

ORIGINAL ARTICLE

# Perception of beef cattle producers in the state of Paraná regarding animal identification by hot iron branding

*Percepção de produtores de bovinos de corte do Paraná em relação à identificação animal a ferro quente*

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## Abstract

The aim of this work was to study the perception of beef cattle producers in the state of Paraná, Brazil, about hot iron branding. Seventeen beef cattle producers answered a questionnaire about their perspective on cattle identification methods and animal welfare aspects. Results showed that there is a consensus among farmers that the identification of animals at their farms is an important practice. The majority of farmers (12/17) use hot iron branding as the main method of identification of cattle and most farmers (11/17) believe it is an efficient method. Considering costs and applicability, 10/17 farmers believe there are other methods of identification that would be viable for utilization at their farms; ear tagging (7/17) and microchipping (3/17) were the most mentioned alternatives. Farmers affirmed believing that animals are sentient beings (16/17) and capable of experiencing pain (17/17). On a scale from 1-5, scores attributed to pain experienced capabilities of different species were high for human babies, sheep and dogs (median = 5.0). The median score attributed to the pain experienced by cattle during branding with a hot iron was 4.0, ranging from 2.0 to 5.0. In conclusion, the opinion of cattle producers in the State

of Paraná, Brazil, indicates recognition of animal sentience and their ability to experience pain. Future efforts should focus on refining and developing new methods that are effective and inexpensive, motivating producers to use procedures that respect the quality of life of their animals.

**Keywords:** Bovine. Farmers. Identification. Opinion. Pain.

## Resumo

*O objetivo deste trabalho foi estudar a percepção de produtores de bovinos de corte do Paraná sobre a marcação de animais a ferro quente. Dezesete produtores de gado de corte responderam um questionário sobre sua percepção acerca da identificação de bovinos e sobre aspectos de bem-estar animal. Os resultados mostraram consenso sobre a importância da identificação dos animais em suas propriedades. A maioria dos produtores (12/17) usa o ferro quente como principal método de identificação do gado e julga que esta seja uma prática eficiente (11/17). Considerando custos e praticidade, 10/17 produtores*

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*acreditam que existem outros métodos de identificação viáveis para utilização em suas fazendas, sendo o brinco e o microchip as alternativas mais mencionadas. Os produtores afirmaram considerar os animais seres sencientes (16/17) e capazes de experimentar dor (17/17). Em uma escala de 1-5, os escores atribuídos pelos produtores à capacidade de sentir dor em diferentes espécies foram mais altos para bebês humanos, ovinos e cães (mediana = 5.0). O escore mediano atribuído à dor que o bovino sente ao ser marcado com ferro quente foi 4.0, variando de 2.0 a 5.0. Conclui-se que a opinião de parte dos produtores de bovinos do Paraná, Brasil, expressa o reconhecimento da senciência animal e da dor experimentada por eles. Esforços futuros devem ser concentrados em refinar e desenvolver novos métodos que sejam efetivos e acessíveis, motivando os produtores a realizar procedimentos que respeitem a qualidade de vida dos seus animais.*

**Palavras-chave:** Bovinos. Pecuaristas. Identificação. Opinião. Dor.

## Introduction

Concerns about animal welfare have focused largely on the pain and distress animals may experience as a result of common practices held on farms (von Keyserlingk et al., 2009). Of many other affective states that animals experience, pain is the most emotive of public concerns about animal welfare (Weary et al., 2006).

In beef cattle farms, animals are often submitted to management practices that are considered important to maintain control and productivity, but have a high cost to the quality of life of cattle. Of all painful practices performed at beef cattle farms, hot iron branding is of special interest. It is still common practice in cattle farms all over the world, despite all the scientific information indicating its aversive effects on animals and also its lack of efficiency on actually identifying animals (Lindegård and Andersen, 2012). Branding is required by various governments, for example, to facilitate the export of cattle from Canada to the United States (Schwarzkopf-Genswein et al., 2012). Also, in Brazil, all cattle vaccinated for brucellosis are required by law to be branded with the two final

