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Opinion of Flemish Poultry Farmers on How Birds Fit for Transport to The Slaughterhouse Are Selected, Caught, And Crated

Femke Delanglez [1,2], Anneleen Watteyn [1], Bart Ampe [1], An Garmyn [2], Evelyne Delezie [1], Nathalie Sleeckx [3], Ine Kempen [3], Niels Demaître [3], Hilde Van Meirhaeghe [4] and Gunther Antonissen [5] & Frank A.M. Tuyttens [1,2,*]

[1] Animal Sciences Unit, Flanders Research Institute for Agriculture, Fisheries and Food (ILVO), Melle, Belgium; femke.delanglez@ilvo.vlaanderen.be; anneleen.watteyn@ilvo.vlaanderen.be; bart.ampe@ilvo.vlaanderen.be; evelyne.delezie@ilvo.vlaanderen.be

[2] Department of Veterinary and Biosciences, Faculty of Veterinary Medicine, Ghent University, Heidestraat 19, 9820 Merelbeke, Belgium; femke.delanglez@ugent.be; frank.tuyttens@ugent.be

[3] Experimental Poultry Centre, Geel, Belgium; nathalie.sleeckx@provincieantwerpen.be; ine.kempen@provincieantwerpen.be; niels.demaitre@provincieantwerpen.be

[4] Vetworks, Aalter, Belgium; hilde.vanmeirhaeghe@vetworks.eu

[5] Department of Pathobiology, Pharmacology and Zoological Medicine, Faculty of Veterinary Medicine, Ghent University, Merelbeke, Belgium; gunther.antonissen@ugent.be; an.garmyn@ugent.be

* Correspondence: frank.tuyttens@ilvo.vlaanderen.be; Tel.: +32 92722605

Simple Summary: Pre-transport management activities can cause stress, injuries, and mortality in poultry. This study aimed to gather information about the current pre-transport practices (selection of unfit chickens, catching preparations, catching, and crating) for spent hens and broilers by questioning Flemish poultry farmers. The results showed that catching preparations such as an extra selection of chickens unfit for transport was performed by a minority of the poultry farmers, and that layer farmers were less in line with the EU-legislation for water and feed withdrawal than broiler farmers. All birds were caught inverted except for one broiler farmer who used mechanical catching (not yet common in Flanders). Additionally, mechanical catching may involve extra costs, increased biosecurity risks, and specific recommendations for the stable (height and width). The broiler farmers preferred mechanical catching for broiler catchers' well-being, while upright catching was considered better for animal welfare than catching more than three chickens by one/two legs, mechanically, or by wings. Awareness of the need to perform an extra selection by the poultry farmers before catching is required. Preparations like closing areas under the aviary system and removing litter (layers) can further streamline the process and reduce animal suffering.

Abstract: The pre-transport phase poses stress, fear, and injury to poultry, and poultry farmers' role is crucial. This study aimed to update knowledge on pre-transport practices for spent hens and broilers in Flanders via a survey among poultry farmers (layers: 31 of 156, broilers: 48 of 203 completed the survey) about the current selection of unfit chickens, catching, and crating, and their opinions. A minority performed an extra selection of chickens unfit for transport prior to catching (layers 25%: 5.1 ± 5.9 h, broilers 39%: 6.8 ± 7.0 h). More layer (69%) than broiler farmers (19%) withdrew feed too early by EU-legislation (max 12 hours before expected slaughter time). Layer farmers closed water lines earlier than broiler farmers (47.9 ± 51.1 min vs. 20.6 ± 23.3 min). More broiler than layer farmers believed that the container type affects the birds' welfare (48% vs. 27%; $P<0.05$). In broilers, mechanical catching was preferred for catchers' well-being, while upright catching was considered better for animal welfare than catching more than three chickens by one/two legs, mechanically, or by wings. Poultry farmers should be sensitized about the need for an additional selection before catching, including clear guidelines about reasons for considering birds fit for transport.

Keywords: Fitness for transport; Industry; Transport system; Poultry; Handling

1. Introduction

At the end of the production phase, broiler chickens and laying hens are usually caught, loaded, and transported to the slaughterhouse [1,2]. Poultry are mostly caught and crated manually in containers or crates by a group of catchers. In some parts of the world such as Canada, the US, and in some Scandinavian countries (e.g. Finland), however, spent laying hens are gassed on farms and not used for consumption, e.g. because farms are located too far from slaughterhouses [3–5].

This paper focuses on the first phase of the pre-slaughter stage before transporting broiler chickens and laying hens. This phase includes the selection of birds that are not fit to be transported, other preparations carried out by the farm staff before the catching event, and the actual catching, crating, and loading of the birds on the transportation vehicle. This early phase of the pre-slaughter stage has been identified as a high-risk event for potential animal welfare issues such as thermal discomfort, bone lesions (e.g. fractures and dislocations), skin lesions (e.g. subcutaneous hemorrhages), fatigue, mortality, fear, handling stress, restriction of movement, sensorial over/under stimulation, motion stress, and resting problems [1,6,7].

