm and

remove as many hazards as possible. Parental modelling of safe farm practices should be emphasized in occupational health policies, as when a parent or guardian is well trained in safety and occupational health, children often follow suit.
Preventive measures for older workers include the addition of short breaks during work and not working when ill, as fatigue and various infections can increase their risk of injury. The vaccination history for older workers farmers should be reviewed to ensure that they are protected against common infections found in the agricultural setting. There should be an emphasis to structure work so that older workers do not work alone, and that a proper communication system be in place (e.g. location and time of the older farmer's work schedule) or a portable communication device (cell phone or two-way radio) to call for assistance should the need arise. Fall prevention measures are also necessary, as older employees face a higher chance or losing their balance due to medication interaction or impaired coordination. These include instructions on safe ladder usage and wearing a safety harness when working on high places, as well as high-quality lighting, especially where there might be trip hazards.

Ultimately, the responsibility lies with the employer to be in close collaboration with OSH experts and occupational physicians, in order to provide the most appropriate working environment for their employees. Be keeping themselves informed and aware on the specific needs of their working population, they will be able to tailor the work environment to address specific issues and barriers that may potentially affect the vulnerable employees.

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CHAPTER 3 – OCCUPATIONAL RISKS IN AGRICULTURE

AIMS OF THE CHAPTER

This Chapter aims to outline the main occupational risks and their impact on accidents and occupational disease for people working in the agricultural sector. It also draws some conclusions from information available at national and EU level.

TRENDS IN EUROPEAN AGRICULTURE

The nature, scale and environment for farming varies considerably throughout Europe as does the complexity of the working methods used. The crops produced and the livestock reared differs from country to country as well as changing over time. The levels and conditions of financial supports to farms varies and continues to change. The farm workforce is changing with increased levels of part time working and fewer workers per farm. The extent and nature of farm mechanisation is also changing, especially as manpower is increasingly replaced by machinery.

The agricultural economy is not confined only to farming – it also includes activities such as fishing and forestry, each of which shares some but differs considerably from farming. However, diversification is a common theme across the sector, with, for example, many farms having added food production facilities, forestry and other economic activities in order to improve the economic viability of farm operations.

The European Commission conduct a farm survey throughout Europe every 4 years. In their latest publication (European Commission, 2015), the radical changes that are taking place within the sector are highlighted (see Table 3.1). The picture that emerges is one of consolidation, with larger farms, more intensive production and fewer workers producing a higher level of economic output.

Table 3.1. Key farm trends in Europe 2010-2013

Indicator	Percentage change	Indicator	Percentage change
Standard output per holding	21.4%	Agricultural land	-0.7%
Agricultural land per holding	12.2%	Livestock units	-3.8%
Livestock units per holding	8.7%	Full time jobs	-4.4%
Full time jobs per holding	8.1%	Number of holdings	-11.5%
		Agricultural workers	-12.8%

Source: (adapted from European Commission, 2015)

Taken together, these factors influence the risks to health and safety not only for agricultural workers, but also for family members, as there is still a large labour input from family members into far operations, while many family farms are also the living space for all family members.

ACCIDENTS AND OCCUPATIONAL DISEASE IN AGRICULTURE

The recording of accidents and occupational diseases differs considerably between countries and it has difficult to obtain a reliable pan-European view of levels and trends (especially in relation to occupational disease). This is true of all economic sectors, but especially the agricultural sector, where enterprises are very small in terms of numbers employed, which typically leads to under-reporting.

Nonetheless, some countries report detailed statistics on fatal and non-fatal accidents in agriculture. Accurate statistics are difficult to find in relation to occupational diseases in the sector.

There are large differences between the member States in relation to the number accidents (fatal and non-fatal). Non-fatal accidents at work in 2014 ranged from 3.6 thousand per 100,000 persons employed in Portugal to 75 per 100,000 persons employed in Romania (Eurostat, 2016). Fatal accidents at work in 2014 ranged from 7.1 deaths per 100,000 persons employed in Romania to 1.0 fatal accidents per 100,000 persons employed in the Netherlands (Eurostat, 2016).

The overall level of fatal accidents in agriculture tends to be very high – in many countries it has the highest rate of any sector. Construction, transportation and storage, manufacturing and agriculture, forestry and fishing have the highest levels of fatal accidents, accounting for 67% of all accidents in the EU in 2014 (Eurostat, 2016).

In Ireland, for example, agriculture has the highest rates of fatal accidents with 23 per 100,000 workers between 2009 and 2015, which is 10 times the average rate across all sectors (Health and Safety Authority, 2016) while the agriculture sector had the second highest rate of non-fatal accidents.

OCCUPATIONAL DISEASES

The data available on occupational diseases in the agriculture sector is much less reliable than is the case for accidents. Whatever the true rate of occurrence of these diseases, much is known about the nature of such diseases (Donham and Thelin, 2016). These authors provide a thorough overview of diseases linked to agricultural work. The Table below highlights some of the main conditions. The diseases and conditions listed in the Table relate not only to specific occupational diseases, but also to commonly occurring general health conditions.

Table 3.2: Occupational diseases associated with agriculture

Type of disease	Conditions
Respiratory system	Bronchitis, asthma like conditions, irritation of upper airways, organic dust toxic syndrome, farmers lung
Skin diseases	Contact dermatitis, sunburn, miliaria rubra, ringworm
Cancer	Increased risk of lymphoma, leukaemia, multiple myeloma and other cancers
Musculoskeletal diseases	Low back pain, degenerative osteoarthritis of the hip and knee, carpal tunnel syndrome
Mental health	Stress related conditions, depression, anxiety

Source: Adapted from Donham and Thelin, 2016

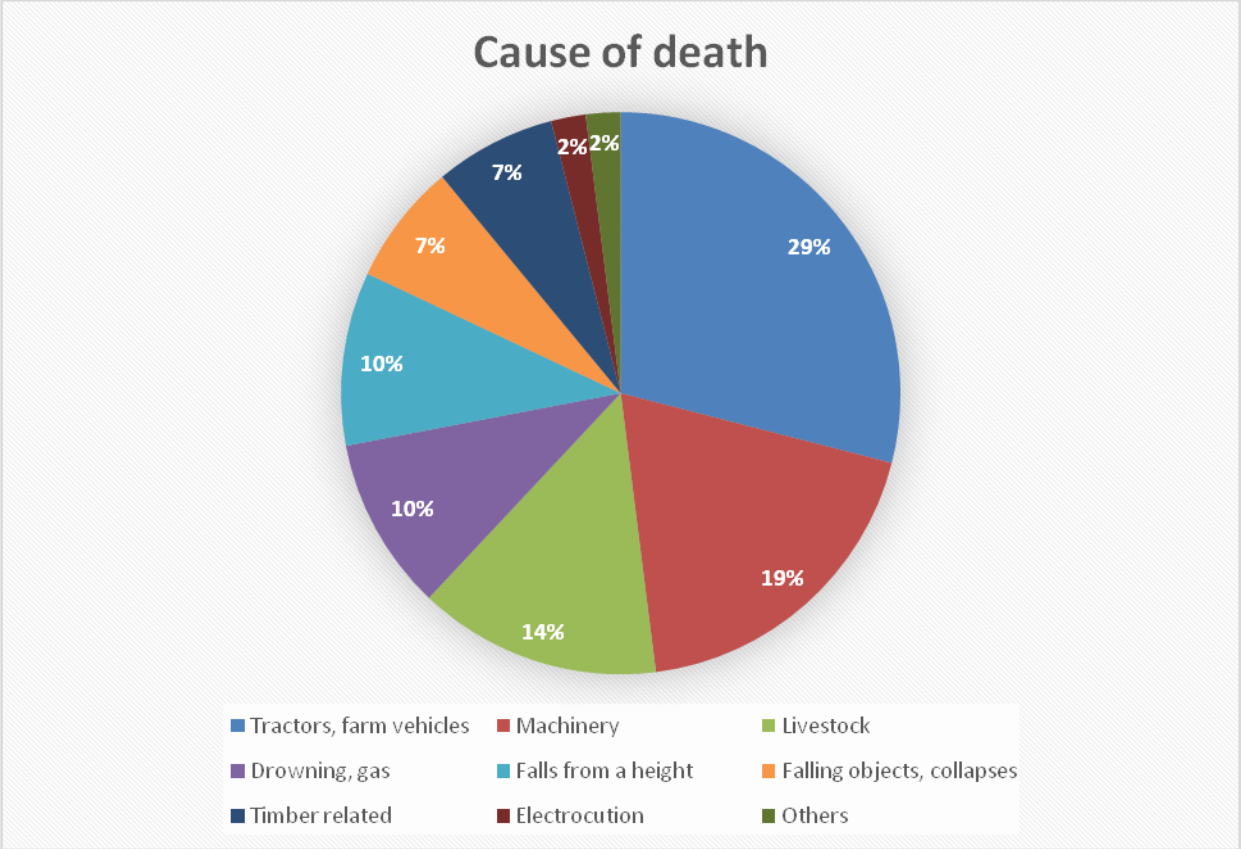
THE CAUSES OF ACCIDENTS AND OCCUPATIONAL DISEASES

Much is known about the causes of accidents – according to the European Commission (European Commission, 2012), the most common causes of deaths in agriculture are:

- Transportation accidents (being run over or overturning of vehicles);
- Falls from height (from trees, through roofs);
- Being struck by falling or moving objects (machinery, buildings, bales, tree trunks);
- Drowning (in water reservoirs, slurry tanks, grain silos);
- Handling livestock (attacked or crushed by animals, zoonotic diseases);
- Contact with machinery (unguarded moving parts);
- Entrapments (under collapsed structures);
- Electricity (electrocutions).

In Ireland, a similar picture emerged in an analysis of accident causes between 2006 and 2015 (see Figure Below).

