



# Making occupational health and safety training relevant for farmers: Evaluation of an introductory course in occupational health and safety in Norway



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## ABSTRACT

Agriculture is a hazardous industry, with a high frequency of injuries. As agriculture is an industry mostly consisting of small enterprises, it may be difficult to prevent injuries. In Norway, an OHS course is available for farmers. This study aims to evaluate this course. The evaluation is a prospective exploratory case study evaluation using qualitative interviews. The results suggest that there was not an increase in use and understanding of OHS systems, despite being the aim of the course. The farmers easily absorbed the practical part of the course, getting solutions and ideas for practical risk prevention at own farm. However, using systems adjusted to farm characteristics required external, face-to-face practical involvement at the farm. The study revealed that the course design was not optimal for farmers, as it addressed the farmers as managers, requiring an understanding of theory, while farmers mainly understand their occupation as practical. The course design should be reconsidered to integrate farmers' daily practices.

## 1. Introduction

Agriculture is a hazardous industry, with a high frequency of injuries (Jadhav et al., 2015; Jadhav et al., 2016). Thus, efforts to reduce injuries are needed. In the European Union (EU), agriculture mostly consists of small enterprises or family farms, where 77% of the agricultural labor force in 2013 consisted of sole holders or other family members (Eurostat, 2016). In the US, 88% of all farms in 2012 were small family farms (USDA, 2015). In Norway, with 41,800 registered agricultural holdings in 2015, the labor input was estimated at 45,900 man years (64% farmers and spouses, 10% family members, 4% independent companies, and 22% employees or temporary hired help) (Statistics Norway, 2016). Contextual factors make occupational health and safety (OHS) interventions generally difficult to implement within small businesses, because they are difficult to reach and they lack resources and competence (Hasle and Limborg, 2006). In Norway, only minimal efforts have been specifically targeted towards small businesses to reduce accidents and injuries. However, the agricultural sector offers farmers an introductory, practical OHS course, provided by the Norwegian Agricultural Health, Environment and Safety Service (Landbrukets HMS-tjeneste, or LHMS<sup>1</sup>). This course fulfils the legal

requirements set by the Norwegian Working Environment Act (WEA<sup>2</sup>) for managers. Despite the course being the main effort for promotion of OHS, it has never been evaluated. As part of the larger research project “Accidents in Norwegian Agriculture” (hereafter termed the AINA project), our study aimed to evaluate this introductory OHS course for farmers.

## 2. Occupational health and safety within agriculture

The high frequency of injuries within agriculture points to a great need for preventive efforts. Systematic reviews of interventions within agriculture have been performed (DeRoo and Rautiainen, 2000; Rautiainen et al., 2008). DeRoo and Rautiainen (2000) examined published safety interventions and found multi-factorial farm-safety interventions as the most promising means for prevention of injuries. More recently, Rautiainen et al. (2008) systematically reviewed interventions with more restricted designs (randomized controlled trials (RCTs), cluster-randomized controlled trials (cRCTs), controlled clinical trials (CCTs), and interrupted time series (ITS)). This review found no evidence for the effect of educational interventions on injury rates, but it indicated that financial incentives and specific changes in legislation

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<sup>1</sup> Since 2014, LHMS has been part of the Norwegian Agricultural Extension Service, or Norsk Landbruksrådgiving HMS (NLR HMS).

<sup>2</sup> <http://www.arbeidstilsynet.no/lov.html?tid=78120>.

could be effective. The authors pointed to educational interventions as a component of multi-factorial interventions (Rautiainen et al., 2008).

Reviews focusing on interventions aimed towards small enterprises, regardless of sector, are relevant for agriculture. Breslin et al. (2010) systematically reviewed quantitative evaluations of interventions in small enterprises. When considering inclusion criteria, this review was less rigid than the review by Rautiainen et al. (2008), and included outcomes related to exposures, behavior and health (Breslin et al., 2010). For small enterprises, the conclusions are generally in line with the studies on agriculture performed by Rautiainen et al. (2008). Despite only a few medium- or high-quality studies, they found moderate evidence for effects of OHS interventions across different outcomes, when the interventions consisted of combinations of activities, including training.

Small businesses may require more assistance from external bodies such as government, local authorities and insurance, compared to larger companies (Hasle et al., 2012; Sinclair et al., 2013). This may be due to specific characteristics, such as the manager and the owner being the same person, and the only one responsible for company activities (Hasle et al., 2010). This kind of owner often has no interest in using resources for establishing formal organizations (MacEachen et al., 2010) or for focusing on OHS (Hasle et al., 2010; Hasle and Limborg, 2006). Studies have pointed to the usefulness of intermediaries in reaching small enterprises (Cunningham and Sinclair, 2015; Hasle et al., 2010; Olsen and Hasle, 2015; Sinclair et al., 2013). Intermediaries are organizations that deliver goods or services to small businesses, and they could also deliver OHS information and programs (Sinclair et al., 2013). Suggested intermediaries are local authorities, labor market parties, trade unions, and regional safety representatives (Hasle et al., 2010; Legg et al., 2010; Olsen and Hasle, 2015). A study from New Zealand found that such intermediaries reach out to farmers (Olsen and Hasle, 2015).