Concerning the fitness of birds for transport, EU-legislation [8] stipulates that "no animal shall be transported unless it is fit for the intended journey, and all animals shall be transported in conditions guaranteed not to cause them injury or unnecessary suffering". Birds not fit for transport should receive appropriate treatment or be immediately culled [8] which is important for ensuring food safety and reducing economic losses [9–11]. Animals that are already sick, weak, and injured are more vulnerable to increased suffering and have a higher chance of dying during transportation because of interacting with unfamiliar animals, difficulty maintaining stability during transit, avoiding fatigue, managing restrictions on feed and water, and dealing with extreme thermal environments [2,12,13]. Given the challenge of properly checking birds' fitness to transport during catching and crating, a fit for transport inspection as close as possible to the catching and loading process is recommended [14]. This fit for transport inspection should be carried out on top of the routine flock inspections that farm staff in the EU must do at least twice per day for broiler chickens [15] and at least once a day for laying hens [16] throughout the production cycle. Specifically for fit for transport inspections, farm staff ought to be knowledgeable about which birds are unfit to be transported and what to do with these instead [10,14,17].

In addition to the extra selection of birds just before the catching event, other preparations are necessary, such as litter removal (for laying hens only), feed and water withdrawal, and lighting adjustments. Specific in non-cage systems of laying hens litter ought to be removed in the alleys to enable containers and crates to be brought inside and placed as close as possible to the hens [7]. Feed needs to be withdrawn at the correct time maximizing the chance that the gastrointestinal tract is empty at the time of slaughter but minimizing the risk of starvation for longer than necessary. Withdrawing feed eight to 12 hours before slaughter is necessary to avoid carcass contamination, as otherwise, the carcasses may be rejected for consumption [18,19]. To maximize gastrointestinal evacuation, four hours of light is recommended after feed withdrawal [20]. In broiler chickens feed withdrawal longer than six hours depletes liver glycogen reserves. Extending feed withdrawal beyond 12 hours can cause prolonged hunger and intestinal cell breakdown [21]. For end-of-lay hens, a feed withdrawal longer than 10 hours will result in prolonged hunger [7]. Undue long feed withdrawal and light adjustments can cause significant stress directly impacting meat quality negatively and can result in economic losses [20]. Furthermore, water should remain available to the birds up to just before catching and loading to hydrate the birds and clean their gastrointestinal contents [20]. Thirst must be avoided as it can negatively affect the animals' fitness, increasing the risk of severe dehydration [22].

The actual catching and loading of the birds can cause fear and stress reactions, fractures, and lesions resulting in animal suffering as well as significant economic losses for producers and slaughterhouses because of carcass rejections [23,24]. There are differences between laying hens and broiler chickens during catching and loading. Laying hens are caught and loaded when they are 65-100 weeks old in the EU [7,25], fast-growing broiler chickens are around six to seven weeks old, and slower-growing broilers are 7-12 weeks old [20]. In the EU, laying hens are housed in enriched cages or non-cage systems (floor housing and aviary systems) [1,26], while broiler chickens are usually kept in floor housing systems [27]. Laying hens are always caught manually whereas broiler chickens can be manually or mechanically caught [1,2,28]. In the case of manual catching, both laying hens and broilers are usually caught by one or both legs (although prohibited in the EU by [8]) and carried upside down. Upright catching, by supporting the abdomen and wings against the body, has been recommended though on animal welfare grounds (less agitation, stress, and injuries) [7,24,29]. Manual catching is physically demanding, mostly experienced as unpleasant by the catching teams, and the welfare of the birds may be further compromised by fatigue among the catchers [24,30,31].

Specific to broiler chickens, mechanical harvesting is an alternative to manual catching. There are two main types of mechanical systems: a sweeping system with rotating rubber fingers or lifting conveyor belts transporting the chickens to the containers [32]. Studies that have compared animal welfare during mechanical versus manual catching are not unanimous. One research [33] mentioned better animal welfare for mechanical catching than manual catching, while [34,35] concluded the opposite. Heterogeneity between study outcomes likely relates to differences in the type of mechanical harvester and the experience and attitude of the staff operating the machine. If mechanical catching is operated correctly, it can reduce the risk of injuries compared to manual catching [7].

Chickens that have been caught are subsequently crated in containers (a container consists of several drawers that must be opened and closed to fill the drawers) or crates (a crate has an opening at the top and chickens are placed in the crate through this opening). The design of these containers and crates plays an important role [36]. Crating broilers is easier in containers with wide drawers than in crates with smaller openings, while the last one can cause wing damage. However, containers with wide drawers have a higher risk of broilers escaping [37,38]. According to a recent study on laying hens, crates are associated with a higher prevalence of body part entrapments (0.006 ± 0.021% vs. 0.037 ± 0.041%) but a reduced risk of injuries (0.014 ± 0.020% vs. 0.002 ± 0.040%) in comparison with containers [39].

Fitness for transport selection, catching, and crating have all been studied previously, but there is limited information regarding the opinions and experiences of the poultry farmers. This study aimed to survey Flemish poultry farmers to get an in-depth view of the entire pre-transport process on commercial farms. Moreover, because poultry farmers remain responsible for the chickens during the entire pre-transport phase, it is important to investigate their opinion on selecting poultry unfit for transport, catching, and crating. Their insights on these aspects can indeed be very decisive for the success and ease with which changes can be implemented in practice.