numbers of the current year shaped by hot iron or liquid nitrogen on the left side of the face, with no recommendation about pain control (Brazil, 2016). Hot iron branding negatively impacts animal welfare in at least three different aspects: stress due to restraining the animal before and during the procedure, immediate pain during branding, and pain in the hours following the procedure (Rushen et al., 2009). Cattle responses to branding include increases in heart rate and plasma cortisol, escape avoidance reactions, tail flicking, kicking, and vocalization, all indicative of discomfort and pain. For example, in a study conducted in Canada, cattle being branded with hot iron showed significantly greater frequencies of tail flicks, kicks, falls in the chute, and vocalizations than animals experiencing a sham branding procedure (Schwarzkopf-Genswein et al., 1997). Recently, cattle being branded with hot iron vocalized more frequently and displayed specific facial expressions associated with pain in a higher proportion than animals sham branded (Müller, 2014).

The availability of other less painful methods for individual identification of cattle leads to doubts about the actual need of hot iron branding. For example, freeze branding consistently appears to cause less pain to cattle than traditional hot iron branding (Lay Jr et al., 1992; Schwarzkopf-Genswein et al., 1997). Individual identification can also be achieved by other relatively less invasive practices such as ear tagging, tattooing, and microchip implantation. In a study with horses, Erber et al. (2012) have shown that microchip implantation resulted in less pronounced pain reactions than hot iron branding. In this case, branding, but not microchip implantation, caused necrotizing burn wounds and generalized increased superficial body temperature, which are indicative of significant tissue damage (Erber et al., 2012). A change on identification regimes at farms from hot iron branding to other methods could represent the end of a practice that causes needless pain to the animals in our care and which is also outdated and at odds with legislative advances and public opinion (Lindegård and Andersen, 2012).

The implementation of such changes, however, requires all stakeholders, to designate their perspective and address possible restrains (Weary et al., 2006). Although there is a general

agreement about the effects of pain on animal welfare, farmers may perceive little opportunity for attenuating these problems without serious economic drawbacks, leading to a conflict between interests and values (Millman, 2013). In order for pain mitigation strategies to be actively adopted, they must be effective for the animals, but also available and in harmony with public concern and farmer expectations (Schwartzkopf-Genswein et al., 2012; von Keyserlingk and Hötzel, 2015). The aim of this study was to identify the perception of beef cattle producers in the state of Paraná about hot iron branding and collaborating to the discussion about the methods of cattle identification and future perspectives on the adoption of less invasive and painful practices.

## Material and methods

This experiment was approved by the Research Ethics Committee at the Health Science Sector of the Federal University of Paraná, Brazil, during session on December 11, 2014, and is registered under the protocol number 909402. A questionnaire was developed to investigate producer knowledge and

perspectives about identification methods for cattle and his/her opinion on animal welfare aspects. The full questionnaire contained 14 objective and open questions, of which five were demographic inquires, five were related to cattle identification methods, and four regarded animal welfare issues (Table 1).

In order to obtain contact details of beef cattle producers in the state of Paraná, a total of nine institutions related to the beef cattle industry were contacted, including governmental organizations, producer associations, and private companies. At first contact, institutions were asked about their interest on participating on the project and, in the case of a positive answer, registered producer contact information was required for direct communication via telephone. All institutions received a short description of the project, and the full questionnaire with a copy of the approval letter by the Ethics Committee attached.

When farmer contact details were provided, they were reached via phone calls, provided with a brief explanation about the project and asked about their interest on contributing to the research. If they were willing to participate, producers were instructed to answer the questionnaire, which took them about five minutes to complete.

**Table 1** - Non-demographic questions and possible answers present on the questionnaire given to beef cattle farmers in the state of Paraná, southern Brazil, 2015

