

## **Ageing workers and agricultural machineries: safety problems**

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### **Abstract**

Concerning the farm labour force, 14.7 million persons were working regularly on the 6.6 million agricultural holdings and actually more than half of the holders in EU-27 is older than 55 years. In Italy in 2003 the 40% of the agricultural holders were older than 65 years.

From the occupational safety and health point of view, agriculture has been recognized as one of the most hazardous occupations and in a context where an high percentage of all farm operators are 65 years of age or older, age becomes a serious factor when considering potential risk for injuries among this population.

The fatal injuries caused by machines for the class age >65 in Italy in the period 2000-2006 are the 34,3% of the total to demonstrate how more dangerous is the factor ‘machine’ for the aged farmers. Among all the machines, the tractor is the main responsible of all the injuries type also for the older farmers: rollover accidents, collision accidents, striking stationary objects and being struck by moving tractors are a concern to agricultural workers in general and when the physiological responses and the body movements are slower as in the advanced age, many accident situations may become fatal.

Older farmers do often use old tractors, purchased 20-30 years ago, before the European Directives obliged manufacturers to adopt the basic safety requirements for tractors and agricultural machines. Because of their machines age, senior operators have less safety equipment installed on their tractors: they have fewer ROPS, emblems, working lights, power take-off (PTO) master shields, communication devices, and safety decals installed.

**Keywords:** ageing workers, agriculture, safety, injury.

### **Introduction**

To correctly analyze the problem concerning old agricultural workers, it is important to clarify both the terms ‘old workers’ and the physical ‘agricultural’ context where these people work.

Although the current definition of “older” workers is 55-64 years of age, if the socio-economic or policy circumstances change in the near future, a re-definition of “older” worker may need to be expanded to include those 55-70 years of age, in order for the definition to accurately reflect the realities of “older workers” . This is the usual situation in agriculture, whereas it doesn’t really exist a retirement age: unlike the rest of the population, farmers tend to remain in farming beyond the normal retirement age. It is not surprising to see farmers in their 70s still farming full time. In a survey conducted in Illinois, farmers in 13 regions were twice as likely to continue working beyond age of 65 as their cohorts in other jobs and the average age was 73 (Sofranko, 2000). Other researches in Kentucky and Iowa found that only farmers with

severe physical limitations had completely retired from physical farm labour (Reed and Claunch, 1998).

The physical work environment is important for any worker in the workplace, but perhaps none more so than for older agricultural workers. It is known that normal and pathological changes affect the bones and muscles of older workers, thereby reducing their maximum physical performance. The consequences are particularly damaging for those workers whose jobs require sustained, concentrated, intense efforts (e.g. long periods of time stooping, bending, stretching or moving heavy materials as in agricultural and forestry works). Noise and vibrations also may not be well tolerated by older workers, and the combined effects of such poor physical conditions can be experienced in a multiplicative, rather than additive, manner by these workers. Concerning agriculture, another serious problem arises, that is the higher probability for older workers to be exposed to injuries, more often fatal, because these workers continue often to perform the same tasks they performed in the past, without taking into account that their physical attitudes are limited and they often use obsolete machineries. Concerning the tractor accidents, the major risks are due to transversal and longitudinal roll-over, caused by an excessive load (both mounted and trailed implement), by sudden machine movements and by high soil slope. The Italian law with the D.Lgs. 359/99 obliges to adequate work tools at the minimum safety level requirements (and the point 1.3 of the attached XV underlines the necessity to limit the risks of machine roll-over using the ROPS – Roll Over Protection Structure and the safety belts). Moreover, the D.P.R. 459/96 obliges manufacturers to sell operating machines with the safety devices installed and tested, but more than one million operating working machines in agriculture are more than 12 years old and these machines are more present in farms where holders are not so young.

### *Old farmers in Europe*

Considering the farm holder as the natural or legal person responsible for the farm, in 2003 about 5 million of agricultural holdings were operating in EU-15, almost half a million less than in 1999/2000 (Eurostat, 2004). In the new Member States the number of agricultural holdings was 1.5 million with a similar downwards trend.