Other ways to reach small businesses are by national, sector-wise or local programs (Legg et al., 2010). Programs including education and training specifically targeted towards agriculture are in place in some countries. The Farmsafe program in New Zealand was developed in 2001 by a national alliance of stakeholders within agriculture. The first phase consists of Farmsafe Awareness workshops as a prerequisite to attending the second phase, which consists of Farmsafe plan workshops (developing safety plans) and Farmsafe skills workshops (training in practical skills) (Legg et al., 2010; Morgaine et al., 2006). Later, a workplace safety discount scheme was added (2006), providing a 10-percent levy discount in the New Zealand Accident Compensation Corporation (Olsen and Hasle, 2015). A community-based Canadian program, initiated in 1988, delivered both educational and clinical interventions. The educational section consisted of newsletters, team packages, on-site training activities, and injury-control conferences covering many topics (Hagel et al., 2008). Both programs showed inconsistent results (Cryer et al., 2014; Hagel et al., 2008; Legg et al., 2010; Morgaine et al., 2006).

As education is a possible component within a multi-factorial approach (Breslin et al., 2010; DeRoo and Rautiainen, 2000; Rautiainen et al., 2008), there is a need for studies with a broad perspective that allow us to understand how a course may work within a larger context. Criticism of OHS intervention evaluations has been voiced regarding the use of randomized controlled trials, ignoring the understanding of interventions taking place in a real-world context of dynamic, complex social systems (Lipscomb et al., 2009; Pedersen et al., 2012; Sanson-Fisher et al., 2007). Other critiques mention that studies evaluate the end results but not the process behind the intervention (Olsen et al., 2012). Several researchers have suggested realist methodology as an alternative approach to examine safety interventions (Olsen et al., 2012; Pedersen et al., 2012). Realism tries to identify “the mechanism

of how complex interventions work [or why they fail] in particular contexts and settings” (Pawson et al., 2005). According to Pawson, (2006, pp. 21–25), an intervention can be understood in the sense of mechanisms (M) explaining what make things happen, the context (C) that is the surroundings or external conditions facilitating or limiting the uptake of the intervention and the outcome (O) of the intervention. The realist approach focuses on patterns of outcome more than on regularities. This reflects an understanding that similar interventions may not work the same way within different contexts (Pawson 2006, p. 22).

Sector-wide strategies and programs to address injury prevention exist in Norway (Ulykker i Norge, 2009). As part of the annually negotiated agreement on agricultural policy between the government and the farmers’ associations, a work group covering all stakeholders within agriculture was in 2009 mandated to organize OHS within the agriculture sector. This became part of the established Common Plan for OHS in Norwegian Agriculture 2007–2012 program (Ministry of Agriculture and Food, 2010). This group points to several important actors in injury prevention. Food Branding Foundation (Matmerk) is responsible for the Norwegian Agricultural Quality System (KSL), offering a quality system that all registered farmers can access. Approximately 37,000 Norwegian farmers are certified in accordance with this system.<sup>3</sup> The system established standards and documentation schemes, based on laws and regulations pertaining to agriculture, as well as requirements from industrial farm-product recipients. As this system reflects all regulations relevant to agriculture, its five-year external audit and the annual internal audit cover the WEA and all relevant OHS regulations. The central bodies in the agricultural sector have agreed that OHS should form an integral part of the agriculture quality system.<sup>4</sup> The other important party mentioned by this work group is the Agricultural Health, Environment and Safety Service (LHMS). The Common Plan for OHS in Norwegian Agriculture 2007–2012 considers the practical OHS course offered by LHMS as the main intervention (Ministry of Agriculture and Food, 2010).

The aim of the course is to provide participants with basic system understanding and knowledge of practical OHS and enhance the use of a documentation tool satisfying the legislative requirements for systematic OHS.<sup>5</sup> The course has three parts as described in Fig. 1. The course addresses basic information about OHS such as legislative and regulatory issues, accident risk, ergonomics, chemical, biological and physical exposure, and mental health. It also covers law and regulation including employer responsibilities, systems, routines, and measures. The e-learning part of the course culminates in an online examination, that is to be passed to receive the course certificate. The farm visit includes a walk through the farm, observing and discussing OHS challenges and solutions, as well as guidance in how to organize practical OHS work including the use of a tool for systematic OHS. This tool is an electronic system for planning and documentation of OHS. Despite the vital role of this course, it has never been evaluated. Therefore, based on the study’s overall aim and the course content, the research questions are:

How do farmers perceive the format and content of the course?

How does the course in practical OHS work regarding:

- Increased understanding of systematic OHS?
- Implementation and use of systematic OHS tools?
- Efforts to control risk at farms (outcome)?

How can external factors influence and moderate potential associations between input and output?

<sup>3</sup> Personal communication, Tom Roterud, KSL, March 9, 2017. For example, 99.8% of all dairy products by volume were produced according to this standard.

<sup>4</sup> <http://www.matmerk.no/no/ksl>.

<sup>5</sup> <http://www.lhms.no/kurs/detalj/praktisk-hms-arbeid#.WCxeKmk7GS0>.

### 3. Methods and materials

#### 3.1. Design

The study is designed as a prospective exploratory case study evaluation (Pawson and Tilley, 1997, p. 87), using qualitative methods. The design was inspired by realist evaluation. Realist evaluation is a theory-driven research approach (Marchal et al., 2012). Pawson and Tilley (1997) describe realist evaluation as testing of theories or initial hypotheses on how interventions should work (Pawson and Tilley, 1997, p. 88). But, in addition they point to exploratory case study evaluation as very useful when programs are well established and cannot be manipulated (1997, p. 87). Despite this OHS course being cited as the most important intervention for promoting OHS among farmers (see above), it has, as said, never been evaluated. Hence, an observational and explorative study seemed to be the most reasonable design.