Questions	Possible answers
6 - Do you believe animal identification is an important practice at your farm?	( ) Yes ( ) No
7 - Is hot iron branding the standard procedure for identification of cattle in your farm?	( ) Yes ( ) No
a - If yes, for how long have you been using hot iron branding?	Open answer
b - If not, which other identification method do you use at your farm?	Open answer
8 - Do you believe hot iron branding is an efficient method for identification of cattle?	( ) Yes ( ) No
9 - Do you know any other methods for identification of cattle? Which other methods do you know?	Open answer
10 - Considering costs and applicability, do you believe other methods of identification are viable for utilization at your farm?	( ) Yes ( ) No
a - If yes, which?	Open answer
b - If not, why?	Open answer
11 - Do you believe animals are sentient beings, meaning they are capable of experiencing feelings?	( ) Yes ( ) No
12 - Do you believe animals are capable of experiencing pain?	( ) Yes ( ) No
13 - In a scale from 1 to 5, where 1 = none and 5 = maximum imaginable, what is the capability of each of the following animals of experiencing pain: Pigeon, Butterfly, Human baby, Rat, Dog, Chicken, Fish, Sheep, Cattle, Cockroach, Wolf	( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5 ( ) I don't know
14 - In a scale from 1 to 5, where 1 = none and 5 = maximum imaginable, how much pain do you believe cattle experience during branding with a hot iron?	( ) 1 ( ) 2 ( ) 3 ( ) 4 ( ) 5 ( ) I don't know

## Statistical Analyses

All objective and open answers were compiled and simple descriptive analysis was performed. Effects of species on the attributed pain capability scores given to animals by farmers, as well as effects of demographic status on the use of hot iron branding as standard procedure for identification of cattle, on general scores attributed by farmers to animals' capability of experiencing pain, and on the score given by producers to the perceived pain intensity experienced by cattle during hot iron branding were tested using the Kruskal-Wallis test followed by the Dunn's test for classification of results. All statistical analyses were performed using the statistical software BioEstat 5.0 (Instituto Mamirauá, 2007).

## Results

Only one of all nine institutions agreed to participate in the project. Five institutions denied disclosing producer information after analyzing the description of the project and the questionnaire. Most negative answers were justified upon privacy policies and protection of producer information. The institution which agreed to participate was founded by producers and it contributed with contact details of eleven producers, which represented all farmers registered with them. Contact detail of 13 other producers was kindly provided by one producer who demonstrated great interest on the survey. After contacting all 24 producers, 17 were willing to participate in the questionnaire. Demographic information from interviewed farmers can be seen on Figure 1.

Demographic information about producers showed that 16 out of 17 producers interviewed were male, 11/17 were 40 years or older, and 10/17 had completed higher education. Only 3/17 producers declared that farming was their full-time occupation, while 6/17 also work as veterinarians and 8/17 had other jobs such agronomy (1/16), sales (1/16), civil engineering (1/16), earthmoving (1/16), legal advisory (1/16), and business (3/16). The most common city of residence was the state capital Curitiba, where 7/17 producers lived, while

5/17 lived in Palmeira, 1/17 in Ortigueira, 1/17 in Campo do Tenente, 1/17 in Cascavel, 1/17 in Paranavaí, and 1/17 in Campina Grande do Sul.

Producers were unanimous (17/17) when declaring that the identification of animals in their farms is an important practice. When asked about the standard method of identification used by them, 12/17 stated that hot iron branding is the method of choice, and 5/17 stated that they use ear tagging. Producers who use hot iron branding reported that they have been using this method for  $25 \pm 13$  years.

The majority of the producers (11/17) believe that hot iron branding is an efficient method for identification of cattle. All producers stated that they know at least one other method of identification, micro-chipping and ear tagging being the most popular with 11/17 producers making reference to these methods, followed by ear tattooing (cited by 9/17 producers), ear clipping (3/17), freeze branding (3/17), and intra-ruminal transponder (1/17). Considering costs and applicability, 10/17 producers declared some alternative methods are viable for utilization on their farms. The most quoted viable method of choice was ear tagging (cited by 7/17 producers), followed by micro-chipping (3/17), and ear tattooing (2/17). The main reason why producers wouldn't consider using another method for identification was the costs involved, mentioned by all farmers who answered "no" to question 10 (7/17 producers).