Figure 3.1. Main causes of death in agriculture in Ireland 2006-2015.



In all 194 deaths in agriculture were notified during the period, with the main causes of death being related to tractors and machinery and other farm vehicles (accounting for 48% of deaths in total). Deaths from accidents with livestock accounted for a further 14% of deaths.
A common way to classify hazards uses the following categories:

- Ergonomic - repetitive movements, lifting incorrectly
- Biological - bacteria, viruses, insects, plants, birds, animals, and humans, etc.

- Psychosocial - stress, tiredness, etc.
- Physical – climate, lighting, noise, etc.
- Chemical - depends on the physical, chemical and toxic properties of the chemical

Ergonomic hazards - Farm work, which involves strenuous physical activities and high levels of manual labour, leads to farm workers being at particular risk of developing MSDs due to ergonomic hazards. (Health and Safety Executive, 2007). Examples of some of the work exposures that farmers face include lifting and carrying heavy loads, working with the trunk frequently flexed, risk of accidents caused by the unpredictable actions of livestock and exposure to vibration from farm vehicles and powered hand tools (Walker-Bone and Palmer, 2002). Farmers are vulnerable to a range of MSDs including: osteoarthritis of the hip and knee, low back pain, upper limb disorders and hand/arm vibration syndrome, as well as to the consequences of trauma such as sprains, fractures and dislocations (Walker-Bone and Palmer, 2002). Musculoskeletal disorders can result in severe long-term pain and suffering for individuals. In addition to their physical effects, they can also lead to further negative consequences such as reduced work ability, lower farm income, poor quality of life, and the onset of other health problems such as stress or depression.

Biological hazards - There are two main groups of biological agents regarded as occupational hazards:

- Allergenic and/or toxic agents forming bio aerosols (bacteria, endotoxin, fungi, mycotoxins, β-glucans, particles of plant and animal origin) causing occupational diseases of the respiratory tract, conjunctiva and skin.
- Agents causing zoonoses and other infectious diseases that could be spread by tick or insect vectors, by the airborne route, by the alimentary route, or immediately by contact with skin (Dutkiewicz et al., 2011).

There are a number of routes of infection for a biological agent. These are ingestion of the agent, inhalation of the agent, entry via mucosal membranes, entry via damaged skin, subcutaneous entry, physical contamination, and transplacentally.
Common zoonotic diseases include cryptosporidiosis, leptospirosis, bovine tuberculosis, salmonella and streptococcus suis. A full list of such diseases can be found in a publication by the European Commission (2012).

Psychosocial hazards - Less is known about the psychosocial hazards associated with agriculture when compared to the other major sources of hazard. However, research has identified number of specific risks, including long working hours, isolation, financial uncertainty, planning difficulties, administrative demands, and the interaction between stress and exposure to multiple physical risks.

Physical hazards are environmental hazards that can cause harm to agriculture employees with or without contact. Examples of physical hazards include: noise and vibration, electricity, heat and cold stress, death and injuries from machinery and animals, falls from a height and solar radiation.

- **Noise and vibration:** Vibrating surfaces are one of the primary sources of noise, and exposures to both types of physical stressors commonly occur.
- **Electricity:** In agriculture electrical accidents occur mainly for the following reasons: plug contains a loose (floating) earth, equipment is connected without using a plug top and/or socket, unsuitable domestic-type plugs and other accessories are used, 'Temporary' joints, both taped and un-taped, are used on extension cables, portable equipment, including infra-red lamps, is connected to lighting circuits.
- **Machinery:** A review published by European Agency for Safety and Health in 2016 found that the highest risk of accidents due to the use of machines or hand tools was found in agriculture. Much machinery in agriculture can become outdated and do not have up-to-

date safety features. Additionally, machinery may not be serviced regularly by qualified mechanics.

- **Animals:** Some agriculture workers will work closely or come in contact with a range of animals as part of their work. Due to their size and unpredictable nature, many fatal and non-fatal injuries are caused by bovine animals. Bulls cause a large number of farm deaths due to livestock accidents. Attacks by recently calved cows are also significant.
- **Falls from height:** The principal risk when working at height is falls, either from ladders, through fragile roofing materials or from unprotected edges of roofs or other structures.
- **Climate:** Climate conditions can amplify existing health and safety issues and can lead to occupational hazards. Examples include exposure to hot and cold environments; air pollution; Climate conditions can affect the prevalence and distribution of vectors, pathogens, hosts and allergens; Extreme weather events can lead to occupational deaths, injuries, diseases and mental stress.

Chemical hazards: Examples of chemical hazard in agriculture include pesticides, herbicides, rodenticides, sheep dips, oils and fuels. Chemical agents can affect workers by inhalation, skin contact, through damaged skin, ingestion, through the placenta or by eye contact. The effects of chemicals can be influenced by a range of factors such as the nature and physical form of the chemical, the route of entry into the body, the mix of substances involved, dosage, exposure and individual factors. The most common substances that pose chemical hazards in agriculture are pesticides, herbicides, rodenticides, sheep dips, oils and fuels.

SUMMARY AND CONCLUSIONS

A number of conclusions can be drawn from this review of the hazards of working in the agricultural sector:

- Farm workplaces are complex work environments for a number of reasons – they often have multiple hazards of different types in significant quantities and they often combine living and working environments for farmers and their families.
- Farm work is intensifying across work, with fewer full-time farmers and farm workers working larger holdings and producing higher farm outputs. in
- The agricultural sector is amongst the most dangerous sectors of the European economy terms of fatal accidents. In some countries such as Ireland, it is the most dangerous, whereas in most others it is amongst the top two or three most dangerous.
- Non-fatal accidents also occur at a very high rate.
- Many occupational diseases are associated with farm work, but are often unreported.
- There is inconsistent reporting of farm accidents between the Member States and this makes it difficult to compare either the rates of accidents or the performance of health and safety systems in agriculture.

Systematic and integrated approaches to risk assessment and prevention are needed in the face of the complex and large health and safety risks in agriculture. These need to be supported by all of the major stakeholders in the sector, including OSH agencies, agricultural organisations, training agencies as well as farmers themselves. Promising approaches exist in a number of countries and these can be adapted and implemented for use throughout the sector in Europe.

RECOMMENDATIONS FOR EMPLOYERS

Obtaining a thorough knowledge of the hazards and risks of the work carried on the farm or in the enterprise is the only sound basis for developing a safe and healthy workplace. Undertaking hazards identification and risk assessment has three main components:

- Technical – This involves a systematic approach to identifying all potential hazards (physical, biological, chemical, and psychosocial) and then performing a risk assessment. In small enterprises and farms, where there may not be the technical knowledge available in-house to perform this task adequately, it is essential to obtain the assistance of qualified people to help with this task. A number of online tools are available to help such as that developed by the Health and Safety Authority in Ireland (Health and Safety Authority, Undated).
- Organisational – this involves taking a systematic approach to the process and producing adequate documentation in order to show that the process is compliant with employer responsibilities and also to provide the basis for the commubnicat9ons that are needed with staff.
- Communications and involvement – involve all staff in the identification and assessment of hazards and risks – the employer will not be effective in undertaking this process on their own. Communicate the results of the hazard identification to all staff using all appropriate means e.g. notices, signs, training, meetings and guidance.

Taking these different elements on board, the following guidance will help to ensure an effective and compliant risk identification process:

1. Use a comprehensive risk assessment tool – A number of risk assessment tools are available that incorporate the hazards identification stage of activities. Obtain advice on which are the best to use that are appropriate to your situation and sector.
2. Take advice where needed – Obtain advice from appropriate sources such as health and safety experts, suppliers of machinery or materials, sectoral agencies, advisers, and so on.
3. Involve workers – ensure that all employees contribute to the process. They are a considerable resource in this regard, as they are the experts on the details of the own work, and are often in a better place to identify hazards than employers or external experts.
4. Communicate results – ensure that all workers, external contractors, visitors to the workplace (and in the case of family farms, all people living on the farm) are aware of the hazards that exist. Use all appropriate and available means of communication to communicate the hazards and risks associated with the work.
5. Identify different classes of hazards – make sure that all relevant types of hazards are identified – physical, chemical, biological, and psychosocial.
6. Ensure that relevant organisational and individual factors are identified. Workplace hazards don't exist in a vacuum – they become evident within the context of a given set of work processes that take place in specific work environments and that are operated by people with their own set of characteristics, habits, training and state of health. All of these can contribute to the amplification or reduction of specific hazards. For example, poorly maintained machinery being operated by fatigued and poorly trained staff pose a much greater risk than situations where this not the case; well ventilated slurry pits pose a different risk when compared to poorly ventilated ones.
7. Provide training where needed staff should be appropriately trained, not only in safe ways of working, but also in relation to the operation of the safety system. This means that they

should understand the process of risk assessment as well as being able to contribute meaningfully to it.

8. Produce a safety statement – different countries have different names for it, but it is essential that the output of the of the hazard identification and risk assessment process is documented in a 'safety statement', i.e. a document that outlines the major hazards within a workplace, their associated risks and the measures that are taken to prevent risks. This is needed not only for compliance with legislation, but as a means of planning the health and safety programme within the workplace.
9. Support industry initiatives – small workplaces can lack the resources to effectively address health and safety issues. The agricultural sector often has active and frequent initiatives that address these issues. Employers should avail of the opportunities to learn and improve that these initiatives provide.