2. Materials and Methods

A quantitative survey about the selection, catching, and crating process (laying hens and broiler chickens) was conducted amongst poultry farmers in Flanders (Belgium) and was based on a prior qualitative farmer (n=5) face-to-face interviews with open questions about the procedures, and farmer opinions on, selecting, catching, and crating poultry. The answers to the open questions were used to formulate appropriate and realistic questions and answer options for the quantitative survey. The survey for laying hen and broiler chicken farmers was created with an online survey tool (LimeSurvey, www.LimeSurvey.org).

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2.1. Respondents

Contact details (phone number, address, and e-mail address) of 156 laying hen and 203 broiler chicken farmers were obtained from the Department of Agriculture and Fisheries in Flanders. These were believed to be a random sample of the total population of 177 laying hen farmers and 522 broiler chicken farmers that were registered in Flanders in 2022 [40]. In April 2022, all poultry farmers on the contact list were invited by email to participate, follow-up calls were made at the beginning of June 2022 to increase the response rate and the survey was closed at the end of June 2022. In total, 31 laying hen (20%) and 48 broiler (24%) farmers filled out the questionnaire completely, and another 134 farmers (49 laying hen and 85 broiler chicken farmers) filled it out partially. Depending on the question, the number of responses varied between 84 and 133 for broiler farmers, and between 42 and 80 for laying hen farmers.

2.2. Questionnaires

There were two questionnaires, one for laying hen farmers and one for broiler chicken farmers. In general, the questions were the same for both surveys, only the answering options for some questions could differ (see supplementary material). Both questionnaires were divided into three sections. The first part gathered demographic data about the farmer-respondent (age, gender, highest level of education completed) and general information about the farm, including location, poultry type, slaughter weight (kg), and slaughter age (in days for broilers, and weeks for laying hens) of the most recently completed production cycle. In the second part, multiple choice questions were asked about the procedure for identifying unfit chickens to be culled during the most recent inspection rounds (performer, reasons for culling, bottlenecks, and advantages). Additional questions were asked regarding the most recent extra selection before catching to remove birds unfit for transport. For the third part, farmers were asked to focus on the most recent catching and loading event on their farm and to provide details on (1) the preparations they had made, including the removal of litter (laying hens), the closing of laying nests (laying hens), changes to the light schedule, and the withdrawal of food and water (multiple choice); (2) the timing of the event (start and end time); (3) the used catching method and type of container/crate, and its influence on animal welfare; (4) the presence and role of the poultry farmer; points of attention during catching and loading (multiple choice); (5) bottlenecks (e.g. noise, stress, injuries, and inefficiency linked to the catching team's behavior) (on a scale from 0 to 100%, with 0% = not present at all and 100% = present); (6) communication with the catching team; (7) economic data (price per chicken and method of payment for the catching team). In addition, they were asked to rank (from most preferred to least preferred) nine (laying hens) or 10 (broilers) different catching methods with regards to economy and time efficiency, the well-being of the catcher, and animal welfare. The catching methods were (a) two chickens in one hand by one leg, (b) two chickens in one hand by two legs, (c) three chickens in one hand by one leg, (d) three chickens in one hand by two legs, (e) more than three chickens in one hand by one leg, (f) more than three chickens in one hand by two legs, (g) one chicken upright, (h) two chickens upright, (i) mechanical harvesting (only for broilers), and (j) wing catching. Finally, the participants could fill in their e-mail addresses and confirm whether they were interested in being informed about the survey results and the larger research project on the pre-slaughter phase in poultry.

2.3. Statistical Analysis

Response data were analyzed using R (version 4.2.1). Continuous variables (e.g. number of chickens per catching movement, the influence of the type of container/crate on animal welfare, opinion of different catching methods, communication catching team, and price per chicken) were analyzed using linear regression, with the type of livestock farmer (laying hen or broiler chicken) as a fixed effect. Differences were reported as least squares mean. Continuous data were assumed to be normally distributed based on visual inspection of model residuals (graphical assessment using QQ-plot and histogram). Binomial variables for selecting chickens (present or absent; e.g. performer, reasons, bottlenecks, advantages, and extra selection) and catching and loading (present or absent; e.g. preparations, for or against daytime loading, which catching method, presence, and role of the poultry farmer, points of interest, payment of the catcher) were analyzed using logistic regression, with the type of livestock farmer as a fixed effect. Differences were reported as back-transformed least squares mean (the proportions or percentages of occurrence). The answers within the type of livestock farmer were compared and also between the type of livestock farmers (laying hen vs. broiler chicken). P-values less than 0.05 were considered significant.

3. Results and Discussion

3.1. General Information

Most laying hen and broiler chicken farmers were older than 45 years (78% and 69% respectively), the majority were male (79% and 80%), and had a high school diploma as their highest degree (70% and 68%) (Table 1). Most laying hen farmers used an aviary (42%) or an enriched cage (37%) system. The number of chickens per stable typically ranged from 10,000 to 30,000 (Table 1). The mean slaughter age and weight of broiler chickens was 28 ± 13 days and 1.70 ± 0.73 kg at the time of thinning, and 38 ± 14 days and 2.44 ± 0.76 kg at the end of the production cycle (n=118). The average slaughter age of the white laying hens was 90 ± 20 weeks (n=11) and for the brown laying hens 85 ± 18 weeks (n=41).

Table 1. Characteristics of the laying hen and broiler chicken farmers/farms who filled out at least a part of the survey, with NA = Not Applicable.