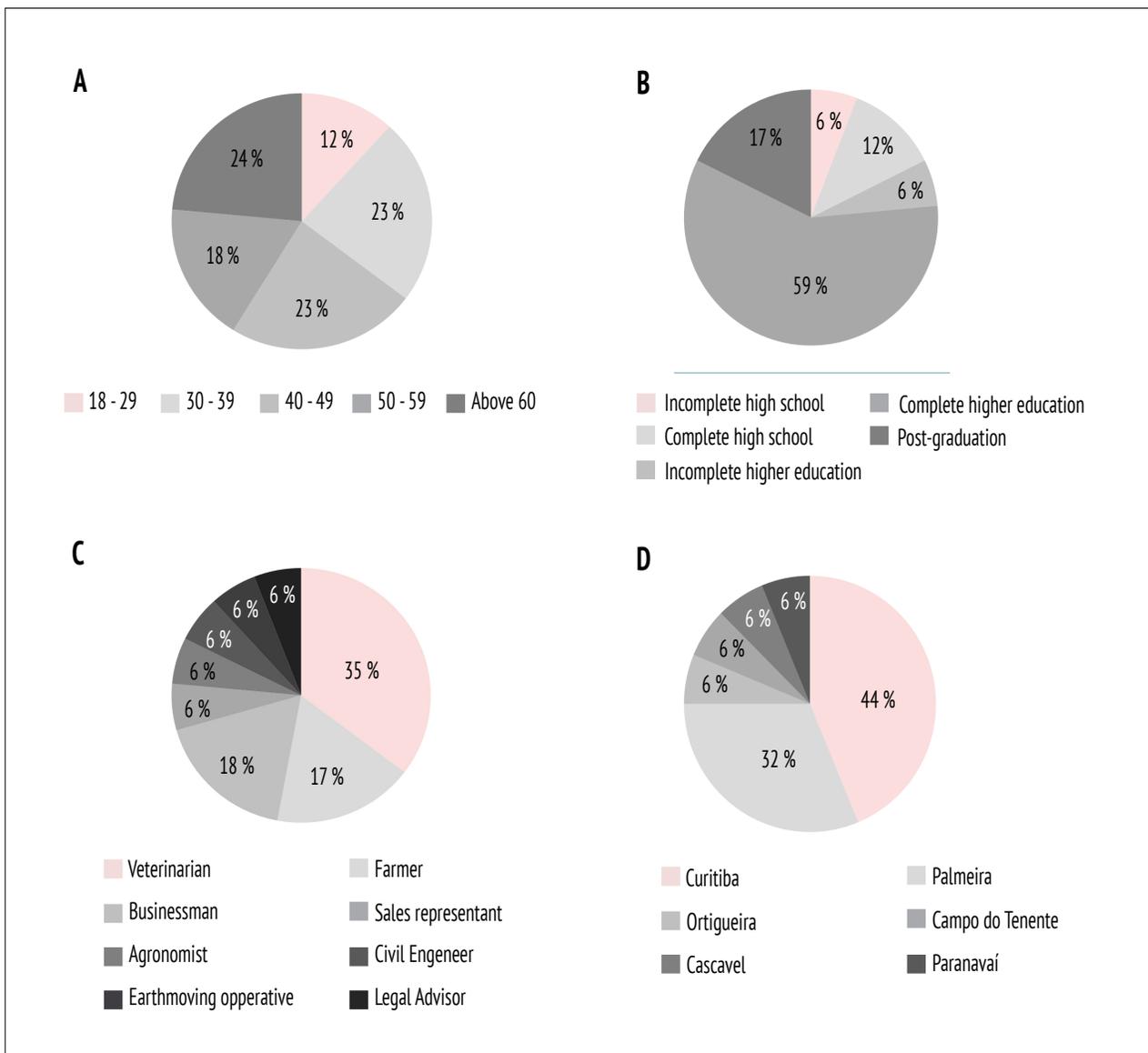
All but one farmer (16/17) believe animals are sentient beings and there was a common agreement (17/17) that animals are capable of experiencing pain. When asked about the capability of experiencing pain in different species, median scores were 4.0 (minimum 1 and maximum 5) for pigeons; 2.0 (1 - 5) for butterflies; 5.0 (3 - 5) for human babies; 4.0, (1 - 5) for rats; 5.0 (2 - 5) for dogs; 3.5 (1 - 5) for chickens; 2.5 (1 - 5) for fish; 5.0 (2 - 5) for sheep; 4.0 (3 - 5) for cattle; 1.0 (1 - 5) for cockroaches; and 4.5 (2 - 5) for wolves. There was an effect of species on the attributed pain capability score given to animals by farmers ( $p < 0.01$ ). The human baby median score was statistically higher than median scores of the butterfly and cockroaches ( $p < 0.05$ ); dog and cattle median scores were similar to human baby mean score but also higher than cockroach mean score ( $p < 0.05$ ) (Figure 2). The

median score given to the pain producers believe cattle experience during branding was 4.0, ranging from a minimum of 2 and a maximum of 5.