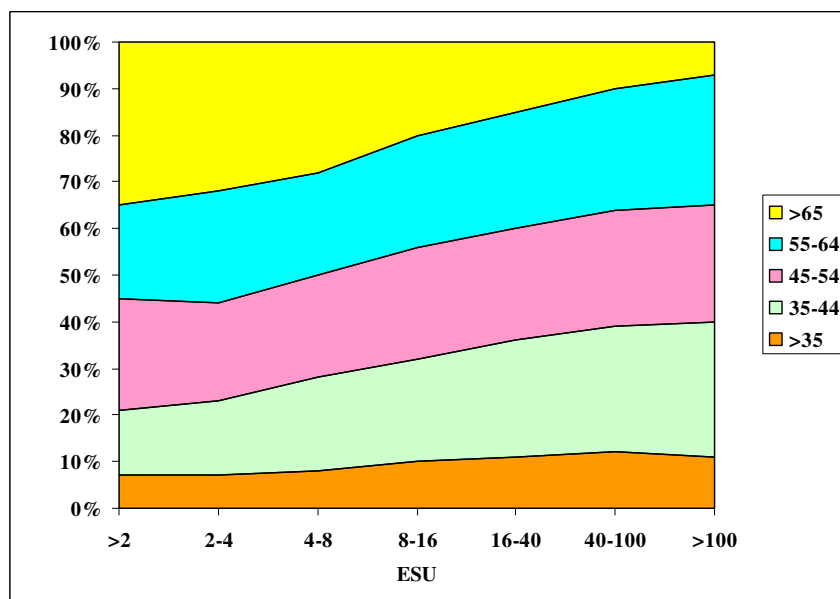
The greatest number of agricultural holdings is found in Italy, where in 2003 about 1,426,000 holdings were counted: different is the situation concerning the agricultural area, which is largest in France (about 28 millions of hectare), Spain and Germany. With its 12,676,000 ha of agricultural area, the agricultural area per holding in Italy is about 8.9 ha, one of the lowest value in the EU-25, where the average agricultural area per holding is around 20-40 ha.

The latest farm structure survey results, for 2003, indicate that the majority of European holdings are still relatively small in size, with 45% of all holdings using less than 5 hectares of agricultural area. The highest shares, in the total number of holdings, of holdings smaller than 5 ha, is found in Malta (97%) and in Cyprus (80%), followed by Greece (70%), Italy and Portugal (both 69%).

Concerning the farm labour force, 14.7 million persons were working regularly on the 6.6 million agricultural holdings and actually more than half of the holders in EU-27 is older than 55 years. In Italy in 2003 the 40% of the agricultural holders were older than 65 years.

While a larger share of older operators has long characterized European agriculture, there is evidence that the number of younger persons entering in farming is decreasing.

Moreover, in both the old and the new Member States the age structure of the holders, according to the farm size, is similar: the share of holders older than 65 decreasing with an increase in the economic size of the holdings. As showed in figure 1, an high number of old farmers works in farms with a low income and normally these are also little farms, with a low agricultural area. In this context also the agricultural machinery is poor, obsolete (it is normal to find in little farms tractors older than 30 years) and often in a bad maintenance situation, without the simplest protection tools.



**Figure 1. Age structure of agricultural holders by ESU (European Size Unit: 1 ESU is equal to 1200 euro of standard gross margin)**

## Materials and methods

In order to understand the actual safety situation for aged farmers, the recent literature has been referred and both European and Italian Agricultural data and Health and Safety data bases have been analyzed. Moreover, concerning old agricultural machines, the European and Italian laws have been analysed.

## Results

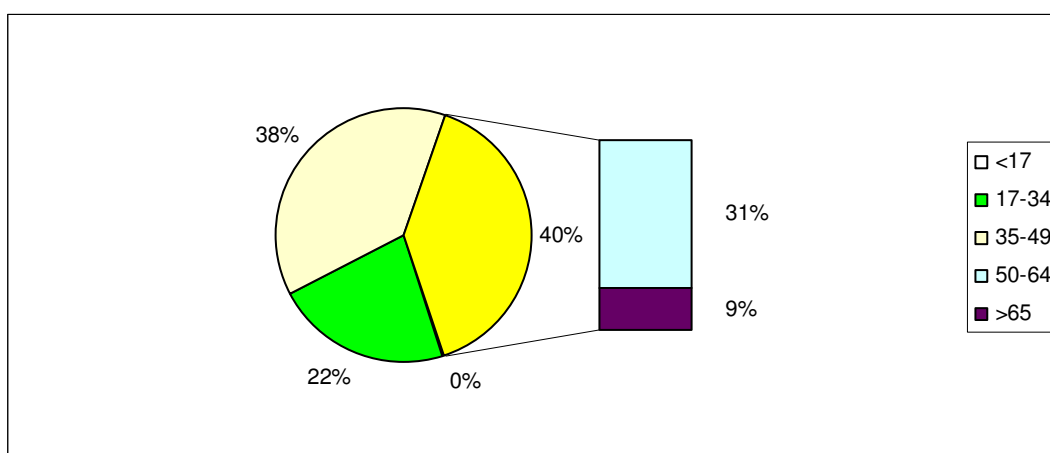
### The problem of the old farmers' risks in the agricultural works: the machine factor

Agriculture has been recognized as one of the most hazardous occupations and in a context where an high percentage of all farm operators are 65 years of age or older, age becomes a serious factor when considering potential risk for injuries among this population. Because no mandatory retirement age exists for older farmers, many of them may continue to perform some tasks beyond their ability to safely accomplish their work. Unlike the rest of the population, farmers tend to remain in farming beyond the normal retirement age.