Characteristics	Laying hen farmers	Broiler chicken farmers
	n=80	n=133
Age (%)		
<18 – 25 years	0 (n=0)	2 (n=2)
25 - 35 years	8 (n=6)	17 (n=22)
35 - 45 years	14 (n=11)	14 (n=19)
45 - 55 years	25 (n=20)	35 (n=46)
55 - 65 years	50 (n=40)	32 (n=42)
> 65 years	3 (n=3)	2 (n=2)
	n=80	n=132
Gender (%)		
Male	79 (n=63)	80 (n=106)
Female	21 (n=17)	20 (n=26)
X	0 (n=0)	0 (n=0)
	n=74	n=131
Highest education level (%)		
Secondary degree	70 (n=52)	68 (n=89)
High school degree	20 (n=15)	25 (n=33)
University degree	10 (n=7)	7 (n=9)
	n=80	n=134
Location of farms (Flemish provinces) (%)		
Antwerp	39 (n=31)	37 (n=49)
Limburg	19 (n=15)	11 (n=15)
East-Flanders	10 (n=8)	16 (n=21)
Flemish Brabant	1 (n=1)	2 (n=3)
West-Flanders	31 (n=25)	34 (n=46)
	n=57	
Housing system (%)		NA
Aviary	42 (n=24)	

Cage	37 (n=21)	
Ground	12 (n=12)	
	n=57	n=110
Breed (%)		
Lohman	26 (n=15)	NA
Isa Brown	26 (n=15)	NA
Dekalb White	18 (n=10)	NA
Nova Brown	12 (n=7)	NA
Bovan Brown	14 (n=8)	NA
Roman Classic	4 (n=2)	NA
Ross 308	NA	95 (n=104)
Sasso	NA	2 (n=2)
Hubbart	NA	3 (n=4)
	n=57	n=110
# of chickens in stable (%)		
< 10,000	23 (n=13)	10 (n=11)
10,000 – 20,000	33 (n=19)	41 (n=45)
20,001 – 30,000	28 (n=16)	25 (n=27)
30,001 – 40,000	7 (n=4)	15 (n=16)
> 40,000	9 (n=5)	10 (n=11)

3.2. Selection of Unfit Chickens During The Production Cycle

As part of daily routine inspections throughout the production round, the selection of (moribund) chickens to be removed from the flock was predominantly done by the poultry farmer him-/herself, and on a minority of farms by farm staff (Table 2). Employing staff for selecting chickens was more common for layers than broilers (14% vs. 4%; P=0.03). During the production cycle, birds could be ill or injured [41].

The most commonly reported reasons for removal were leg problems/lameness (57%) or feather-pecked chickens (43%) for layers, with feather-pecking potentially leading to cannibalism and high mortality rates [42,43]. In the EU-legislation for laying hens, no specific criteria are indicated for selecting unfit chickens during the production cycle [16]. Thus, it is difficult for the laying hen farmers to know whether they comply with the legislation. To solve this problem, it is advised that the EU-legislation provides clear guidelines for the laying hen farmers according to the criteria for selecting unfit laying hens during the production cycle. For broilers, leg problems/lameness (85%) and stunted growth (71%) were mentioned the most as reasons for selecting unfit chickens during the production cycle (Table 2), with lameness (86.4%) and broken legs (79.5%) also noted as culling reasons in literature [42]. The EU-legislation for broiler chickens stipulates criteria for selecting unfit chickens during the production cycle e.g. seriously injured animals or evident signs of health disorders including walking difficulties, severe ascites, or severe malformations [15]. Leg problems/lameness can be linked to walking difficulties. Furthermore, severe ascites or severe malformations were not indicated by the surveyed broiler chicken farmers. Although these criteria were not present as options in the survey, the surveyed poultry farmers could mention other criteria by themselves.

Laying hen farmers most commonly reported time constraints (33%) as the primary bottleneck for selection. In contrast, broiler farmers most frequently reported financial (47%) and time (35%) constraints as their main challenges. Selecting unfit birds is time-consuming but cost-saving by reducing feed costs and disease spread [12,44]. Both groups rarely mentioned a lack of knowledge about which poultry to select as a bottleneck (layers: 8% vs. broilers: 7%). Specific knowledge on identifying unfit birds should be the focus of the farmers, with veterinarians advising farm staff in identifying unfit birds [19,45,46]. Concerning the advantages of selection, laying hen farmers prioritized animal welfare over flock uniformity and reduced feed waste (55% vs. 29% & 30%; P=0.03). Broiler farmers prioritized animal welfare over reducing feed waste (74% vs. 47%; P<0.001). Overall, broiler farmers considered animal welfare (74% vs. 55%; P<0.01), flock uniformity (66% vs. 29%;

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P<0.001), and reducing feed waste (47% vs. 30%; P=0.04) to be more important than laying hen farmers did (Table 2). For both broiler chicken and laying hen farmers, it is essential to have an inspection protocol that is efficient and not time-consuming based on scientific and legislative recommendations.

Table 2. Multiple choice answers (multiple answers are possible and lead to summed percentages higher than 100%) about the performer, reasons, bottlenecks, and advantages of selecting chickens during the production cycle according to laying hen and broiler chicken farmers.