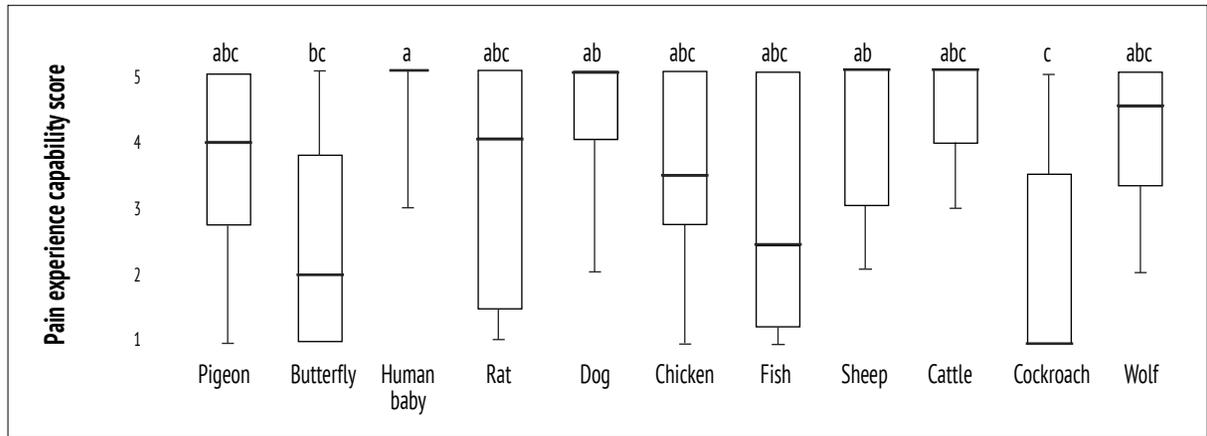
There was no association between age group and use of hot iron branding as standard procedure for identification of cattle ( $p = 0.72$ ). There was an effect of age group on general scores attributed by farmers to animal capability of experiencing pain ( $p < 0.05$ ). Producers in the age group of 50 - 59 years old gave similar scores for pain capability than producers in the age groups 18 - 29, 40 - 49,

and 60 years or older, but constantly gave higher scores than producers in the age group 30 - 39 years old (Figure 3). There was no effect of age group on the score given by producers to the perceived pain intensity experienced by cattle during hot iron branding ( $p = 0.50$ ).

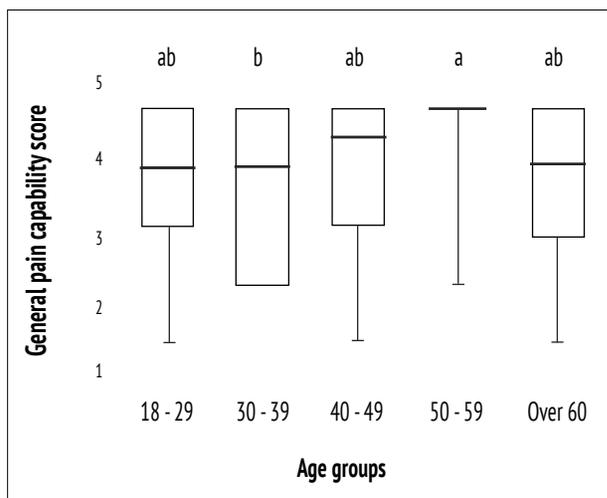
Due to the high prevalence of males and producers with complete higher education, data was not sufficiently homogeneous to test for any possible effects of gender and education on the answers given.



**Figure 1** - Demographic information of 17 beef cattle producers interviewed in the state of Paraná, 2015. Graphics represent percentages of age group (A), education (B), occupation (C), and city of residence (D).



**Figure 2** - Median perceived pain experience capability scores given to different species by 17 beef cattle farmers interviewed in the state of Paraná, southern Brazil, 2015. Median box plots accompanied by different letters indicate statistical differences by Kruskal-Wallis test followed by Dunn's test between species given scores ( $p < 0.05$ ).