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CHAPTER 4 – OCCUPATIONAL DISEASES IN AGRICULTURE

INTRODUCTION

Agriculture is recognized as one of the three most hazardous sectors of activity (along with construction and mining), in terms of fatalities, injuries and work-related ill-health. The agricultural sector employs an estimated 1.3 billion workers worldwide, i.e. half of the world's labour force (ILO, Agriculture: a hazardous work).
Agricultural workers and farmers work in physically demanding conditions, exposed to the effects of weather, noise, vibrations, dust, and chemicals. They work with potentially dangerous vehicles and machinery, poorly designed tools, livestock, in difficult terrain, at height or near pits and silos. Force, posture, and the repetitive nature of the work cause a range of health problems. Family members are also in many cases exposed to these occupational hazards.
In the International Labour Organisation (ILO) Protocol of 2002 to the Occupational Safety and Health Convention, 1981 (No. 155), the term 'occupational disease' represents any disease contracted as a result of an exposure to risk factors arising from work activity (Article 1 (b) (ILO, List of Occupational Diseases, 2010).
Work is an important determinant of health. It can influence health positively (favourable behaviours, self-esteem, less mortality in comparison with unemployed persons) or negatively (accidents, work related diseases, absenteeism). Health is an important determinant of work, too. A healthy employee works and earn better, is more rapid and attentive at work and has increased productivity.
In agriculture, non-standard employment (NSE) is common, with a high prevalence of categories of work contracts/arrangements that are rare in other sectors - day labourers, migrant workers, temporary jobs, seasonal employment etc. Agriculture is recognized as a low-wage sector (ILO, 2016). Against this background, it is unsurprising that health surveillance and recognition of occupational diseases are deficient; statistical data are poor, making it difficult to analyse and compare countries. To prevent occupational diseases, they must first be recognised and analysed based on reliable statistical data in order to identify and produce a hierarchy of the most important problems to be solved.

THE EUROPEAN REPORTING SYSTEM OF OCCUPATIONAL & WORK-RELATED DISEASES

All illnesses that can be caused, worsened or jointly caused by working conditions are considered work-related diseases. This term can be used to describe not only recognised occupational diseases, but also other health conditions. The working environment and the work process contribute significantly as one of several causative factors for other disorders (Joint ILO/WHO Committee on Occupational Health, 1989; EODS, 2000; Eurostat, 2013).
An occupational disease may be caused by physical, chemical, biological, ergonomic or psychosocial factors at work. Classic occupational diseases are characterised by a clear, often practically mono-causal relation to a specific exposure (van Dijk et al, 2011). Occupational disease is defined by national authorities responsible for recognition of occupational diseases (EU, 2008).
Some examples of occupational diseases in agriculture are:

- farmers' lung, caused by inhaling dust from mouldy hay, straw or grain;
- noise-induced hearing loss, after years of exposure at high levels of noise at the workplace, such as mechanics, tractor drivers, etc;

- asthma or/and allergic rhinitis caused by plants, pollens, animal dander, bee stings or stings from other insects, insect bites, foods, especially nuts and shellfish, chemicals, etc.;
- skin cancer at farmers working with chemicals, mineral oils, with unprotected exposure at sun.

Reportable occupational diseases are diseases defined by national law in national lists. These lists of recognized occupational diseases are the basis for administrative provisions for compensation. Preventive measures are applied on the basis of these lists. The legal reporting process is specific to each country (Nagy and Kudász, 2016). Usually, the occupational diseases lists are open to change, new work-related diseases are diagnosed and recognized, in accordance with new emerging risks that appear at the workplace.

There are two main elements which must be present in the definition of occupational disease, which are common in different countries (ILO, 2010):

- *There is a causal relationship between exposure in a specific working environment or work activity and a specific disease*; it is established on the basis of clinical and/or pathological data, job analysis, professional background and occupational risk factor identification and evaluation, and recognition of the role of other risk factors (ILO, 2010).
- *The disease occurs among the group of exposed persons with a higher frequency* than the average morbidity of the rest of the population, or in other worker populations (ILO, 2010).

The diagnosis of an occupational disease is usually made by an occupational physician. In order to establish the causal relation between the signs and symptoms of the disease and the work exposure, it is essential to take a detailed and accurate occupational history. Its purpose is to identify the possible etiological (causative) factors of the occupational disease at the workplace, the intensity and the duration of this exposure, the circumstances of exposure (failures, accidents, non-use of protective means, indiscipline, incorrect application of procedures, etc.). Taking the occupational history is an important part of the practice of occupational medicine doctors. An accurate health evaluation of the worker is usually correlated with the exposure data in order to decide if the worker is fit to work in specific conditions, or with restrictions, or with measures to adapt the working conditions to the health status of the worker (chronic diseases, invalidity, high predisposition, etc) are necessary.

Table 4.1. Occupational history taking

History element	**Description**
Education, qualification, jobs	Duration, chronological order, noxious/hazards
Workplace and professional activity	Short description of the workplace and of the working conditions, occupational risks, tasks, work organization and working process.Short description of a working day.
Occupational diseases, workplace accidents	Work-related complaints and symptoms at work/linked with work, similar colleague's health problems/ occupational diseases; workplace accidents' circumstances
OSH measures	Engineering/technical (general, local, individual) control, administrative control, medical prophylaxis, including vaccination, workplace health promotion, occupational medicine doctor / nurse at the workplace/assisting the enterprise.

A complete and detailed occupational history can reveal that an illness is "occupational", but a superficial one can lead to confusion and the occupational character of the disease cannot be proved. A misdiagnosis leads to the healing opportunity being lost. In practice, many occupational diseases are not recognized, and are under-reported.
There are a number of typical situations:

- the worker has the illness symptoms, but is not asking for occupational medical advice; there is a lack in his knowledge about the occupational risk and its possible health effects;
- the worker health problem is treated correctly, but the occupation is not recognized as source of the problem;
- some occupational diseases have a long latency period, the disease symptoms occur years after the causative exposure cessation, and the link between occupation and health effects is not recognized;
- some diseases have an asymptomatic evolution and the time of diagnosis is too late to apply efficient measures and treatment.

Work-related diseases have a complex aetiology. They have multiple causal agents, but factors in the work and/or working environment are recognized to play a role in the development of such diseases. Work-related illness does not necessarily refer to recognition by an authority (Nagy and Kudász, 2016). For example, musculoskeletal disorders can have multiple causes.

A more precise distinction between occupational diseases and work-related diseases can be made by occupational health specialists, calculating their attributable fractions (Nagy and Kudász, 2016).

A third group of diseases, with no causal relation with work can also affect working populations. Their evolution can be aggravated by occupational hazards to health (Eurostat 2013). For example, workers with hypertension may be able to control their blood pressure only with difficulty, or may suffer hypertension crises after long hours of physical effort at work, such as in the case of manual handling when shearing sheep on hot summer days.

In the EU context, the approach to Occupational Disease statistics is set out in the EU Regulation (EC) No 1338/2008 on the Community statistics on public health and health and safety at work (The European Parliament and the Council of the European Union, 2008).
Work-related stress and work-related musculoskeletal disorders such as back pain is a major concern in Europe: 37% of workers in the EU report working all or almost all of the time to tight deadlines; 62% carry out repetitive hand or arm movements; and 34% almost always have to work at high speed (Sedlatschek, 2017). Occupational diseases and work accidents cause pain and suffering, family and social disturbances, as well as financial losses.

The economic cost of work-related diseases and injuries is estimated at 3–5% of EU GDP. Occupational disease and work injuries are responsible for about 4,000 avoidable deaths due to accidents and about 160,000 deaths due to work-related illness every year. In recent years occupational accidents have decreased, but this is not the case for work-related illness, such as occupational cancers, mental health problems or musculoskeletal disorders (Sedlatschek, 2017).
In 2007, in Europe there were 20 million cases of non-fatal work-related diseases. 8.6% of workers in the EU-27 experienced a work-related health problem in the past 12 months, which corresponds to 20 million people (Takala, 2014) (see Figure 4.1). The actual costs for prevention activities, such as training OHS, workplace health promotion, recreation and culture, corporate fitness, communication in the EU come to €200bn per year. The costs for early retirement, sick-leave, accidents, permanent disability and presenteeism in the EU come to €3,000bn per year (Takala, 2014).