Selection	Laying hen farmers	Broiler chicken farmers	*P*-value
	n=66	n=103	
Performer (% of respondents)			
Farmer	79^{x}	90^{x}	**0.04**
Farm staff	14^{y}	4^{z}	**0.03**
Company veterinarian	0^{xy}	15^{y}	0.10
No one	21	29	NA
	n=44	n=86	
Reasons (% of respondents)			
Stunted growth	14^{y}	71^{x}	**<0.001**
Leg problems/lame birds	57^{x}	85^{x}	**<0.001**
Feather pecking (victim)	43^{x}	3^{y}	**<0.001**
E. coli	32^{yz}	26^{z}	0.45
Huddled chickens	18^{yz}	13^{yz}	0.41
	n=66	n=103	
Bottlenecks (% of respondents)			
Financial	15^{y}	47^{x}	**<0.001**
Time	33^{x}	35^{x}	0.83
Insufficient knowledge	8^{y}	7^{y}	0.85
	n=66	n=103	
Advantages (% of respondents)			
Animal welfare	55^{x}	74^{x}	**0.01**
Uniformity of the animals	29^{y}	66^{x}	**<0.001**
Preventing of disease	49^{xy}	63^{xy}	0.06
Less feed waste	30^{y}	47^{y}	**0.04**

Significant P-values (P < 0.05) between laying hen and broiler chicken farmers are indicated in bold and P-values between 0.05 and 0.10 are underlined. Superscripts (x,y,z) indicate pairwise significant differences within the column.

3.3. Preparations before Catching and Loading

Figure 1 gives an overview of the average timeline of the preparatory phase before the onset of the catching and loading of birds as reported by the laying hen (n=51) and broiler farmers (n=77).

3.1.1. Feed Withdrawal

For feed withdrawal before catching and loading, 19% of broiler chicken and 69% of laying hen farmers withdraw feed earlier than 12 hours and exceed the limit of 12 hours stipulated in EU-legislation [15], causing potential hunger and intestinal cell breakdown in poultry [7,21]. Scientific recommendations suggest six to eight hours before the scheduled loading time [7], this recommendation was met by 54% of broiler chicken and 15% of laying hen farmers. Furthermore, laying hen farmers (13.3 ± 6.0 h) (n=26/51) closed feed lines earlier than broiler chicken farmers did (7.6 ± 3.1 h) (n=59/77) (Figure 1).

3.1.2. Extra selection before catching and loading

A quarter (25%, n=14/57) of laying hen farmers and 39% (n=37/94) of broiler chicken farmers performed an additional selection round shortly before the catching and loading event to remove birds unfit for transport (Figure 1). These broiler and laying hen farmers selected birds unfit for transport based on the selection criteria during the production cycle such as stunted growth, leg problems/lameness, feather pecking, *E. coli*, and huddled chickens. One broiler farmer only removed the dead birds during this extra selection, sick or ill animals were not selected. The EU-legislation [8] and scientific research [7] stipulate that unfit animals shall not be transported with the following criteria: 1) inability to move independently without pain or to walk unassisted (severe lameness: unable to stand or walk more than a few steps), 2) evident signs of illness, 3) broken bones (legs and wings) and dislocations, 4) presence of a severe open wound and prolapse, 5) cachexia and emaciation, 6) wet plumage in low effective temperature (except for ducks and geese), and 7) poor feather cover in end-of-lay hens [7]. According to these criteria, not all of them were mentioned as options in the survey, however, the surveyed poultry farmers could indicate other criteria by themselves.

Furthermore, the EU-legislation and scientific research recommend an extra selection before catching and loading [7,8], more specifically within 12 hours [7]. Not all poultry farmers performed the extra selection within 12 hours before catching and loading, namely a minority of the broiler (19%) and laying hen (7%) farmers performed this selection too early (>12 hours). According to our survey broiler chicken farmers (6.8 ± 7.0 h) (n=37/77) started earlier with the additional selection just before catching and loading than laying hen farmers (5.1 ± 5.9 h) (n=14/51), and within 12 hours. This lasted on average for about 1.2 ± 0.9 h for laying hen flocks and about 0.9 ± 0.8 h for broiler chicken flocks.

In summary, many chicken farmers did not perform an additional selection before catching, and specific criteria such as the presence of a severe open wound and prolapse, cachexia and emaciation, wet plumage in low effective temperature, and poor feather cover in end-of-lay hens were not mentioned, however, the surveyed poultry farmers could have given these as other options.

3.1.3. Water Withdrawal

Specific for withdrawal of water as preparation, laying hen farmers (47.9 ± 51.1 min before the onset of catching) (n=14/51) withdrew water earlier than the broiler chicken farmers (20.6 ± 23.3 min before the onset of catching) (n=48/77). Water should be provided close to catching stipulated by scientific research, but not mentioned by the EU-legislation to avoid dehydration [7,8,27,44]. This is practiced by 71% of broiler farmers (between 0 and 15 minutes before catching and loading) in contrast only 27% of laying hen farmers (between 15 and 120 minutes before catching and loading).

3.1.1. Other Preparations Specific for Laying Hens

Among the 36 laying hen farmers without a cage system specifically, seven removed the litter (average: 27.6 ± 21.4 h), eight closed the area under the aviary system with fences (average: 9.1 ± 11.6 h), and 14 closed the laying nests (average: 4.9 ± 5.8 h) (Figure 1). These steps simplify the catching process, reduce carrying distances, improve container transport, and reduce slippage, resulting in less stressed chickens and improved working conditions [1,7,45].