The data was gathered through individual interviews with farmers before the course, one month after, and two years after the course. The qualitative design provided informants with the opportunity to come out with more detailed descriptions and opinions, and the farmers' particular context could be addressed. The longitudinal design was chosen due to its ability to follow changes in attitudes and behavior over time and explore the sustainability of such courses in the longer term.

The study presented in this paper is part of the larger AINA research project, which in addition to this study includes a comprehensive survey of farmers and field work with qualitative interviews with farmers and their families.

#### 3.2. Recruitment

To reflect a diversity of topography and operating conditions, it was decided to study courses in selected regions of mid- and southwest Norway. The head of each region's LHMS was informed about the study, and they all approved that researchers could take contact with course instructors and course participants. Relevant courses were then identified by reviewing the LHMS' web pages with courses planned from October 2011 until March 2012. The researchers contacted the OHS course instructors by telephone and asked for permission to invite course participants to take part in the study. The researchers also asked for access to the lecture part of the course, and to participate at the farm visit. The researchers' objectives for attending the course were to understand how the courses were organized and to get an impression of attitudes, interests, and topics to be discussed. One instructor did not give permission.

When the course instructors had accepted the proposed plan, researchers got access to contact information of those who had enrolled the course. This information came from the course instructor or from the local organizer, as several of the courses were initiated and organized by local branches of the Norwegian Farmers' Union. Course participants were then contacted and invited by the researcher who should follow their course, and those who accepted the invitation received an information letter. All farmers who wanted to take part in the study were required to give written consent. Of the 26 potential participants, 21 accepted the invitation. The course instructors did not get any information about who participated in the study.

#### 3.3. Data gathering

For participants who agreed to take part, an appointment was made for a pre-course interview with the participant. Follow-up interviews with the participants were performed approximately one month after the course. The final interviews were conducted approximately two years after the course. Depending on the region and travel distance, the interviews were done either by telephone or in person.

The data was gathered by means of a semi-structured interview guide. The interview guide comprised three parts. The first part considered the pre-course interview, asking for background information about the farmer and the farm, reason for course participation, course expectations, and existing OHS organization at the farm. The second part of the guide covered the one-month post-course interview, addressing opinions on the course, the course organization, the course instructor, and questions about specific measures or actions that farmers took after the course. The final part of the guide was the two-year follow-up interview assessing what farmers could remember from the course. Before the final interview, the researchers had summarized actions, plans, and organizational issues from earlier interviews. All interviews were recorded, transcribed verbatim and anonymized.

#### 3.4. Analysis

The analysis was performed by abductive reasoning (Martela, 2015). Abductive reasoning is a creative process allowing for a circular movement in the analysis between the researcher's pre-understandings, gathered data, and existing theories. The analytical process then becomes an iterative process. The theoretical framework used in this analysis is inspired by Pawson (2006), using his concept of context, mechanisms and outcome and a theoretical model especially developed for small enterprises (Legg et al., 2010). Although the study was not theory-driven, initial assumptions existed. Firstly, assumptions existed about the farmers' perception of themselves as managers. Secondly, we had an understanding of interventions taking place in a real-world context of dynamic, complex social systems (Lipscomb et al., 2009; Pedersen et al., 2012; Sanson-Fisher et al., 2007).

Pawson's (2006) theoretical model acknowledges that interventions are surrounded by larger social systems (the context) comprising infrastructural (politics, public support), institutional (culture), interpersonal (communication, learning environment, relationships), and individual layers. These layers must be considered when interpreting why intervention succeeds or fails (Pawson et al., 2005). The mechanism is the connection between these social systems and the outcome. Pawson (2006, p. 23) calls this the "engines of explanation". As there is no clear definition of the concepts of *context* and *mechanisms*, our analyses were based on Pedersen et al. (2012). In a context of occupational safety interventions, they suggest that *contextual factors* include: Global and national financial markets, national laws and infrastructure, safety level at baseline, organizational changes, formal local structures, informal norms or rules, and production pressure. They further suggest that *mechanisms* include: Interpersonal relationships, motivation, role behavior, and trust.

Legg et al.'s (2010) model is targeted towards small enterprises. The model includes the intervention design and how it may be embedded in larger programs/contexts, how it should reach small enterprises, participants' interpretation, and the change process and effects. This allows for studying more than just the intervention, including how it targets

the selected group and the process from interpretation to effects. The model addresses contextual factors, or moderators, similar to Pawson (2006). However, Legg et al.'s (2010) model has a temporal aspect while Pawson's model does not problematize time, allowing for analyzing the OHS course as a temporal process in a longitudinal perspective.

Based on the model by Legg et al. (2010), the categories *interpretation*, *change*, and *effort* were identified for our material. Thereafter, we used Pedersen et al.'s (2012) suggestions for context and mechanisms as a guideline for understanding phenomena that could be classified as either context or mechanism. This was done for all phenomena found in *interpretation*, *change*, and *effort*. Phenomena that could be interpreted according to Pedersen et al.'s (2012) categories were directly used. Any other phenomena were labeled according to our understanding of the phenomena identified. Considering the course design, categories were developed independent of the theoretical framework, and were instead based on the participants' descriptions and the course description.