For this reason, farmers routinely work beyond the standard retirement age and frequently farm to an advanced age. As self-employed workers, farmers can continue to farm - often at a reduced scale – after reaching the age at which wage and salary earners have retired. Thus, at a time of physical diminishment, older farmers face increased vulnerability to injuries and illness and may continue to perform tasks beyond their ability to safely accomplish the work.

Older farmers have been said to be a special population that needs recognition and attention. However, with few exceptions, older farmers, to date, have been largely underrepresented in research efforts related to farm health and safety.

In Italy, considering the INAIL data for the period 2004-2006 (figure 2) it is possible to see the accidents rate in agriculture grouped by class age, where the class >50 reports the 40% of the total declared injuries and the workers older than 65 are 9%.



**Figure 2. Distribution of the injuries declared in the agricultural sector in Italy in the period 2004-2006 by age groups (source: INAIL)**

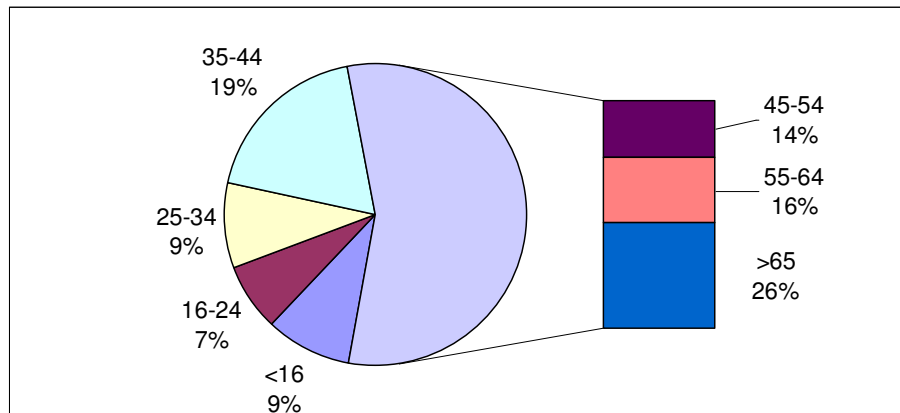
From a general point of view, in agriculture it does not seem that older workers are more exposed to risks than the others, but the situation changes if fatal injuries are considered.

In Great Britain, the Health and Safety Executive in 2005 (HSE, 2005) reported the fatal injury distribution as represented in the figure 3, where it is evident the high percentage of fatal accidents occurred to the older farmers. In another survey of the HSE, concerning the period 1996-2006, the three main causes of fatal injuries to workers in the agricultural sector over these years were detected:

- transport - being struck by a moving vehicle (25%);
- falls from a height (17%);
- struck by moving or falling objects (16%).

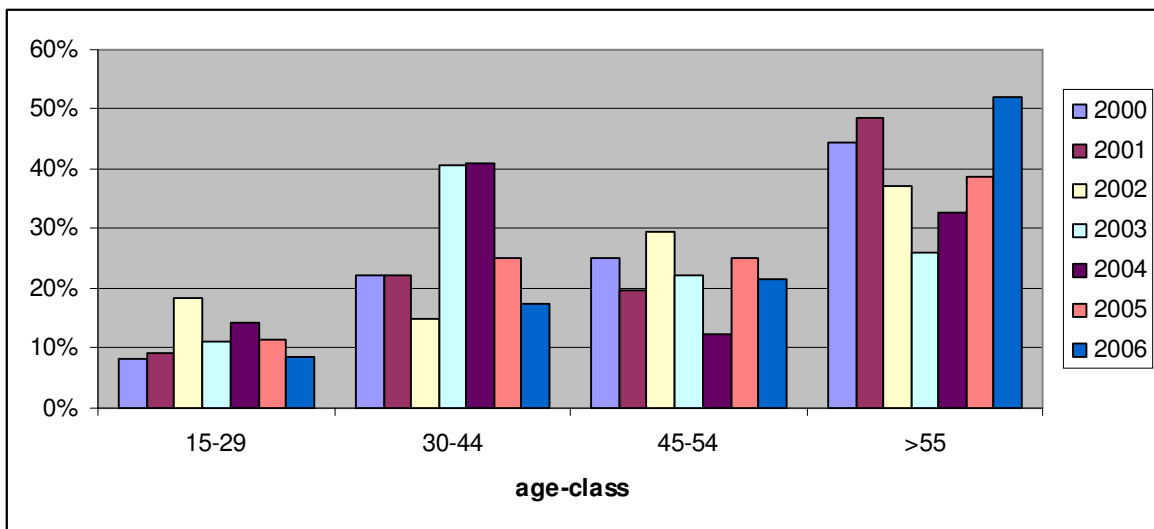
At the end, from the HSE surveys, it comes out that older farmers are more exposed to fatal injuries and the ‘machine’ factor is quite high.