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In summary, better planning based on the expected slaughter time is needed. Clear guidelines and agreements between the poultry farmer, catching team, transporter, and slaughterhouse are essential, and taking into account differences between layers and broilers especially catching laying hens in an aviary system (catching during dark period because laying hens are on the system and easier to catch). The event planner should specify actions aligned with the slaughter schedule.

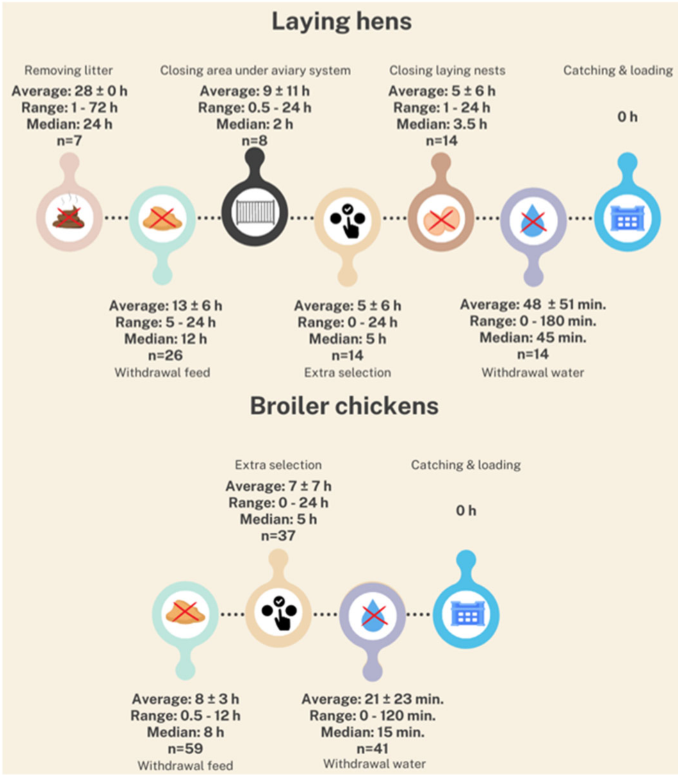

Figure 1. Timeline on how much time before catching the different preparations took for laying hen (n=51) and broiler chicken (n=77) farmers with timeframes indicated by the surveyed poultry farmers. Specific for the extra selection, 57 laying hen farmers and 94 broiler chicken farmers answered the question.

3.4. Catching and Crating for Transport

During the catching of laying hens, completely dark (66%) occurred the most according to the lighting schedules with completely dark, dimming lights and no change of the lightning schedules (e.g. when it's dark outside no chance in lightning schedules is required) as different options. There was no difference in completely dark and dimming lights for broiler chicken farmers as changes in the lighting schedules (Table 3). No poultry farmers indicated using blue light in the stable, which is known to calm chickens and give the catchers more visibility during the catching process to minimize the risk of accidents [1,44,46,47]. For laying hens, catching always began in the evening (from six to 12 p.m.) (Table 3). In contrast, the starting time for catching broiler chickens showed a wide range from the early morning to the late evening. For laying hens, catching and loading typically ended late in the evening or early in the morning, whereas for broilers it extended from late evening until noon (Table 3). Catching, crating, and loading occur predominantly in the dark when the animals are calmer, less stressful, and easier to catch as mentioned in the literature [1,27,48–50]. Furthermore, 20% of broiler farmers and 10% of laying hen farmers expressed a preference for daytime loading, with broilers reportedly being calmer during the day compared to laying hens. To facilitate daytime catching, the use of curtains is recommended to reduce sunlight and help keep chickens calm [24,51].

All laying hens were caught manually with 52% caught by one leg and 48% by two legs. Similarly, nearly all broiler flocks (99%) were caught manually with 82% by one leg and 18% by two legs, except for one flock. The Chicken Cat Harvester (Antwerp, Belgium) was used for the single flock of broilers that was caught mechanically. The mean and median for laying hen (range: 2 - 10

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chickens) and broiler chicken (range: 2 - 12 chickens) farms is for a catcher to carry and crate five chickens at a time. Remarkably, on 4% of the broiler chicken farms, more than nine chickens were carried and crated at a time (Table 3).

Table 3. Lighting schedules, start and end time catching and loading, number of chickens per catch by the catcher, presence of the poultry farmer during catching and loading, and the task of the poultry farmer during catching and loading according to laying hen and broiler chicken farmers.