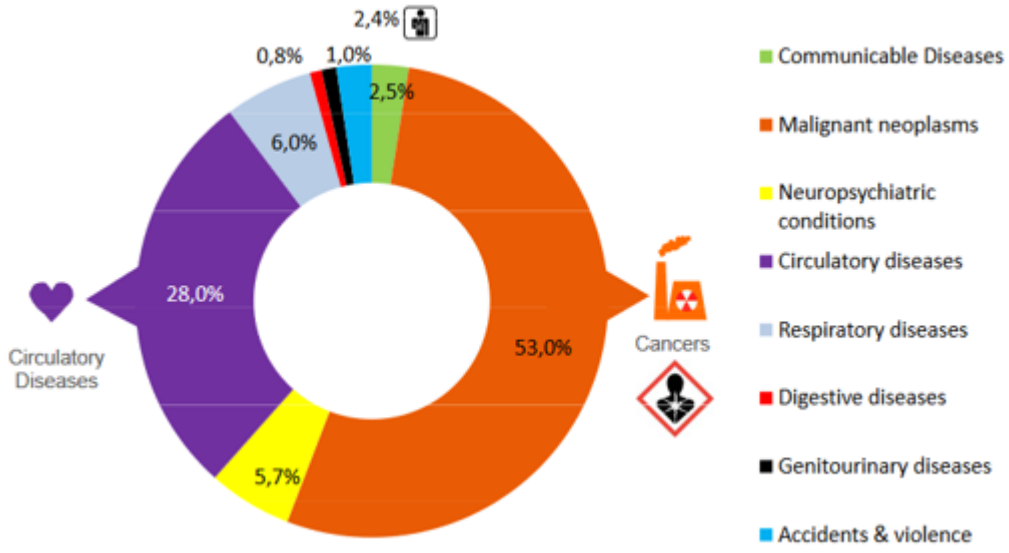

Figure 4.1. Work-related annual deaths caused by illnesses in the EU28

The European Statistics on Occupational Diseases (EODS) system collects statistical data on occupational diseases. The project started in 1995 and the first data collected according to the Phase 1 methodology was ready in the year 2001 (van Dijk et al, 2011).
26 out of 29 EU countries: AT, BE, BG, CY, CZ, DK, EE, FI, FR, DE, GR, HU, IE, IT, LV, LT, MT, NO, PL, PT, RO, SK, SI, ES, CH, UK have a list of occupational diseases (De Norre, 2013)
The degree of comprehensiveness of the lists varies between countries. In many countries, the national list is similar in structure to Annex 1 of the European list[6]. The list of selected diseases uses the ICD-10 International Statistical Classification of Diseases and Related Health Problems (EODS annex with specifications). Article 1 of the Commission Recommendation sets out 10 topics concerning the lists in Annexes I and II, which gave the structure to the reports from each country: recognition, compensation, prevention, target setting, recording and reporting, epidemiology, research, diagnosis, statistics, awareness raising, and Articles 2,3 and 4 add some accompanying rules. Annex I comprise 108 diseases or groups of diseases, divided in five groups according to their causation (chemical exposure, exposure to germs and parasites, physical exposure) or the affected organs (skin, respiratory tract, most of which are related to causative substances). There is a second annex, Annex II comprising 48 diseases or groups of diseases, also divided in five groups; most of them (36) refer to causation by chemical exposure (Eurostat, 2013). A diagnosis of an OD has implications for prevention, health care, and actions for workplaces, industry, worker representatives, for the individual and the treating physician.

Compensation for occupational diseases can be covered by different insurance systems, in line with national legislations (De Norre, 2013). Not all EU countries have a specific compensation system for occupational diseases (23 out of 29). Among these 23 systems there is a great deal of heterogeneity (EUROSTAT, 2010, De Norre, 2013). National compensation schemes require both a well-established causal relationship at a general level and good documentation of the exposure and the disease at individual level (Karjalainen and Virtanen, 1999).

[6]Commission recommendation of 19 September 2003, 2003/670/EC, concerning the European Schedule of Occupational Diseases

There are also large differences in recording systems, in their management (insurance organisation, Ministry, other organisations), in the reporting criteria used, and in their objectives (compensation, statistics, risk and prevention) (De Norre, 2013). Given this diversity, it is hard to compare statistics between countries and even within some countries (De Norre, 2013).
With the exception of Bulgaria, all the countries (BE, CY, CZ, DK, EE, FI, FR, GR, HU, IS, IT, LV, LT, MT, NO, RO, SI, SK, ES, SE, CH, UK) recognise or do not rule out (AT, DE, IE, PL, PT) a problem of under-reporting of occupational diseases (De Norre, 2013).
The complex pattern of national systems is illustrated in the diagram (Figure 4.2).

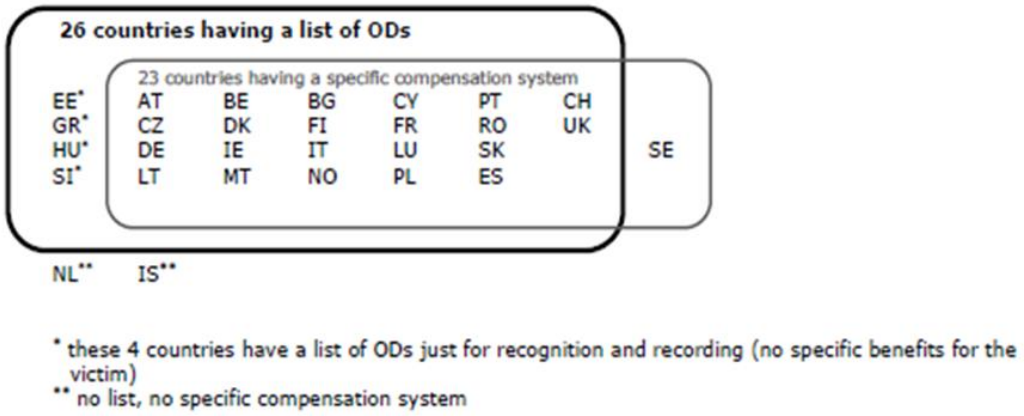

Figure 4.2. National systems of recognizing and compensating occupational diseases

There are variations in concepts, using different terms, such as 'recognized cases' or 'reported cases'. Under-reporting of occupational diseases is a consequence of variations in reporting practices and in recognition systems, starting with the content of national lists and with the recognition criteria (considering, or not, the intensity of exposure) (De Norre, 2013). A country's economic activities (agriculture, industry, services) determine the number and the type of the reported and recognized occupational diseases (De Norre, 2013).

The main occupational diseases or risks covered by quantified national objectives with a view to reducing the rates of recognized occupational illnesses, (whether quantified or not), are:

- musculoskeletal disorders (DK, FR, DE, IS, SK, GR, HU);
- hazardous substances (FR, IT, GR, HU, PL);
- noise (DK, GR, HU);
- asbestos (FR, GR);
- respiratory and skin allergies (PL, DE);
- psychosocial disorders (DE, DK, IS, HU, PL);
- work-related health hazards (DE).

In conclusion, there is no single system of reporting occupational diseases common to all EU countries. This makes it difficult to analyse and compare occupational morbidity data. Available data show that Member States use different definitions and lists for reporting and compensating occupational diseases. Occupational diseases are under-reported, especially in the new Member States.
In agriculture, occupational diseases are under-reported and not recognized in all countries. Possible causes are the poor coverage of OH services, the form of employment and, sometimes, the low level of awareness of workers, who are not covered by an occupational health service or physician.

OCCUPATIONAL DISEASE DATA IN AGROSH+ COUNTRIES

A brief analysis of occupational diseases in the project countries shows different systems of recognizing and reporting these illnesses (See Tables 4.2 and 4.3).

Table 4.2. National definitions of Occupational Disease (OD) and Work-Related Disease (WRD)

Bulgaria	Occupational disease (OD) is defined as a disease which appears only as a result of harmful factors in the working environment or working processes and is included in the list of Occupational diseases
Greece	Occupational disease is the acute or chronic poisoning or illness of the employee where: a) They have been employed for a minimum working time or employed in any of the following undertakings, professions or occupations for a period of at least equal time to that for the appearance an illness specified in a table. b) an assault has been medically diagnosed, either during his or her employment, after the expiry of the above-mentioned period, or, interrupted, within the sickness period defined in the time table following the pause of employment.
Ireland	In Ireland, there is a list of 'prescribed diseases' that are linked to occupation – these should be reported by physicians to the public health authorities. However, there is no widely applied definition of occupational diseases. Currently, the Health and Safety Authority is collaborating in a Eurostat project to define a common European set of occupational diseases. There is no definition provided by the Health and Safety Authority of WRDs, though they do collect data through the Quarterly National Household Survey (formerly the Labour Force Survey) on 'work related ill health'. This uses a self-definition of the concept (illnesses or disabilities that you have experienced that you believe were caused by or made worse by work)
Romania	Occupational disease is defined as an illness resulting from the exercise of a profession or is caused by physical, chemical or biological agents in the workplace and the overworking of the bodily organs or systems during the work process. WRD are multifactorial diseases, where some determinants are of an occupational nature.

Table 4.3. List of occupational diseases in AGROSH+ countries

Bulgaria	There is an original reportable list of ODs. It is based on national legislation as a procedure for recognising of Occupational disease, and as a regulation for information, registration, confirmation, appeal and annual analyses of Occupational disease.
Greece	The EU list was adopted by Presidential decree 41 FEK91 A (19.4.2012)[7]
Ireland	There is no definitive list currently, but the HSA are taking part in an EU project to define a common list. There is a list of prescribed diseases which include some that are related to occupation that are supposed to be (but not always) reported to public health authorities.
Romania	There is a reportable list of ODs, the Occupational Disease Table with Mandatory Declaration. This list has been introduced and modified later through legislation[8]

[7]'National list of occupational diseases in accordance to the recommendation of the Commission of European Union2003/670/19.09.2003, 'about the European list of occupational diseases' (EE L 238/25.09.2003)'

[8] Law on safety and health at work no. 319/2006 (framework directive);

THE MOST PREVALENT OCCUPATIONAL DISEASES IN AGRICULTURE

Epidemiological studies show that agricultural workers suffer most from musculoskeletal disorders; respiratory diseases; pesticide-related illnesses; noise induced hearing loss, and cancer (Fathallah, 2010). There are common health problems in all the agriculture sectors, like musculoskeletal disorders, respiratory sufferings, and diseases that can be find useful in some specific sectors, like zoonoses in zootechny, noise induced hearing loss in mechanical activities, like forestry.

FARMING

The most commonly studied contaminants in agriculture are pesticides and fertilizers (nitrogen, phosphorus), organic compounds (manure contaminated with pharmaceutical substances), degreasers, toxins, additives to animal feeds (trace elements Na, K, Cu, Zn), and heavy metals (mercury, arsenic, lead, cadmium). In farming activities are used agrochemicals such as pesticides and fertilizers, nanoparticles, other chemicals that can affect the respiratory tract of the workers. Air pollutants effects can occur in specific activities:

- Preparing land and harvesting; the machines generate dust (exposure to organic and inorganic dust);
- Machinery and equipment maintenance exposes workers to mineral oil substances and to combustion products;
- Spreading pesticides and fertilizers;
- Handling and storing seeds;
- Animals care works and cleaning of their shelters;

In regular farm activities workers are exposed to pollen and other seasonal allergens; organic dust, from cereals or other crops or of bacterial origin (spores, bacteria, endotoxins); dust mites, animals and their products (hair, urine, faeces); gas and fumes: from mud/manure and fertilizers (carbon dioxide, ammonia, methane, hydrogen sulphide), from silos (carbon dioxide, nitric dioxide), exhaust fumes, welding fumes; chemical substances: pesticides (insecticides, herbicides, fungicides), disinfectants, paints, and infectious agents (bacteria, virus, parasites, protozoa).