In Italy, INAIL (Istituto NAzionale Infortuni sul Lavoro) data concerning injuries in agriculture demonstrate that the tractor is the unique responsible of 10% of injuries and it is the 35% cause of fatal injuries. The injury cause represented by machines amount to the 17% of the total and the tractor is the second cause after the soil.



**Figure 3. Fatal injuries rates in Great Britain by age groups in 2005 (source: HSE)**

Using the ISPESL (Istituto Superiore per la Prevenzione E la Sicurezza del Lavoro) data base, it is then been possible to analyze the situation in Italy for the period 2000-2006, concerning the fatal injures caused by machines in agriculture, by age class (figure 4).



**Figure 4. Fatal injuries caused by machines in agriculture in the period 2000-2006 in Italy by age group**

The highest incident rate is represented by the age older than 55 and this trend is increasing in the last years (starting from 2003): only in 2006 the number of fatal injuries caused by machines for this class of age has been the highest respect the sum of all the others (52% of the total).

Considering the class >65, it is then possible to compare the fatal injures caused by machines for this class age with the class >55 (table 1): also in this case in the last years (2005 and 2006) the number of injuries for the oldest workers increased.

**Table 1. Fatal injuries caused by machines in agriculture in the period 2000-2006 in Italy for the >55 and >65 class age**

	2000	2001	2002	2003	2004	2005	2006
>55	48	37	10	7	16	17	12
>65	23	10	3	4	4	9	7

The fatal injuries caused by machines for the class age >65 in the period 2000-2006 are the 34,3% of the total (60 fatal injures caused by machines with a total of 175) to demonstrate how more dangerous is the factor 'machine' for the older workers also in Italy.

Among all the machines, the tractor is the main responsible of all the injuries type also for the older farmers: rollover accidents, collision accidents, striking stationary objects and being struck by moving tractors are a concern to agricultural workers in general and when the physiological responses and the body movements are slower as in the advanced age, many accident situations may become fatal.

From the American literature, in the last 10-15 years one in nine farmers aged 55 and older had been involved in a tractor rollover (Janicak, 2000). In Pennsylvania more than 40% of farm fatalities at the end of nineties involved victims 65 years of age or older and two-thirds of farm fatalities involving farmers older than 65 were tractor related, with a large majority involving an overturn. One Canadian study, addressing work-related mortality in older farmers, found that older farmers died while performing tasks common to general farm work, that most were owner-operators, and that many were working alone at the time of death (Hernandez-Peck, 2001). Focus group research in Kentucky and Iowa (Reed, 1998) found that "only farmers with severe physical limitations had completely retired from physical farm labour." Tasks involving heavy lifting, climbing, and repetitive motion cease when physical limitations precluded their completion without excessive pain and machinery assisted work, especially tractor driving, continued.

There are a number of conditions frequently associated with age (i.e., arthritis, limited vision and hearing, depression) that potentially make the demands of daily farming extremely dangerous for the older farmer. Nonetheless, in many situations older farmers have been described as unwilling to recognize or accept their physical limitations (Whitman and Field, 1995).

#### Risk evaluation for old farmers in the tractor use

Also if older farmers may use their experience, competence to judge, sense of responsibility and steadiness, on the other hand they must face with the decrease of muscle strength, sight, speed of perception and hearing, all conditions which may become fatal in some circumstances. The most dangerous situation during the tractor driving are: loose of control and of front adhesion, wheelie, lateral skidding, lateral overturning, rolling. As a consequence, operator damages are due to tractor falling, crushing, collision with external obstacles, collision with the tractor structure. Responsible key points of the injuries are the tractor characteristic, the soil condition, the way the machine is driven, the operating connected machine characteristic and the work to be done.