Catching and loading	Laying hen farmers	Broiler chicken farmers
	n= 35	n=60
Lighting schedules (% of respondents)		
Completely dark	66 (n=23)	50 (n=30)
Dimming lights	26 (n=9)	50 (n=30)
No change	9 (n=3)	0 (n=0)
	n=42	n=65
Start time (% of respondents)		
0 – 2 a.m.	0	17 (n=11)
3 – 5 a.m.	0	25 (n=16
6 – 8 a.m.	0	26 (n=17)
9 – 12 a.m.	0	2 (n=1)
1 – 3 p.m.	0	0
4 – 5 p.m.	0	0
6 – 8 p.m.	62 (n=26)	3 (n=2)
9 – 12 p.m.	38 (n=16)	28 (n=18)
	n=42	n=65
End time (% of respondents)		
0 – 2 a.m.	55 (n=23)	12 (n=8)
3 – 5 a.m.	19 (n=8)	9 (n=6)
6 – 8 a.m.	2 (n=1)	28 (n=18)
9 – 12 a.m.	0	37 (n=24)
1 – 3 p.m.	0	3 (n=2)
4 – 5 p.m.	0	6 (n=4)
6 – 8 p.m.	0	0
9 – 12 p.m.	24 (n=10)	5 (n=3)
	n=42	n=65
# of chickens per catch (% of respondents)		
2	17 (n=7)	0
3	0	0
4	33 (n=14)	25 (n=16)
5	12 (n=5)	60 (n=39)
6	29 (n=12)	9 (n=6)
7	0	2 (n=1)
8	5 (n=2)	2 (n=1)
9	2 (n=1)	0
10	2 (n=1)	2 (n=1)
12	0	2 (n=1)
	n=43	n=65
Presence of poultry farmer (% of respondents)	5 (n=2)	9 (n=6)
Start	2 (n=1)	0
End	93 (n=10)	91 (n=59)

Whole process		
	n=42	n=65
Task Poultry farmer (% of respondents)		
Supervision	72 (n=31)	77 (n=50)
Instructions	30 (n=13)	23 (n=15)
Catching	12 (n=5)	18 (n=12)

For most catching events, the farmer stated to have been present from the beginning until the end of the catching and loading process (layers: 93% and broilers: 91%). A small percentage was present only at the start (layers: 5% and broilers: 9%) or at the end of the catching process (layers: 2%). During catching and loading, poultry farmers mainly supervised (observing) (layers: 72% and broilers: 77%), and some also gave instructions (layers: 30% and broilers: 23%) or helped with the catching (layers: 12% and broilers: 18%). Poultry farmers stated to prioritize the handling quality by the catchers of the chickens (layers: 89% and broilers: 95%), compared to costs associated with the catching and loading process (layers: 59% and broilers: 36%). Furthermore, scientific research mentioned that the catchers' attitude impacts animal handling quality [52–54]. Notably, more broiler chicken farmers than laying hen farmers mentioned that the type of container/crate influenced animal welfare (48% vs 27%, $P<0.05$) (Figure 2). The design of the container/crate plays an important role [36], as improper crating can cause harm [45]. Modular systems, which are placed near the chickens, have been shown to reduce DOA rates [55]. Bottlenecks during catching and loading, such as a lot of noise (layers: 28 ± 20% and broilers: 25 ± 19%), injuries due to catching (layers: 20 ± 19% and broilers: 23 ± 23%), and uneven distribution of chickens in containers (layers: 22 ± 20% and broilers: 28 ± 29%) were present to a lesser extent according to the poultry farmers, indicated by the low percentage on a scale from 0 to 100% (0% = not present at all and 100% = present). The communication with the catching team was scored (on a scale from 0 to 100%, with 0% = no communication and 100% = perfect communication) by the laying hen farmers as 84 ± 19% (n=31) and by broiler chicken farmers as 73 ± 26% (n=47), on average. Surveyed poultry farmers reported positive outcomes from the catching process, including good communication with catchers, minimal noise, reduced injuries to the animals, and even distribution of chicken in containers, all contributing to a smoother progression of the catching and loading. The majority of both laying (81%) and broiler chicken (75%) farmers paid the catching team per chicken, with an average price of €0.19 ± 0.06 and €0.034 ± 0.003 per laying hen and broiler chicken, respectively. For a flock of 20,000 chickens, this amounts to €3800 for layers and €680 for broilers.

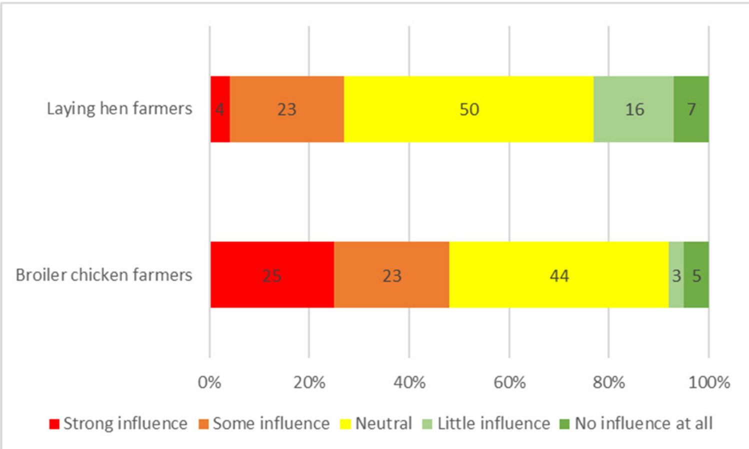

Figure 2. Opinion on the influence of the container/crate on animal welfare by laying hen and broiler chicken farmers.