Allergic respiratory sufferings affect more and more workers. Rhinitis is defined as irritation and inflammation of the mucous membrane inside the nose. Common symptoms which appear after months or even years after the start of exposure include: rhinorrhoea, sneezing, nasal obstruction, and nasal pruritus. 9-42% of the global population is affected, as a consequence of pollution and

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government decision no. 1425/2006 - methodological norm (of 11/10/2006) on the application of the provisions of the law on safety and health at work no. 319/2006;
Government decision no. 955 of 8 september 2010 amending and supplementing the methodological norms for the application of the provisions of the law on safety and health at work no. 319/2006, approved by the government decision no. 1425/2006;
Order no. 1256/443 of july 7, 2008 for the approval of the component and attributions of the commission of occupational medicine experts accredited by the ministry of public health and by the ministry of labour, family and equal opportunities;
Law no.346 / 2002 on insurance against accidents at work and occupational diseases - amended and completed;
Order no.553 / 2002 for the approval of the methodological norms regarding the establishment in 2003 of the Initial Fund for the functioning of the insurance system for accidents at work and occupational diseases

modern life. It is induced by occupational risk factors, which usually also cause asthma. Occupational rhinitis is caused by constant exposure to substances at the workplace (pollens, powders, detergents, etc.). One important element is that symptoms reduce (at least in the first years after the onset of the disease) at the weekend and during vacations. Occupational rhinitis is often associated with asthma, skin diseases, throat and eye inflammatory suffering. Occupational rhinitis usually precedes the development of occupational bronchial asthma. Early diagnosis and changing the workplace needed to avoid the aggravation of the disease and the development of bronchial asthma.

Occupational asthma is one of the most frequent occupational diseases, with significant changes of health status and entailing high costs. There are more than 250 agents that may be involved in the aetiology of occupational asthma in the rural environment, for example wood dust, cleaning substances, animal proteins and enzymes, plant proteins – flour, cereal dust, rubber, leather, talc powder, bacteria, fungi, insects, pesticides, isocyanides and metals. The duration of exposure is the main factor in the development of occupational asthma (18 months to 5 years). The affected worker can fully recover if exposure is not prolonged. Short-term exposure (under 6 months) can accidentally cause an exacerbation of asthma, especially in workers with a predisposition.

A disease showing the connection between exposure to organic dust and respiratory ailments is *farmers' lung* (extrinsic allergic alveolitis). The factors that cause the disease, in various degrees, are external (allergens) and body factors such as the host's health, age, smoking history.

Chronic obstructive pulmonary disease is an association of symptoms (such as cough and sputum production), with smoking being the most frequently involved etiological factor. When a non-smoker develops the disease, the most likely causes are irritants in occupational or environmental exposure. A higher prevalence has been associated with people working with animals, harvesting hay, working on mixed farms, milling, fertilization, silo work, the use of pesticides and in those with a history of smoking and in older people.

Lung cancer is usually found quite late in its development which is why the rate of mortality is quite high. Most cases are reported in smokers (10% of them are diagnosed with lung cancer). In 10% of those suffering from lung cancer elements of occupational or recreational exposure to potential pathogens can be identified. There are studies showing a high risk of developing lung cancer in workers who spread pesticides, particularly Diazinon (Jones et al, 2015).

Pleural mesothelioma is a malignant tumour that affects the pleura, usually as a side effect of exposure to asbestos (especially crocidolite). Latency can be of up to 40 years. In most countries in Europe, the use of asbestos was banned in the early 1990s. However, people are still exposed to asbestos in the rural environment, as asbestos may be present in roofs, or pipes.

Toxic materials are chemical substances or mixtures that may cause harm to an individual if it enters into the body. The route of exposure can be inhalation (most common), skin contact (through unprotected skin), and ingestion (e.g., eating food or smoking a cigarette using contaminated hands.
A wide range of chemical substances are used to combat and control pests. They are generally called pesticides, and include insecticides, herbicides, fungicides, bactericides, and acaricides whose toxic mechanisms or long-term side effects are still unknown. Since acute intoxication is rare, occurring accidentally or intentionally for criminal or suicidal purposes, discussions are currently focused on the cumulative effect of such substances on human health, especially the threat posed by organophosphates, carbamates and pyrethroids (US EPA, 2016).

The main categories of chemical agents used in EU are Organophosphate compounds, Carbamates and dithiocarbamates, Synthetic pyrethroids, Urea derivatives, Phthalimides, Triazoles and imidazoles, Quinazolines, Copper and compounds, Aluminium derivatives, Sulphur products, and 2,4-Dichlorophenoxyacetic acid and derivatives.

Organophosphates and heavy metals (aluminium) are neurotoxins with selective targets. Aluminium, for instance, is involved in Alzheimer's disease. Acute poisoning may occur in the case of exposure to organophosphates, aluminium phosphate and carbamates, while pyrethroids are known to cause respiratory and skin problems. The organs that are mainly affected by pesticides are the skin, the lungs and the central nervous system, and chronic effects are mainly respiratory (bronchial asthma) and neurological diseases, diseases of the reproductive system, as well as cancer (Das Rupali et al, 2004).

Biocides are a wide range of chemical substances used for disinfection, to kill 'organisms of concern' e.g., microorganisms, algae, molluscs, and rodents. The risk of exposure to such substances appears usually in zootechnics, but also in animal feed and cereal storage, agriculture settings and buildings.

Recently, new contaminants have been considered such as pharmaceuticals, steroids, drug-resistant genes, prion proteins, but their environmental impact is as yet unknown. These chemical substances are generated by man-made activities, from animals fed with processed food, hormones or drugs, from plant protection products, and from the cultivation of exotic/invasive species (genetically modified organisms) which destroy natural species and alter the balance of the ecosystem. The threat to human health comes from the growing concentration of such substances in drinking water, wastewater and soil.

Agrochemicals used in agriculture requires rigorous control to prevent possible health consequences for employers, workers and the general population. One of the long-term health effects is *cancer* (Gunderson et al, 2011). Organophosphate insecticide exposure is associated with different cancers, leukaemia, non-Hodgkins lymphoma, soft tissue sarcoma, pancreatic cancer and genitourinary tumours. Pesticides can also contribute to lung and thyroid cancer (Gunderson et al, 2011; Donham & Thelin, 2016).

Nanomaterials have begun to be used in agriculture, especially for plant protection and production. Preliminary studies show the potential of nanomaterials to improve seed germination and growth, plant protection, pathogen detection, and pesticide/herbicide residue detection (Nagy and Kudász, 2016). Long-term animal studies, performed with nanostructured carbon black, aluminium oxide, aluminium silicate, titanium dioxide (hydrophilic and hydrophobic) and amorphous silicon dioxide resulted in tumours (EU-OSHA, 2009).
Also, at risk are workers in pesticide production plants, farmers and agricultural workers; staff working in greenhouses, orchards and vegetable plots; gardeners; maintenance workers, and people involved in disinfection, wood preservation, the handling of treated wood.

Data regarding the incidence of *cardiovascular diseases (CVDs)* in farmers are contradictory, however, and recent data shows a higher incidence of CVDs in this specific population. A Greek study showed that the incidence of hypertension and other cardiovascular diseases was higher in farmers than in non-farmers. (Desmos, 2016). An Irish study showed that 83% of farmers had at least 4 risk factors for CVDs, 46% of them being hypertensive (van Doorn, 2017).
The main risk factors for CVDs in the farming population are the aging of the agricultural workforce; smoking and alcohol consumption; dyslipidaemia; obesity; high levels of physical effort; temperature

and microclimate variations; low socioeconomic status and stress; noise, vibrations, long hours of work; and comorbidities (particularly Diabetes mellitus).

Hypertension is both a disease and risk factor for other cardiovascular diseases. Its incidence in the farming population is rising with greater age, decaying health, and increased number of risk factors, and is greater than the non-farming population. Farmers are exposed to a greater risk of developing coronary artery disease due to increasingly unhealthy lifestyles. Peripheral vascular diseases can have a high socioeconomic impact through pain and discomfort and must be recognized and treated adequately.

Certain plants may cause either chronic systemic toxicity through phytotherapy which is a traditional practice in the rural environment, or skin toxicity. Even if certain plants have therapeutic properties, nevertheless they can be toxic because of their active principles (e.g., alkaloids), impurities or contaminants (such as heavy metals), and they can contaminate harvests by themselves, as happened in India and Afghanistan.
Certain plants used in horticulture such as Leander (Nerium oleander) or yew (Taxus genus) can produce cardiac effects. The main pathology seen in horticulture is irritant or allergic dermatitis.
Skin contact with chemicals and plants or prolonged exposure to ultraviolet radiation (sunlight) can have dermatological effects such as irritant and/or allergic contact dermatitis, sun-induced dermatitis, burns, melanoma and skin cancer.

Contact dermatitis of the hands is the most common occupational skin disease. Any substance (including water after long term exposure) has a potential to cause skin irritation. The main irritants are: soaps/detergents, acids/alkalis, organic solvents, metalworking fluids. A single exposure to a strong irritant might be sufficient. The main allergens are: chromate, epoxy resins, biocides, fragrances, formaldehyde, rubber chemicals, and methacrylate. Contact eczema in some tulip, narcissus and hyacinth cultivators during harvesting, sorting or packaging bulbs is called ‘tulip finger’.