Finally, Legg et al. (2010) defined *effect* as "whether actions are carried out as intended." We interpret this understanding of *effect* as similar to what Pawson (2006) calls *outcome*. As we were interested in which OHS actions the farmers performed after the course, outcome/effects were defined as any efforts to control risk related to the course aim. In accordance with this, we looked for efforts to increase basic system understanding, using a documentation tool satisfying the legislative requirements for systematic OHS, and practical efforts. Legg et al.'s (2010) model also covers how interventions were provided to the targeted group. This was not included in our study, as these results are reported elsewhere (Kjstveit et al., 2013).

The first author of this article performed the analysis, while the categories and the final model were developed in discussions with the second author.

### 3.5. Ethics

The study was approved by the Regional Committees for Medical and Health Research Ethics – Central Norway (number 2011/2239, later 2011/2239-26).

## 4. Results

Five courses were included in the study. Two courses were held in the southwestern part of Norway: One in a region with flat topography and dairy and beef as the main productions; and the other in a region with several sheep farms. Three courses were held in mid-Norway and reflected differences in operating conditions: A mountainous area; a flat area with large amounts of vegetable production; and a third area that was topographically somewhere between the other two, with mixed production, but mainly dairy. Two courses had female instructors with diverse backgrounds of two to four years of experience as OHS advisors. Three courses had male instructors with three to seven years of experience as OHS advisors. Three course instructors had own farming experience.

The final study group of farmers that had participated in all three interviews, comprised 16 farmers, four of whom were female. The mean age for the participants was 45, ranging from 28 to 65 years. Only one participant had a university degree. Most participants had a family farm, but nine used additional hired assistance. Five of these farmers hired help during busy work periods (such as harvest time) or for specific tasks. One farmer worked alone, and another farmer depended

on up to 10 hired workers during the busy season. Furthermore, six farmers hired a relief worker<sup>6</sup> to do their job when they were ill or on vacation. One of these farmers in addition hired help for specific tasks. One farmer had only one production (sheep), and two farmers had four productions (dairy/beef/grain/forest, and pigs/potatoes/grain/peas). The remaining farmers had either two or three productions: Beef (seven farmers), dairy (six farmers), sheep (five farmers), grain (four farmers), pigs (two farmers), fodder (two farmers), potatoes (one farmer), vegetables (one farmer), and chickens (one farmer).

Fig. 1 shows our final model. The results are described in accordance with this model. From left to right are shown interpretation, change process (including course design), and farmers' efforts to control risk. The phenomena will be highlighted in italics the first time they are presented.

### 4.1. The interpretation

The left side of Fig. 1 shows the phenomena related to the interpretation of the course. *Contextual factors* are important for how farmers interpret the course. For many of the participants, the actual reason for participation was that the *external audit in KSL* had revealed they were lacking a managerial OHS course. This course is mandatory according to the Work Environment Act, so *regulation* is an underlying cause for participation. Another contextual factor was *cultural norms and attitudes* among farmers. Considering expectations, a female participant stated: "I would expect, to get a form-based system, where I can just tick off, so that I in an easy way, in a simply practical way can have my KSL audit accepted." This statement illustrates her understanding of the system as fulfilling legal requirements. Another farmer claimed: "It is a pile of paper (laughing)." These statements point to an interpretation of OHS regulations, as not adding practical contribution to a good work environment and reduction of risks at the farm. Similar negative opinions were found across courses, regardless of geographical location.

The *mechanisms* found in the interpretation of the course point to the participants' willingness to become enthused by the course. One mechanism found in the interpretation was *motivation*. The participants' motivation (in most cases: lack of motivation), mirrors the contextual factors earlier mentioned. The common understandings of OHS as merely satisfying a system, without having practical contributions and reducing risks at the farm, seem to enhance a lack of motivation for attending the course, an attitude even further strengthened by the course being mandatory. This may act as a barrier to become involved when attending the course. Another mechanism found was *role understanding* that could increase a positive attitude towards the course. Some farmers became aware of the course as being mandatory for managers. This seemed to increase an awareness of their role as a manager. Hence, they started to reflect upon not being the only worker at the farm, but actually being responsible for the occupational health and safety of others. For farmers who related their course participation to role understanding, attendance was less related to satisfying a system, but more related to establishing a useful system focused on safety issues and responsibility for employees. These farmers showed an open attitude toward increasing their knowledge regarding the more theoretical aspects of OHS, hence this seems to facilitate a positive attitude towards the course. One female farmer explained: "Well, I suppose that there may be such aha-experiences, things that maybe wouldn't have come to mind. And then perhaps it can be about shaping up routines...and in a way, I am sure we maybe already know some of the course stuff, but there is probably quite a bit of new, as well, details we haven't thought about. And the opportunity to get some assistance, in getting a good OHS system for the farm, that is important."

<sup>6</sup> Relief workers are employed in a common pool. The farmers contract the relief workers from this pool and are responsible for a safe, sound work environment at their farm. Family members can also be employed by and hired from this pool.

## 4.2. The change process

The change process, shown in the middle of Fig. 1, was defined as participation in the course. The course design is shown in a separate box to the left.