The tractor overturning risk is one of the most dangerous one and it may be caused by many environmental factors, such as soil slope and soil sinking, but also by human factors as wrong operating machines connection, unbalanced charge, high speeds, especially in turns and over sloped soils. The previous circumstances become worst if the tractor is not in a good maintenance

condition or if changes are made to the machine, such as mass distribution modification or protective equipment elimination (because: '... they slow the working activities').

Older farmers do often use old tractors, purchased 20-30 years ago, before the European Directives obliged manufacturers to adopt the basic safety requirements for tractors and agricultural machines. In a Finnish study, of the overturned tractors, 84% did not have a safety cab and in cases evidence demonstrated that a safety cab or simply a ROPS with a seatbelt could have saved the victim's life (Rissanen and Taatola, 2003).

Unfortunately, the implementation of safety procedures and the installation, use, and maintenance of protective equipment over old agricultural machines is generally a matter of individual choice for the majority of farmers. Because of their machines age, senior operators have less safety equipment installed on their tractors: they have fewer ROPS, emblems, working lights, power take-off (PTO) master shields, communication devices, and safety decals installed.

Also if perceived risk levels are highest among the senior farmers, however, tractor-related hazards such as riding on the tractor drawbar and operating without ROPS are considered by many old farmers as a moderate risks (Whitman and Field, 1995). Another question is the economic factor: in an American survey, though a large percentage of the senior respondents (88%) considered ROPS to be effective in preventing serious injuries and fatalities from tractor overturns, only 26% expressed the belief that the safety benefits of ROPS outweighed the costs of installing the device (Whitman and Field, 1994).

Moreover, another important tool is the seat belts, which protects the driver not only when the tractor overturns (restraining the driver within the survival volume), but also when it is involved in a head-on collision on the road (Molari and Rondelli, 2007).

In this situation, whereas there is a deficiency of the basic safety devices, is quite unrealistic to propose electronic control for the machine stability: electronic systems are important tools at the condition that basic safety supports are guaranteed. In this last case, may electronic support senior farmers' work? The switch from 'mechanic' to 'electronic' does not seem to be appreciated by aged workers, unless they were used to electronic devices when they were younger: it is not simple to assign to a 'cable' a work perceived as human driven for an entire life. Moreover, focusing on the reasons that aged farmers continue to engage in physical farm labours, it was found that they first relinquished mental tasks, such as computerized records and design of new farm programs (Reed, 1998).

Another aspect which must not be undervalued for the senior worker is the access system to the driving seat: because the injury 'fall from the height' is present in the 27% of the injury causes in agriculture, it is important to guarantee a safety access to the driving seat of the tractor. The stair must not be too much high from the soil, handholds must be present and the stairs must prevent the risk of slipping.

## **Conclusions**

Senior farmers, like most agricultural workers, are at risk of sustaining serious tractor and machinery-related injuries. Aged operators, however, may be at additional risk due to normal physical and sensory deficits associated with aging. Evidence also indicates older farmers often do not recognize, or do not acknowledge, that they are susceptible to serious injury (Ambe and Murphy, 1995). A review of agricultural safety programming reveals that relatively few resources target the older farm population. A need exists for intervention efforts geared toward enhancing

awareness of tractor and machinery-related hazards, fostering positive attitudes concerning injury prevention strategies, and encouraging safer work practices among senior farmers.

Guidelines free downloadable by Internet are nowadays available in Italy (for example at the ISPESL website) to adapt old machines and old tractors with the elementary safety devices: engineering approaches such as ROPS, seatbelts and slow-moving vehicle signs can be effective in rollover, fall-off and rear-end accidents. But engineering interventions can not entirely eliminate machine-related hazards, particularly if there is no enforcement of their use: the challenge posed to agricultural safety professionals, therefore, is to develop injury intervention programs that more effectively encourage and reinforce the voluntary adoption of safe work behaviours and practices among farmers, especially using the intervention of other farmers who can witness the safety devices effectiveness (Witte et al., 1993). Thirty-five years ago, Simonds (Simonds, 1973) wrote:

“The mass media can be effective in giving individuals correct knowledge, but personal contacts, especially those that reach individuals in small groups, help actualize the next step by providing the setting and stimulation for individuals to change old health practices or to adopt new ones. Believing that the mass media alone can do the job...is very unrealistic and simplistic...”

The economic aspect is also important: it is true that aged farmers who work in little farms have less economic chances, for example to buy new machines, but the cost to make a tractor safer, for example, with a ROPS, a new seat with seat belt, suitable access systems, PTO and hot surfaces protection, is not too high (1800 euros as average estimation), an amount a lot inferior at the human life value.

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