3.5. Farmers' Opinion about Catching Methods

Figure 3 shows the farmers' preference ranking for 10 (broiler) or 9 (layers) different catching methods according to cost and time efficiency, catcher well-being, and bird welfare. In this study, almost all chickens were caught inverted, a common method used by farm staff [7], and preferred for cost and time efficiency, catcher well-being, and bird welfare. More chickens were caught by one leg than by two, on a minority of broiler (8%) and laying hen (9%) farms. More than six birds were carried at once in contrast with the other poultry farmers mentioning worse animal welfare and catcher well-being with more than two birds per hand. Furthermore, there was no significant difference in preference for catching chickens by one or two legs with an equal number of chickens per hand based on cost and time efficiency, catcher well-being, and bird welfare. Regulation 1/2005 [8] prohibits lifting or dragging animals by their legs or causing unnecessary pain. Best practices recommend catching poultry with two legs while supporting the body, with a maximum of three birds at once [7,49,56]. Furthermore, maximizing the weight per lift by 2 kg in laying hens results in less physical strain for the catcher [57].

In addition, according to the surveyed broiler chicken farmers, carrying one chicken upright is considered animal-friendlier than holding more than three birds inverted per hand, but less efficient. Specific for upright catching, no significant difference was found in preference between catching one or two chickens. It is advised to avoid inverted carrying of chickens as it can cause more injuries (e.g. dislocated joints, leg or wing fractures, and bruises) and stimulate wing flapping compared to an upright position [7]. Therefore, upright catching could improve animal welfare, with a reduction of chicken stress and avoidance of discomfort (obstruction of breathing due to the absence of diaphragms) by not being held upside-down [44,58,59]. Furthermore, upright catching results in shorter handling durations than catching by the legs of four or more chickens because only one or two chickens are caught per time [60]. Upright catching reduces stress and injuries but requires 70% more labor and is more exhausting according to catchers [29,57,59]. In addition, the total catching process of upright catching takes longer compared to inverted catching [57,59].

Only one broiler chicken farmer used mechanical catching, which is better for the catcher's well-being but worse for animal welfare and cost and time efficiency compared to manual catching based on the opinion of the surveyed broiler farmers. Mechanical catching reduces stress (limited contact between human and animal) [33,61,62] and injuries [32,33,63] if the catching machine is operated correctly with trained personnel [7], in contrast with other studies [34,64,65]. Mechanical catching has limitations such as extra costs (purchase, transport, and cleaning), elevated biosecurity risks (difficult to clean the machine and can result in a higher chance of contamination), and the requirement for stables to be accessible for large machinery [63,66].

In summary, inverted catching is common in Flanders, with chickens typically caught by one leg, though catching by both legs is recommended as best practice [7,49,56]. Upright catching can improve animal welfare (scientific), but is more time-consuming, costly, and tiring for catchers [57]. Mechanical catching has potential benefits for both catchers and animal welfare (scientific), but it is not widely used in Flanders due to its limitations.

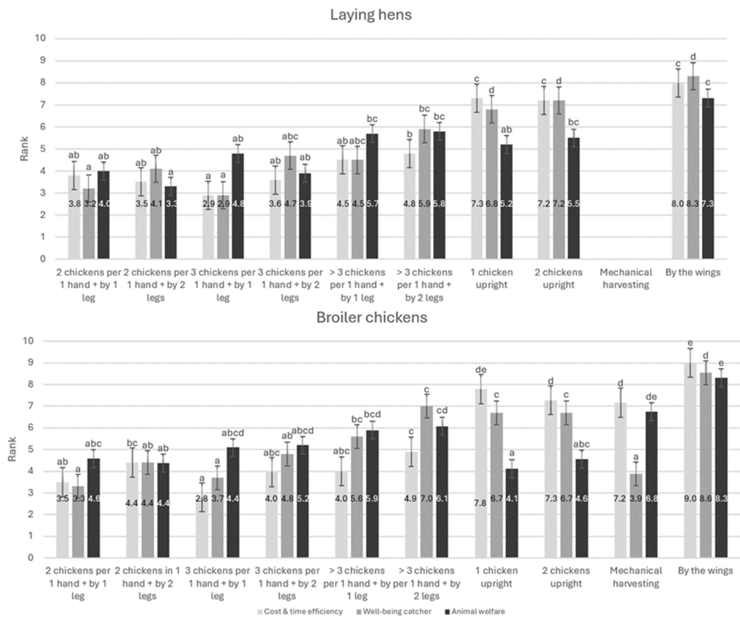

Figure 3. The preference of 10/9 different catching methods based on cost and time efficiency, the well-being of the catcher, and animal welfare by broiler chicken (n = 52) and laying hen (n = 38) farmers ranked from 1 (most preferred) to 10/9 (least preferred). Significant differences (post-hoc test with Tukey correction for all pairwise comparisons) between catching methods per category (cost and time efficiency, the well-being of the catcher, and animal welfare) are indicated with a,b,c,d, and e superscripts.

4. Conclusions

In conclusion, educating and sensitizing poultry farmers and their staff about culling poorly conditioned animals is vital to prevent birds from suffering during the pre-transport phase. Establishing and using guidelines for selecting chickens throughout the production cycle is essential. Additionally, a minority of the poultry farmers performed an additional selection within 12 hours before catching. Raising awareness about performing this additional selection is essential because it can prevent the suffering of unfit birds during transport. While upright catching improves animal welfare according to scientific research, it is not practiced by the farmers in our survey. Mechanical catching could benefit catchers but is uncommon in Flanders. Effective communication and respect for animal welfare are essential to reduce noise, and injury, and ensure efficient catching and crating.

5. Patents

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