### 4.2.1. Lecture

The course starts with a three-hour introduction, including a lecture, a film, and time for discussion. Topics and discussion intensity varied between the courses. The farmers were reluctant about the introduction, showing no specific enthusiasm and replying with short answers. However, one farmer did articulate some challenges that may explain this lack of enthusiasm: “Especially old farmers, it hurts, you know, to sit down calmly to view that screen, go through these over-heads. Of course, it will affect the classes, if there is some reluctance and not much involvement. So, I think it depends a lot on your course group, how much you benefit from it.”

This quote points to the *course design*, especially the *lecture form*. The farmer stated that a *lecture-like presentation* on a screen is not the preferred way of learning for older farmers. This form will not engage this group of participants. Participants clearly addressed that they missed *discussions and group work*. However, from one course to the other there were differences in discussion intensity, which may reflect participants’ enthusiasm, how they gained attention, and how well the participants knew each other. Therefore, also *interpersonal relations* matter. A *film showing serious farming accidents* was very much appreciated, being described as relating to their *emotions*. It was described as emotionally engaging and was remembered even two years after the course.

Another aspect of the course design was the *theoretical content* and the perceived *lack of practical examples*. A farmer suggested: “Then [with more practical examples], I think I would have more reference points for sorting things out. Maybe made it easier to start a conversation with others, about what we are doing.” The last component of course design was the *course instructor*, although the farmers did not emphasize it a great deal. When the farmers did mention the course instructor, it was the instructors’ *behavior and pedagogical skills* the farmers talked about. This concerned the instructors’ ability to address issues in practical terms and deal with discussions. The farmers reacted positively if the course instructor had *personal experience as a farmer*.

Considering the *context*, farmers understood *farming as practical work*. This is important for understanding mechanisms. The participants stated that practical examples made talking easier. Farmers are used to talk about practice, due to their everyday practical reality. This also points to a *mechanism* through which the course may act. In the lecture, participants were introduced to language and concepts they perceived to be far from their practical reality – literally a perception of *alienation*. This may explain farmers’ lack of ability to state opinions in and about the introduction. The farmers described the film in positive terms, perhaps due to its practicality and being aligned closer to farmers’ reality.

### 4.2.2. E-learning

Participants described the e-learning in several ways, exemplified

by two opposite statements. One male farmer stated: “We were supposed to study at home, which worked only so-so for most of us, I think because you could jump straight to the test.” This was opposed to a female farmer, who stated: “I found it interesting and I found it informative... the home study...and for each topic, there were actually three different pages that you could delve into, and you did so because you wanted to know. Is this real? Is this really the case? I at least, made extensive use of the facts part.” The effort that participants put into the e-learning indicated their *motivation* for this part of the course. The first farmer honestly stated that he had not read it, yet still managed the test, based on common sense. The design of the e-learning part of the course, or the *connection between the content and the test*, allows for taking the test without much reading. Some farmers stated that they did the test too hastily, perceiving reduced learning outcome. In general, the farmers did not state much outcome from the e-learning, with the enthusiastic female farmer as an exception.

### 4.2.3. The farm visit

The participants found the farm visit part of the course interesting and inspiring. They even mentioned this two years after the course. Considering the course design, the *form* is a paramount overall cause for the farmers’ positive attitude. The farm visit was organized as *walking in groups* through the farms while making *observations*. However, the experience varied somewhat, due to the composition of the group, so *interpersonal relations* played a role, also here. The *content* of the observations and discussions was decided by the *choice of farm* visited.

The positive evaluations of the farm visit may be related to placing the course within the farmers’ daily context of farming as practical work. Four main mechanisms were identified. *Recognizability* was related to production type and building age. The farmers could mostly transfer aspects from the visited farm to their own farms, as they experienced similar issues like electricity and fire risk across production types. However, participants questioned if a farm with new production buildings, including new technology and automatized work processes, would entail the similar recognizability. They also perceived new buildings as having everything in order, with nothing to observe.

A quote from one farmer points to another mechanism particularly related to the farm visits: “For example, and especially when on the farm visit, you think differently when you visit someone else’s farm, and spot what can be done differently, what works well, what doesn’t. You obviously don’t see this at your own place, because there you walk within the same surroundings all the time. So, actually, that was probably the most useful part.” The statement points to what we call an eye-opener, *preventing home blindness*, in which farmers become so familiar with their own farm, potentially neglecting risks and lack of order. A farmer hosting the visit argued along similar lines: “And then, I eventually got to have the whole farm reviewed in a way, you may say...becoming aware of aspects that I don’t see myself, when going around here every day, but was observed by those visiting. You know, they were folks from farms down the road, and from other places...And then I had this ... I think it was great, because I learned a lot and I have already taken action on some of the things they pointed out.” Hosting the farm visit, and having others observing his own farm, also gave him the outside perspective.