**Figure 3** - Median scores given by 17 beef cattle farmers to the perceived pain experience capability of different species during an interview realized in the state of Paraná, southern Brazil, 2015. Median box plots accompanied by different letters indicate statistical differences by Kruskal-Wallis test followed by Dunn's test between age groups ( $p < 0.05$ ).

## Discussion

The number of positive responses to participate in the survey was very low considering the official number of beef cattle producers in the state of Paraná, with its 55,873 registered farms (Mezzadri, 2013). Low participation rates are common in

survey research, and responses to questionnaires are low even when there are monetary incentives (Deutkens et al., 2004). On a recent survey discussing difficulties encountered by beef cattle producers in adopting a traceability system in the state of Minas Gerais, Brazil, the number of participating producers was also low, with a total of 20 respondents (Lopes et al., 2012). Similarly, on a survey describing farmer perceptions of animal welfare in the Netherlands, a total of 15 farmers were interviewed (Te Velde et al., 2002). Confidentiality restraints in governmental institutions and a possible indisposition with the survey topics on private institutions may explain the difficulty in reaching producers. The development of a cooperative research, in partnership with those institutions and addressing shared issues, should be more effective in that matter. Even though our results are not representative of the population of producers in the state of Paraná, collected data may give relevant preliminary information to address issues related to animal identification and animal welfare from the farmer perspective. The low variability of producers perspectives on questions related to the importance of cattle identification, to animal sentience and capability of experiencing pain suggests that in these issues results may have some predictive value. Interpretation of contextualized data, no matter how limited it is, might contribute significantly to the establishment of new references (Veronese and Guareschi, 2006).

There has been a significant advance on global standards and requirements for cattle identification (Schroeder and Tonsor, 2012). Identification of cattle is of paramount importance to ensure control of productivity parameters, differentiation between farm herds and to guarantee disease control and traceability. Producers interviewed in our survey seem to understand these issues and consider identification as an essential practice. The unanimity about the importance of identification showed by producers indicates that there is a demand for reliable methods of identification. This demand is also described in other countries with traditional beef cattle production such as Australia (Petherick, 2005), Canada (Stanford et al., 2001), and the United States (Schroeder and Tonsor, 2012).

The main methods of cattle identification used by the surveyed farmers are hot iron branding and ear tagging. This is in accordance with a study conducted in Brazil, where the percentage of producers that use ear tags, hot iron branding, or both methods combined summed up to 80% (Lopes et al., 2012). Producers who declared the use of hot iron branding have been using this method at their farms for more than two decades, suggesting that the adoption of this practice is not recent, but could be interpreted as a form of “tradition”. At newer farms, producers might be prone to use additional identification techniques that seemed impossible or expensive a few years ago, but that are now available and more affordable (Stookey and Watts, 2004). Recent international changes on traceability policies might be influencing producers to use methods with trace-back capabilities, which may contribute to the obsolescence of hot iron branding (Schroeder and Tonsor, 2012).

The majority of interviewed producers declared they believe hot iron branding is an effective method for identification. Superiority of the hot iron branding over other methods is often defended by farmers that discuss that branding scars can be read at distance (Lindgaard and Andersen, 2012). Accordingly, even though many cattle producers in Western Canada were open to alternatives to branding, they did not feel that an effective option was available if cattle were kept on community pasture (Moggy et al., 2017). However, results from a study with horses show that hot iron branding

does not allow reliable identification of animals due to hair growth around the branding mark and one of the digits often being ineligible (Aurich et al., 2013), and Lopes et al. (2017) observed 1.6% of annotation errors with hot branding identification method.

Another commonly mentioned advantage of hot iron branding is the low costs related to the method (Schwarzkopf-Genswein et al., 1997) and in fact, hot iron brand and ear tag were the methods with the lowest effective operating cost (Lopes et al., 2017). Indeed, cost was the most common answer, given by all producers in our study when asked about the reasons why they wouldn't consider other methods viable for application at their farms. Even though producers know a number of alternative methods, these do not seem to be economically attractive for widespread adoption. However, the aspect of costs related to management procedures in farms is a complex matter. Stressful practices are known to have significant effects on productivity indexes of farm animals, representing an indirect cost related to such procedures (Broom, 1997). Furthermore, hot iron branding causes leather injuries decreasing the sale price. A detailed study of the costs involved with different methods of identification of cattle should be helpful at clarifying major influences and determining the real economic aspects of each practice.