Cancers are a large group of diseases that can affect any part of the body. It consists in a sum of heterogeneous diseases having different forms. For each of them are necessary a specific diagnostic and a specific management of the case. Other common terms used are neoplasms and malignant tumours (WHO, 2017). Cancers are caused by carcinogens, which are chemical, physical or biological agents (van Dijk et al, 2014). Risk factors or conditions that could cause cancer or contribute to its development, include physical, biological, organisational, and psychosocial factors (Nagy and Kudász, 2016). The most frequent risk factors agricultural workers are exposed to are pesticides, biological agents (hepatitis, Helicobacter Pillory, mycotoxins), endocrine disruptors, nanomaterials, work organisational factors, sedentary work, and atypical working time.

Shift work and night work are associated with negative consequences for health and well-being, such as increased risk of cardiovascular disease, fatigue, reduction in the quantity and quality of sleep, anxiety, depression, gastrointestinal disorders, increased risk of miscarriage, low birth weight and premature birth, and cancer (Harrington, 2001). Exposure to light at night has been suggested as a contributing cause of breast cancer (Nagy and Kudász, 2016).
Currently, cancer determine 53% of occupational work-related annual deaths (see Figure 3XX). Every year some 102,500 people die in the EU as a consequence of occupational cancer (EU Commission, 2017) (see Figure 4.3).

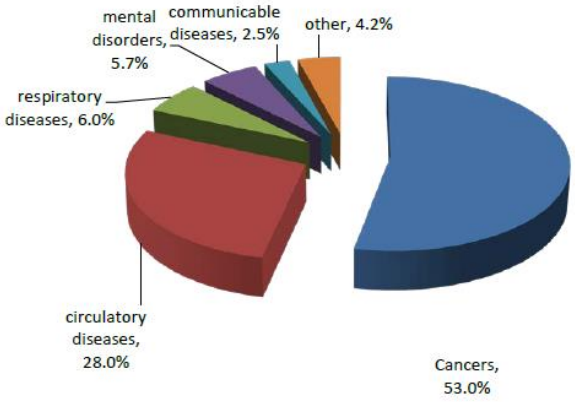

Figure 4.3. Work-related annual deaths in the EU28 and other developed countries

THE COMMON HEALTH PROBLEMS IN AGRICULTURE

The European Union's social partners in agriculture, EFFAT and GEOPA-COPA made an Agreement in October 2004 on the reduction of workers' exposure to the risk of work-related musculoskeletal disorders (EU Report on the current situation in relation to occupational diseases' systems in EU Member States, 2013). Musculoskeletal disorders are a group of troubles that affect the articulations of the human body. They continue to be a significant hazard for rural workers, respectively the most frequent injury caused by physical jobs. Different studies, national and international, confirm that farming is a physically demanding occupation with work tasks that can cause MSDs (e.g. Osborne et al, 2010).

The most common reported musculoskeletal disorders among agricultural workers, caused or aggravated by poor ergonomic working conditions, long working days, and heavy workloads are low back pain and degenerative osteoarthritis of the hip and knee (Donham and Thelin, 2016).
Back pain and the majority of work-related upper limb disorders are categorised as non-specific and episodic. They have different forms of manifestation, with periods of intense discomfort and incapacity. The ability of the individual worker to carry out his work can be affected. Many persons with these conditions, especially back pain, never seek treatment and most recover on their own (Bevan et al, 2009) (see Figure 4.4).

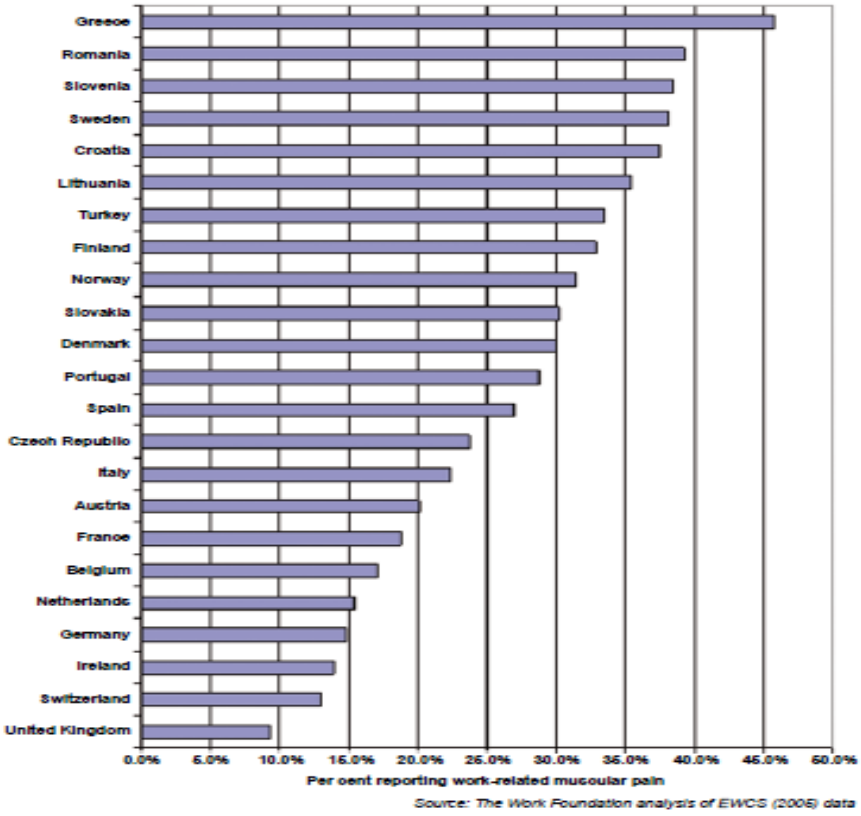

Figure 4.4. Work-related muscular pain – self-reports from European workers

The effects of pain from MSDs can impact on work performance in terms of stamina and resilience, cognitive capacity or concentration, rationality/mood, fatigue, mobility and/or agility.

Agricultural workers are frequently exposed to loud noises produced by mobile machinery such as tractors, harvesters, tools and other work equipment, and animals. Repeated exposure to intense noise can cause permanent hearing loss and tinnitus, especially by the age of 30. Noise may lead to auditory impacts (such as tinnitus, acoustic trauma, or NIHL), and non-auditory effects such as sleep disturbances, general effects (cardiovascular, metabolic changes), and behavioural impacts.

Usually, noise and vibration occur together. Agricultural workers are at particular risk of vibration. 38% of all workers exposed to vibrations work in agriculture, according to Eurofound's fourth European working conditions survey (EWCS, 2016; EU-OSHA, 2008). They are exposed to both whole-body vibrations (produced by tractors and self-propelled farm machines such as harvesters and mowers) and to hand-arm vibrations. The health effects induced by vibration are discomfort, and acute or chronic illness that involve the internal organs, the musculoskeletal system, the kidneys and the circulatory system. Exposure to hand/arm vibration through powered hand tools, such as chainsaws, brush cutters or grinders can cause nerve, muscle, joint and vascular damage (white finger syndrome) (Government of Nova Scotia (2014).

Workers in agriculture are the group with the highest risk for prolonged sun exposure. It can cause skin erythema (redness) and skin cancer. Professionals who are at risk of developing skin cancers as a result of chronic sun exposure include farmers, horticulturists, fisheries and forest workers, especially those with fair skin and light or ginger hair, who are not using appropriate protective equipment.

Physical and manual work can lead to corns and calluses, fissures and profound wounds among agriculture employees and can often become infected.

FORESTRY (SILVICULTURE)

Forestry workers are exposed to long hours, including night shifts face a multiplicity of risk factors that can lead to severe accidents and occupational diseases. Ground workers (e.g. offsiders, choker setters and log graders) and machine operators (e.g. harvesters, forwarders, truck drivers) are exposed to intense noise that can lead to noise induced hearing loss. Years ago, forestry workers did not use hearing personal protectors.
Heavy physical effort, body position, long-term repeated movements, hazardous manual handling, forces, vibrations, bad weather (extreme heat, cold or wet weather) are conditions for musculoskeletal disorders, that affect the majority of woodcutters operating chain-saws (70% of such workers) and more than 60% of other loggers. Degenerative diseases of the spinal column were very frequent, independent of the type of activity in forestry.
Wild animals in the vicinity, contaminated drinking water sources and the absence of proper hand washing facilities are factors that can cause infectious diseases, such as rabies, tetanus, Lyme disease, acute diarrhoea and others.

APICULTURE

Beekeepers also are subject to some characteristic risks: all bee keepers will eventually receive a bee sting. The normal reaction is local pain for a few minutes and some local swelling for a day or two. Some persons can be sensitive to stings and can develop an allergy to bee stings that can become a generalised rash or an anaphylactic shock with risk to life.
A considerable amount of lifting is necessary in beekeeping and some beekeepers suffer back injuries. Hives with two or more boxes, with some stored honey, will weigh more than 32kg. Frequently beekeepers have to handle the hives on their own many times per day.

AQUACULTURE AND FISHERIES

High levels of occupational risks (e.g. physical (injuries), chemical risks (burns, irritations, allergies), and biological hazards (parasites, diseases) are faced by aquaculture and fisheries.
Feed mill workers can be exposed to excessive noise and can develop noise induced hearing loss and mental fatigue. Feed mill workers are at risk of developing occupational asthma and rhinitis.
Stings from fish spines can arise during fish handling without appropriate safety devices. They may cause severe pain and can result to tetanus infection or whitlows. Hatchery workers are also exposed to the risk of needle stick injury which can open a gateway to many viruses and other diseases.

Snake bites, crab clawing and bites from fish (e.g. tiger fish, snappers) are hazards prevalent in rural fish farming that can affect workers in earthen pond fish farms, especially when they are not using appropriate protective gear.

Inorganic fertilizers are used extensively in enriching fish ponds (e.g. lime, pesticides and formaldehyde). Some of these are caustic and can cause skin irritation resulting in severe cases of

occupational dermatitis and severe burns. Inhalation of laboratory chemicals may lead to respiratory ailments such as bronchitis, rhinitis and asthma.