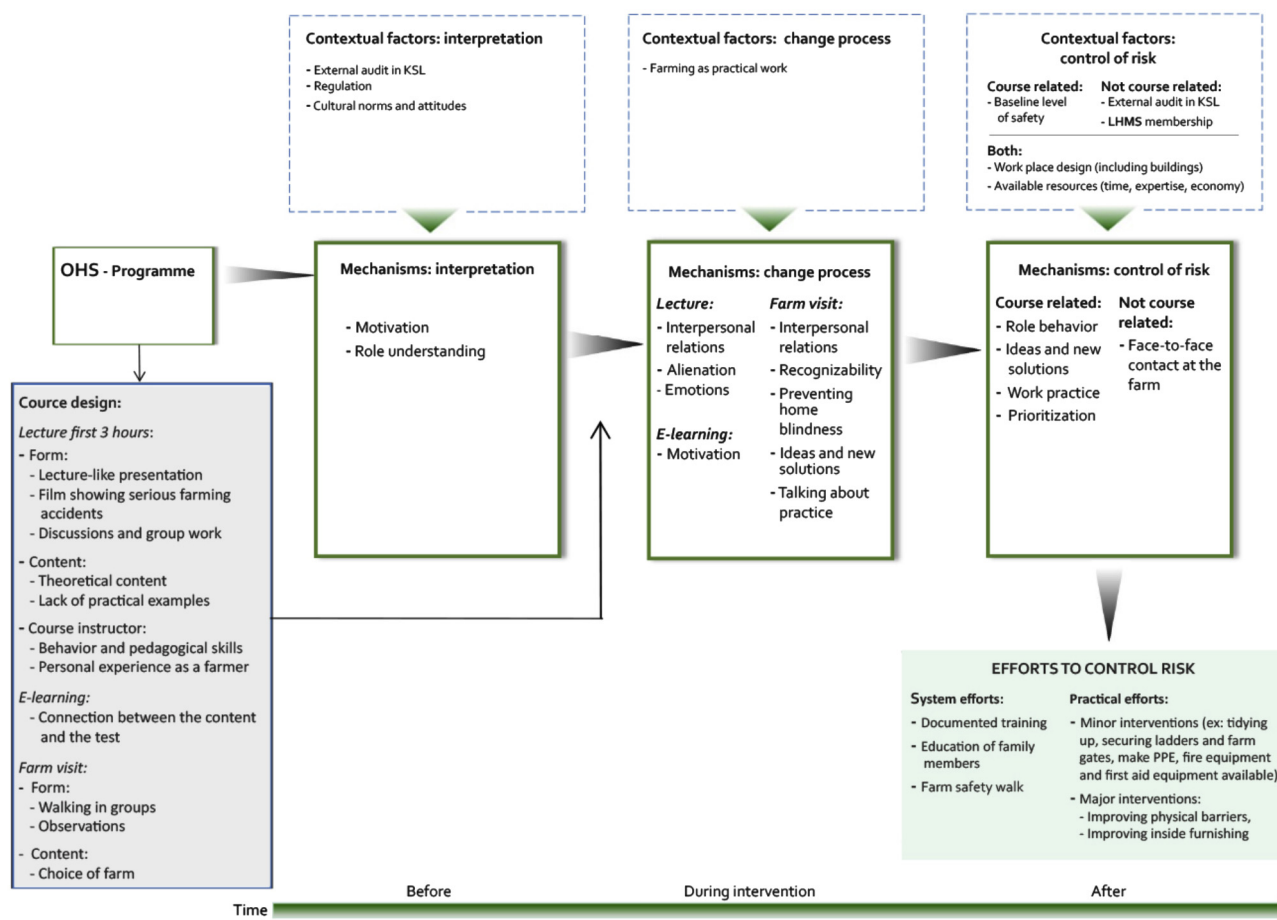


Fig. 1. The final model, illustrating the results. From left to right the model shows interpretation, change process (including course design), and farmers’ efforts to control risk. Contextual factors are presented in the upper part of the model and mechanisms are presented below.

Observations are not only about being blind, but also observing how others do things. One participant stated: “And then we were several in a group, and we all looked and discovered different things that we then could focus upon. An interesting experience.” Several farmers mentioned that they got *ideas and new solutions* for their own farm. The participants emphasized course discussions and *talking about practice* with farmers having different opinions and perspectives as being very productive.

#### 4.3. Efforts for control of risk at own farm

The lower right section of Fig. 1 summarizes the *efforts to control risk*, separated into *system efforts* and *practical efforts*.

Considering efforts, one aim of the course was enhancing the use of a documentation tool satisfying legal requirements for systematic OHS. The farmers did not mention a more active use of the system available from KSL, or any other system of documentation, from before to after the course. Considering system efforts, we did find minor adjustments. Farmers are obligated to systematically document the training given to employees and family members working at the farm. *Documented training* (the agreement for employees to sign after training on specific tasks) was one particular learning experience from the course. The farmers described other, less systematic activities, such as *education of family members* (involving them in the e-learning) and taking employees or the family on a *farm safety walk* after the course. Practical efforts included actions such as *tidying up, securing ladders and farm gates*, and *making personal protective equipment (PPE), fire equipment and first aid equipment available*. A few larger interventions related to *improving physical barriers or improving inside furnishing* of farming structures were

also performed.

Outcomes depended on contextual factors and mechanisms, even after the course. The *contextual factors* influencing what was or wasn’t done, were perceived as a *baseline level of safety*, which was important for both changes in active OHS system use and practical efforts. One farmer stated: “In fact, we already used to do a lot of those things, so we have not made that many changes. It might be something about those gates (fences), then that we have become more aware of. Otherwise we have not changed any of our practices.” A few farmers perceived the course as confirming they were doing something right.

Responsibility for others (like employees), or *role behavior*, seems to be the only *mechanism* explaining the minor system efforts seen in this material. In terms of practical efforts, *ideas and new solutions* identified during the farm visit gave farmers useful advice on how to improve OHS at their farms. One female farmer elaborated: “Since we have a barn-bridge up there, and it needs a railing. I got ideas how it could be arranged, in a simple way, without being all that expensive.” Many farmers denied changes in *work practice*, and stated that this could be a challenge, as one farmer argued: “But the challenge is, that it should not last only for a week or two, but become something sustainable, and that you manage to incorporate it into every day practice.” The course seemed to affect a short-term awareness of risk and changed work practice, but long-lasting changes in practice may be difficult.

The analysis also identified contextual factors and mechanisms that influenced efforts initiated by the course as well as efforts due to other causes, such as having an *external audit in KSL*. Contextual factors that influenced efforts after a course and after an audit were: *Workplace design (including buildings)*, as the design became a barrier towards expensive, practical solutions; and *available resources* (such as *time*,

expertise, and economy), mostly described as inhibiting farmers' actions. One farmer described a barrier to improving a grass hoist: "We talk about many thousands, considering the costs, to rebuild it. If we should hire people. However, my husband could do it himself, if he had time. But so far, he hasn't. Actually, it is a bit difficult, having it this way." Prioritization and difficulties in prioritizing became more evident when the effort required many resources. Difficulties in prioritizing and lack of access to inexpensive and timely resources may also be why the same interventions were still marked as "planned to do" more than two years after the first interview with some farmers.

Finally, active use of a documentation system was not influenced by the course, but by other factors. When we considered farmers actively using a system prior to taking the course, we found both contextual factors and mechanisms explaining this. The external KSL audit and LHMS membership act as contextual factors in our model. The mechanisms for initiating the active use of an OHS system, was *face-to-face contact at the farm* with auditors and OHS advisors during the external audit. For one farmer, LHMS membership mediated a face-to-face visit from an OHS advisor. This helped them develop an OHS system. Other farmers pointed to both OHS advisors and KSL auditors as making this system active and understandable. Although the course doesn't change use of an OHS system, non-members might become OHS service-members afterward. If this membership entailed a farm visit, there may be an indirect consequence of the course.

## 5. Discussion

The overall finding is that the practical OHS course does not reach its goal of increased systematic understanding and use of OHS systems. We do find that the course leads to short-term, increased awareness of risk and minor, system-related, efforts to reduce risk. Moreover, the analysis reveals that the course uptake is a matter of complex dynamics between contextual factors, mechanisms, and course design. In the following section, we will first discuss contextual factors and mechanisms, suggesting why the course does not reach its goal. We will then address how the findings challenge the course design.

Regulations are prominent contextual factors for the farmers, but farmers' characteristics influence how farmers respond. Attention must specifically be drawn to the Working Environment Act (WEA) and the internal control of safety, health, and environment (IC Regulation).<sup>7</sup> According to the WEA, an OHS course is mandatory for managers. Management is in general perceived as a full-time responsibility, mostly relying on an administration unit with formalized roles, responsibilities, and specialized tasks. Moreover, large organizations have advisors with extensive and specific training in OHS. This may not be the case in small enterprises. Specific characteristics for small enterprises are that the manager and owner are often the same person (Hasle et al., 2010) and there are limited resources and interest in focusing on OHS and establishing formal organizations (Hasle et al., 2010; Hasle and Limborg, 2006; MacEachen et al., 2010). In a representative survey of Norwegian farmers, being part of the AINA project, 41% of the respondents state they have employees and/or relief workers. Of those that report formal employees, only 31% employ three or more workers. The same survey also shows that about 48% of Norwegian farmers have vocational education within agriculture and only 25% have higher education (college or university) (Kjestveit et al., unpublished results). Hence, Norwegian farmers have minor resources and competencies for administration, which corresponds to findings for small enterprises.

Moreover, the IC-regulation sets the requirement for a written OHS system, but it does not necessarily fit the farmers' reality. This regulation was introduced for the oil industry in the 1980s and extended to include all private and public enterprises in 1992, with a revision in 1997 (Hovden, 1998; Skotnes and Engen, 2015). The internal control

regulation is functional, meaning that organizations have the freedom to develop an OHS system and guidelines suited for their specific tasks and hazards (Skotnes and Engen, 2015). The authorities therefore prescribe safety goals, while companies can develop guidelines suited to their industry and risk picture. The internal control regulation requires an appointed responsible person in the enterprise, documented systematic actions fulfilling OHS objectives, a system for deviations, and system audits as tools for internal and external control (Hovden, 1998). The misfit to the farmers' reality has two aspects. Firstly, farmers may perceive observed risks and hazards as something to be dealt with in a practical way, without first documenting them in a system. Secondly, farmers' understanding of reality may not be compatible with documentation and systems. A qualitative study on farmers' life, conducted as part of the larger AINA project, shows that Norwegian farmers are used to the unforeseen and atypical in their normal work situation (Follo and Holte, unpublished results). They may perceive written OHS systems as not suited to capture their unpredictable work situation and risk picture. We find similar results in the AINA survey of a representative sample of Norwegian farmers, where 41% of the farmers fully or partly agreed with the statement that "OHS is about written documentation only" (Kjestveit et al., unpublished results).