Waterway pollution with pesticides, oil spills, and other xenobiotics can pollute ponds and water sources which can also pose risks for workers that work in such farms.

Flocculants (e.g. aluminium sulfate (alum), calcium sulphate (gypsum)), disinfectants used to disinfect equipment and holding units (e.g. formalin hypochlorite), fumes, smoke and soot are recognized as serious health risks, associated with asthma, cancer and other serious ailments.
Biological risks come from different pathogens (e.g. vibrio, fungal, parasitic infestation and pathogenic infections).
In the marine environment, warm water and nitrogen can cause blooms of marine algae. The eutrophication of water is the accumulation of nutrients from the release of uneaten food, faeces and metabolites that damage the water column and generate unwanted algae. These include two groups - dinoflagellates and diatoms and both of these can release toxins that can affect workers.

CONCLUSIONS

Agriculture is a very complex field of activity, with multiple occupational risks, differing with the sub-sector, region, culture, tradition, and national aspects. Ergonomic problems, physical and psychological demands, chemicals and dusts, biological risks, individually or together, can affect the health status and the life of the agricultural workers. The risk of accidents and occupational diseases is very high in agriculture. In these circumstances, a good risk management, starting with risk recognizing and evaluation is the key of preventing these events.
A safe and healthy working environment for agricultural workers is essential to maintaining agriculture as an attractive sector for workers, and hence for the competitiveness of the sector (EU Report on the current situation in relation to occupational diseases' systems in EU Member States, 2013).
The priorities in the prevention of ODs are MSDs, hazardous substances/asbestos, psychological risks, nanotechnology, emerging/new occupational risks (pesticides, nanoparticles, and shift and night work).

RECOMMENDATIONS

Some practical recommendations for agriculture employers include:

- Risk identification and management (see the Risk chapter);
- Improving working conditions and their control;
- Providing workers with accurate and complete information about the risk and its consequences, including the first signs of poisoning, disease and the seriousness of the illness;
- Good working practices, including the proper use of personal protective equipment;
- Risk cessation/the elimination of risk factors as early as possible after the onset of the disease (it can help in treatment and to prevent illness of other workers);
- Providing agricultural workers with occupational medicine services and occupational health problem-oriented advices, in according with occupational exposure and the complaints of the workers;

- Properly conducted medical examinations before and during work, to determine whether the worker is "fit for work", to recognize counter-indications; to identify specific symptoms and to adapt or change the workplace;
- Smoking cessation is paramount for reducing the impact of a multitude of health problems, such as all cardiovascular diseases, respiratory illnesses and cancers.
- Limiting or excluding intense physical effort and adapting workload can lead to lower cardiovascular strain and musculoskeletal diseases for workers with cardiovascular disease conditions.
- Treatment of patients working in agriculture should be adequately explained and closely supervised.
- Farmers are often isolated while working, and may be a long distance from emergency services. In the case of cardiac arrest, it is important to train all farm employees/family members how to perform CPR.

Workplace health promotion programs can improve workers health status and change lifestyle. They must be adapted to the workers priorities: BMI control (normal values, 18.5-24.9 kg/m^2); reducing salt intake (<5 g/day) for CVD; reducing alcohol intake (20-30g/day in men, 10-20g/day in women); reducing fat intake, smoking cessation, regular physical activity (2.5-5 hours of moderate vigorous activity/week) for sedentary persons; benefits of correct PPE use (e.g. earmuffs or earplugs in noise exposure, adequate respirators and masks in respiratory exposure, proper gloves in pesticide, vibration, cold exposures), personal correct hygiene, understanding of the benefits of medical periodical checks, importance of knowing and respecting OSH rules and legislation.
Workers who have suffered work-related cancer and allergies must be protected from re-exposure to the same risks or other carcinogens/allergens. Special measures must be taken, such as workplace adaptations and protective equipment.
Following injury or disease, working conditions must be adapted to the physical and psychological abilities of the workers. In particular, the first days after return to work are crucial for the workers' health evolution and occupational future. Enterprises should be prepared to adapt working conditions to specific conditions at an early stage or they should offer a new, protected workplace if the old one remains dangerous.
It is necessary to educate agricultural workers, the stakeholders involved in agriculture and the general population in the rural environment about occupational risks, early detection of their consequences, the importance of the medical screening and the need for proper protection, including workplace health promotion. For these actions, employers understanding and collaboration is essential.

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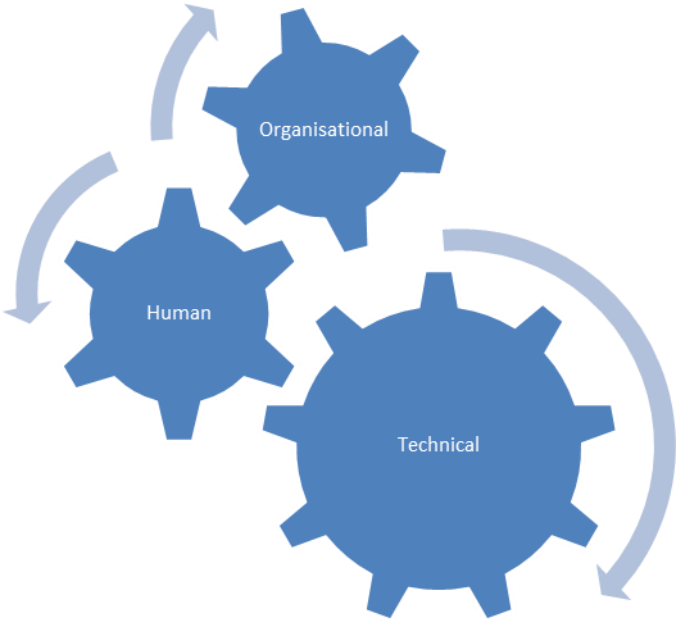
CHAPTER 5 – OSH PREVENTION AND PROTECTION ACTIVITIES FOR THE AGRICULTURE SECTOR

INTRODUCTION

The purpose of this chapter is to introduce the strategic, technical, and organisational aspects of effective prevention measures. It also aims to promote an understanding of the context within which corrective actions are to be decided upon, and to provide some practical examples of potential solutions to real health and safety issues.



There are 3 important elements to tackling H&S issues in the agricultural sector (Hämäläinen, et al, 2006):

Organisational

State Agencies have an important role to fulfil when tackling safety prevention. They have the function of guiding, developing, and then communicating performance and recent developments, and general awareness within the sector. There are significant gaps between countries in terms of the organisations responsible for this area and the performance levels that they oversee. With the introduction of the new Member States, there needs to be a period of transition, where Government organisations, industry organisations and entire sectors appreciate the new standards of reporting and ultimately the performance that is required. Each state has its own context of existing regulations, reporting system s and monitoring systems to be accommodated when taking on these new standards. An example of this is the entry of Eastern European Member States, who have a significant high labour/low technical starting point, when compared to Member States from Northern Europe (Thompson, 2016). Other organisational aspects of relevance are the safety culture within the individual organisation, and the need for agricultural organisations to participate and help shape future requirements.

Human

Human behaviour has a significant impact on safety performance, and the labour market within the agricultural industry has a number of unique characteristics that can have a significant adverse effect on safety performance. Certain agricultural sectors have a high reliance on transitory labour during peak harvesting periods, sometimes with a higher emphasis on obtaining labour supply rather than ensuring that the levels of training or competence are adequate.

The labour force also contains a higher than normal proportion of workers aged over 65, which have a specific risk profile for undertaking manual work, and use of equipment. There is also a heavy reliance on the 'family' being the core source of labour availability and the pressures of conforming to normal commercial structures and chain of command. In addition, the existence of commercial property and personal property on farms adds to the complexity within many sectors.

Technical

Technical issues relate to the physical plant and equipment and to the software used to drive equipment. In addition, it refers to the recent growth in electronic media sources such as social media and material available on the internet (e.g. Avvo, 2018). This is one area, where significant improvements have been made in plant design to reduce harmful events such as fatal or non-fatal accidents, yet there still remains significant scope for further development and deployment across the sectors for new technology, and the use of social medial/internet for improved communication, participation, awareness, and risk reduction.

RISK ASSESSMENT

The complexity and interaction of technical, human and organisational factors requires that a structured approach is taken to the management of health and safety risk. The most significant tools that can assist in risk management is the risk assessment process and tools.

These tools help list the hazards present in a workplace and will help prioritise the levels of risk associated with these hazards. It also form the basis for developing a program of corrective actions to make the workplace safer. Risk assessment tools are available from European organisations (e.g. Palmerk, 2016), through State Agencies (e.g. HSE, 2016), through industry specific support groups (trade or labour based) (e.g. Health and Safety Authority, 2017), or even private commercial organisations or individuals. An example of the priority of risks would be the event of falling from a hay barn roof which could be scored as a 25, whereas the risk of injury from strawberry tray transfer could be scored at 16. Both high scores require action, but the fall from roof corrective actions should be completed ahead of any others in this example.

FROM RISK ASSESSMENT TO PREVENTION

The output of a risk assessment is a list of potential corrective actions that are required. Alternatively, open ended questions which need answers that ensure the correct actions are put in place are a legitimate output. There are also different choices available in which to tackle a hazard. The 'best fit' choice is one where the best possible action is implemented, while not burdening the organisation beyond its capacity, ensuring that the corrective action has real and measurable outcomes, and is one that the workforce adopts and becomes standard practice. There are many of examples where tools and equipment to improve safety have been purchased and the workforce never uses them, as they do not reduce the original risk, take too long to use, or introduce new risks and where supervision agrees with the workforce.