When considering farmers' characteristics and their understanding of a misfit between OHS systems and reality, both may explain the observation of alienation found following the lecture part of the course as well as the resistance to OHS systems. Firstly, when considering alienation, Hasle and Limborg (2006) points out that the OHS terminology used among health and safety professionals is perceived as irrelevant and too generic for small enterprises. Farmers participating at the course, meet a terminology similar to the OHS terminology used across all industries in Norway. For farmers, due to their education and experience, it may become difficult to establish a connection between this terminology and their daily work practice. Secondly, considering resistance to OHS systems, researchers have pointed to such systems made auditable as part of certification systems, requiring focus on the visible, on cause-and-effect thinking and on standardized solutions, and excluding important work environment factors (Hohnen and Hasle, 2011). Furthermore, a point is made regarding these certification systems, that they entail more focus on the audit process itself rather than controlling hazards (Gallagher et al., 2003). Based on this, there is a need to establish a closer link between OHS-systems, the terminology and concepts used and the practice and reality among farmers.

Some minor system-related efforts were found after the course. These changes may be caused by the course increasing an awareness of their role as a manager, being responsible for others. For instance, many farmers did comprehend the requirement for documenting the training given to employees. Studies of small enterprises find an acceptance of risk, health, and safety measures being part of a craft-based control over their roles, managing risk as an individual, not as a managerial matter (MacEachen et al., 2010). Our results indicate that it is possible to change this mindset, focusing upon responsibility for others. The importance to farmers of safety messages that address the risk of significant others, has been noted by other studies (Sorensen et al., 2008). When studied in a controlled trial, where the intervention was a tractor-retrofitting social-marketing campaign, pointing to risk of significant others, in combination with a rebate, promising results were found (Sorensen et al., 2011). The political climate in Norway is enforcing larger, more efficient farms (Ministry of Agriculture and Food, 2016). If realized, a larger number of farmers will have employees, which may, in accordance with our results, demand and imply a greater general awareness of management's responsibility for employees. In the longer run, this awareness may increase the understanding of OHS and contribute to a more positive attitude to OHS.

The prior discussion considering farmers as managers and their understanding and use of OHS systems, enables us to question the theory behind the course design and if this design is appropriate for farmers. The course was embedded in a larger program (Common plan

<sup>7</sup> <https://lovdata.no/dokument/SF/forskrift/1996-12-06-1127>.

for OHS in Norwegian agriculture 2007–2012 [Ministry of Agriculture and Food, 2010]). According to Dahler-Larsen (2001) such programs may be a result of political decision-making, hence to identify the theory behind the course design becomes difficult. The OHS course structure, with an introductory lecture, followed by e-learning, and finalized with a farm visit, indicates stage theory, where training begins with passive presentations, followed by active learning (practice). Moreover, stage theory emphasizes expert feedback, and one-way communication, instead of dialogue (Burke et al., 2007). Improving safety at the farm is part of workplace learning. Laberge et al. (2014) point to “work activity regulation model” as an approach to workplace learning, suggesting that some environments stimulate learning more than others. From our results, the farmers’ positive attitude towards the farm visit indicates what kind of environment that appeals to farmers. Hence, farmers’ learning should be embedded in their own practical reality. This effect is further implied by the results showing how auditors or OHS advisors who visit the farm can activate farmers’ OHS systems by establishing a link between an actual and an observed risk picture, their practice, and their use of documentation systems. Based on this, we suggest that the course design should be revised, where the first preliminary change could be to start the course with the farm visit. This revision should be made in close collaboration with all stakeholders who can enforce organizational learning at the farm.

Considering the scope and the limitations of the study, there are three points to make. Firstly, this study has a limited number of participating informants. The variety and number of phenomena that consider context, mechanisms and outcome, could be increased with a larger study group. However, those who participated in the study, represented different parts of the country, different production forms, different local contexts, different age groups, and both genders, hence representing a variety of experiences, opinions, cultures and practices. Secondly, there can be selection effects with respect to participation in such a study. However, the phenomena described had relevance and was of interest, irrespective of how many participants described each of them. In that sense, whether there was a bias towards critical or more positive participants, all experiences were treated equally. One reason for being critical might have been the course’s mandatory nature. On the one hand, this applies to all. On the other hand, younger farmers participated due to recently becoming farmers while some of the older farmers participated because they were forced to by the KSL, otherwise they would not get the external audit accepted. The latter group also were the most critical voices in the study. Thirdly, recall biases are an aspect in a longitudinal design study. Such biases were particularly related to farmers’ description of their efforts, forgetting efforts, as well as forgetting/addressing wrong causes for efforts performed. As efforts were asked for in all three interviews, we were able to identify efforts that were not caused by course participation. Also, farmers may not have separated efforts resulting from the course participation from other causes and we could not identify any mistakes made between the course participation and the external audits, if these were close in time.

## 6. Conclusion

The course aim was to increase system understanding and use. However, farmers saw their occupation as practical. They easily absorbed the practical part of the course, and solutions and ideas for practical risk prevention. Active use of systems adjusted to farm characteristics requires practical external involvement, face-to-face at the farm. This finding argues for reconsidering the course design to become more in line with suggestions in the literature on workplace learning, e.g. through integration into the farmers’ daily practice. Furthermore, the agriculture sector should take more advantage of having external parties’ visits to farms, communicating OHS to farmers. In conclusion, the current course design is not optimal for farmers.

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## Conflict of interest

There is no conflict of interest in this study.

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