The Table below demonstrates the decision to be taken when considering the risk. The preferred option should always be to eliminate the risk, with the last option being that of introducing and solely relying on Personal Protective Equipment to control the risk.

Table 5.1. The hierarchy of controls

Strategy	Example
Elimination	• Most effective method of prevention • Physically remove hazard • Hardest to achieve
Substitution	• Second most effective prevention • Physically change hazard to a safer alternative • Change Powder to liquid
Engineering controls	• Commonest starting point for risk assessment • Isolation between the hazard & workforce through use of barriers or equipment
Administrative controls	• Looks at how workforce interaction is arranged: operating procedures/rules • Effective training & awareness : changing behaviours
Personal protective equipment (PPE)	• Least effective, but most frequently used tactic • Reliant on individual to make themselves safer • Short term relief, reliant on strong supervision

PREVENTATIVE MEASURES

Table 5.2 is designed to highlight the links between a specific hazard, its risk group and the possible preventative measures that may be taken. It demonstrates the full hierarchy of controls being considered, along with analysing the risk originating from one of the top 5 causes of accidents. These examples and solutions are not exhaustive, and may not be the best fit depending on the level of risk and the organisation. This is where external or additional support may be useful, as a single individual may not be best placed to decide. In practice, the risk assessment process is reliant on the involvement of groups of employees and perhaps others. The collaborative approach should continue especially when dealing with complex or challenging hazards.

Table 5.2. Hazards, Risks and Preventative measures

HAZARD	RISK	PREVENTION	HIERARCHY
Risk of falling out of tractor when moving from field to field	Transportation / Machinery Contact / Crushing	• Fit safety belt/harness to all vehicles. • Training & Awareness on use of new safety device • On the spot inspection on new measure in use	Engineering Control & Administrative Control
Contact on Public Highway with Farm vehicle	Transportation / Machinery Contact / Crushing	• Audible/Visual signage at entry points to highway. • Drivers with Public license only allowed on highway. • Inspection of road bound vehicles [lights] • Use of Radio/Phone	Engineering Control & Administrative Control
Dust release from fertilizer bag when diluting	Biological exposure	• Review chemicals with supplier & switch all powder products to either liquid or solid • Purchase LEV Booth for dilution task • Purchase Respiratory equipment along with Gloves, apron, Glasses	Substitution/Engineering Controls, PPE
Falling off hay barn roof	Fall from Height	• Investigate the hire or purchase of drone for repair inspection tasks through farm. • Discuss with local emergency services rescue provision • Purchase and complete training on fall arrest equipment • Barrier off work area & provide 2nd person	Elimination, Engineering Controls, Administrative Controls, PPE
Manually lifting strawberry tray onto van	Manual Handling	• Investigate switching to smaller tray with lighter load • Fit lifting platform into collection areas • Provide improved lifting training • Allow 'Micro breaks'& encourage stretching exercises	Engineering Control, Administrative control.
Contact point between Vehicle & Workers	Transportation / Contact Machinery	• Create barrier 'drop off' zones where only vehicles are allowed, or pedestrian allowed at specific times: No Go zones for pedestrians	Substitution/Engineering Controls/Administrative Controls/PPE

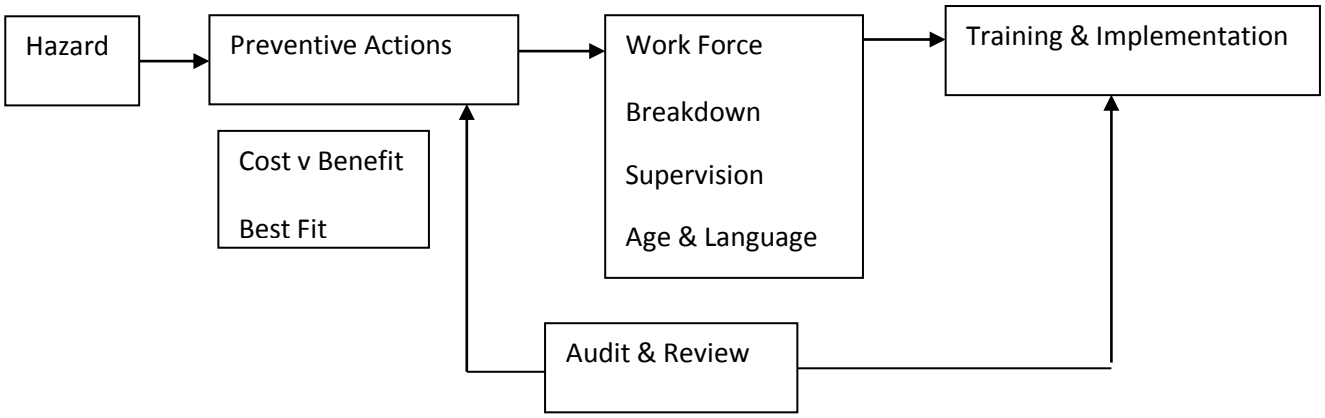
HAZARD	RISK	PREVENTION	HIERARCHY
		• Create walkway for pedestrians • Install audio alarms onto vehicles • Change type of vehicle used (e.g. pedestrian pallet truck instead of fork lift) • High visibility jackets & Safety boots worn	
Entry into grain silo to carry out repair	Confined space/Drowning/Lone working	• Discussion with local emergency services or contract specialist • Provision of correct & appropriate rescue equipment • Selection, awareness, & training provided given circumstances & task at hand	Engineering Controls / Administrative Controls
Repair to fish farm netting in situ	Drowning/Entanglement	• Task to be performed during daylight hours in good climatic conditions only. • Appropriate rescue personnel & equipment in use. • Selection, awareness, & Training provided given circumstances & task at hand	Engineering Controls / Administrative Controls
Risk of crushing from cattle	Husbandry/Crushing	• Isolation holding pens, stockade equipment • Use of hand tools/sticks • Appropriate selection , training & awareness of risks with workforce • Available local communication devices • Safety shoes & impact resistance clothing	Engineering Controls / Administrative Controls, PPE
Jammed equipment	Entanglement / Contact Machinery	• Equipment fitted with E stops • Isolation process clearly understood (ways of working), signs & training. • Use of appropriate stop sticks/wedges • Available local communication devices • Cut resistant gloves, local lighting	Engineering Controls / Administrative Controls, PPE
Exposure to long summer	Biological exposure	• Erection of screening from sun (fixed/mobile)	Engineering Controls /

HAZARD	RISK	PREVENTION	HIERARCHY
weather		• Provision of protective clothing (hats with neck covers, glasses, long sleeved shirts) • Use of sun creams • Regular medical checks & further awareness • Switch to night time working hours	Administrative controls/ PPE
Lone working	Fatigue	• Manual log sheet & communication device with regular contact required • Reduced hours/task rotation • Restricted tasks allowed to be completed	Administrative Controls
Poor posture when harvesting apples	Muscular Skeletal	• Mechanical equipment available for harvesting (crop type, environment, cost issues) • Manual tools (sticks, scissors, stilts) made available; team lifting training • Design crops to grow in particular shape/position to make easier harvesting	Engineering Controls / PPE
Labor force of mixed language	Communication	• Use of on line translation software for written or video material from manufacturers • Use of another employee to coach or train • Use of diagrammatic material • Restricted task training until competency demonstrated.	Administrative Controls
High levels of olderlder workforce	Fatigue	• Increased level of eye & hearing inspections • Restricted tasks when related to physical strength work • Closer level of supervision & clear instructions	Administrative Controls

RECOMMENDATIONS

Undertake a risk assessment - The starting point for all good health and safety practice is Risk Assessment. Ensure that an assessment is in place (carried out within the last 12months). If this has not been done, make a positive plan to complete one. Make sure to include other employees in the process.

The diagram below (Figure 5.1) illustrates the risk assessment process together with the main factors to be considered when undertaking the risk assessment. Its stages are identifying a hazard, developing preventative measures that reflect the workforce, the level of supervision required to implement them along with any barriers, the suitability of the measures for the business in terms of cost and resources required, and how are workers to be trained and how are they to be implemented consistently. The final piece is checking that the measures are in place and that reduced risk actually results.



Communicate the risk assessment – Ensure that the risk assessment known to all of the workforce. This can be communicated in many ways, e.g. face to face meetings, training courses or electronic and social media.

Get advice when needed - If unsure about how to undertake a risk assessment get advice from external organisations. Seek guidance from official sources on the how to do a risk assessment and look for other related assessments already completed that may help in the process.

Risk assessments can take time – Completing a risk assessment can take a lot of time. Completing an effective assessment involves visiting each part of the operation, asking questions of workers on potential hazards and solutions to them. This may take a number of sessions but will provide an accurate picture of the risks and priority list of preventative actions.

Use existing resources - for example, on line assessment forms, guidance materials on use of tractors, chain saws and other equipment, use manufacturers training material as part of training. Contact industry trade representatives to ask for information, and use other guidance information. In the UK there are Approved Codes of Practice - which provide step by step guides on most aspects and sub sectors of agriculture (e.g. Health and Safety Authority, 2017).

Link to working methods and processes - Link Risk Assessment information to ways of working, to any training, briefings and general staff awareness actions. Training should be recorded (and signed by attendees), and should move towards competency based training with end test/assessment to

demonstrate learning. Consider using staff to help deliver the training – there may be hidden talent amongst them and it will help improve compliance.

Acknowledge workplace demography – take into account the composition of your workforce, e.g. young (under 18years of age), children (under 14), older (over 60) or migratory labour and develop ways of working to address their special needs. This may involve, for example, translating material into their native language, using manufacturer materials in their language, assigning work of a less physical nature.

Work with other organisations - Participate in sectoral prevention or improvement programs (IOSH, 2018) run nationally, as the information is freely available, general enough for all to understand, and starts to build up reference material and improved knowledge for all.

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ANNEX 1
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