There was a high percentage of producers in our study stating that there are alternative practices to hot iron branding which are potentially viable for use. High prevalence of producers using ear tagging and micro-chipping as alternative methods for identification might be an indicative of the route to be taken. Regarding technical efficiency and economic viability of the implementation and use of cattle identification methods, Lopes et al. (2017) observed that the electronic ear tag presented the highest technical efficiency because it required less time for implantation in the animal as well as for reading and transcribing the numbers to an electronic database and it was not associated with reading errors. Also, the authors stated that as the number of animals increases, the economic viability of electronic ear tagging improves considerably. Considering the potential of alternative methods to hot iron brand in reducing animal suffering and their efficiency as a means of cattle identification (Løken

et al., 2011), a change appears to be in accordance with worldwide trends in animal traceability and public concerns about animal welfare (Lindegaard and Andersen, 2012; Schroeder and Tonsor, 2012).

Interviewed producers recognize animals are sentient beings, capable of experiencing pain. One producer, however, answered that although animals are capable of experiencing pain, they are not capable of experiencing feelings. The emotional component of pain in animals is indeed a controversial subject open to debate (Treede, 2006). However, a growing body of research on the motivational and subjective aspects of behaviors (Désiré et al., 2002) indicate that the complexity of responses to pain go beyond simple and acute detection and reflex responses and begin to demonstrate a level of behavioral complexity that would require some form of experience (Sneddon et al., 2014). Indeed, pain in animals has been recognized as an aversive sensory and emotional experience since 1997 (Molony and Kent, 1997).

Generally, farmers believe human babies possess higher ability to experience pain, but they attributed similar scores to cattle, indicating that they agree with scientific suggestion that the animals under their care might experience pain in a similar way to humans (Sneddon et al., 2014). Similar results were obtained in a study conducted in Norway, where the majority of dairy farmers either agreed (39%) or totally agreed (31%) with the statement that animals experience physical pain as humans do (Kielland et al., 2010). Lower pain capability scores attributed to animals by producers aged between 30 - 39 years old suggests that younger producers are less likely to recognize pain than producers aged between 50 - 59 years old. This might be associated to practical knowledge or emotional maturity, yet elucidation about the real factors contributing to this effect may be better detailed on further research.

Differences in absolute scores given to sheep, cattle and chickens deserve further investigation as the husbandry and welfare of these animals might be influenced by the producer perceived impact of management practices on animal lives (Ohl and van der Staay, 2012). Lower scores attributed to invertebrates (butterflies and cockroaches) are coherent with scientific uncertainty about the real aspects of pain in these animals (Sneddon et al., 2014).

When asked about how much pain they believe cattle feel when branded with a hot iron, most farmers attributed high scores. This result, associated to the fact that many of the interviewed farmers still use hot iron branding, confirms the scientific suggestion that although producers might recognize the pain associated to specific procedures, they do not always act to mitigate it (Millman, 2013). For example, in Western Canada, considering 57% of cow-calf producers that practiced branding, only 4% used pain mitigation (Moggy et al., 2017). However, Bath (1998) suggests that changes must begin with awareness, and farmer recognition of the pain involved on hot iron branding might be considered per se as an important step towards the adoption of alternative methods. Thus, for further improvement on attitudes towards adequate pain management in animals, it is important that new, robust and practically useful methods for pain diagnosis be developed and that producers learn to identify painful procedures conducted in their farms (Flecknell and Roughan, 2004; Millman, 2013); producers should also be provided with information about adequate pain management methods (Hawkins, 2002; Schwartzkopf-Genswein et al., 2012) and feel motivated to enhance the welfare of the animals under their care (Weary et al., 2006).

## Conclusion

Recent international concerns about the identification of cattle seem to be also shared by Brazilian producers. Although hot iron branding is a widespread method for identification of animals, it appears that alternative practices are getting more popular among producers, probably encouraged by new trends in traceability policies and public opinion. Producer awareness about animal sentience and the pain experienced by the animals under their care might indicate a step towards change on identification procedures. In terms of animal welfare, future efforts should focus on refining and developing new methods that are effective and inexpensive, facilitating the use of procedures that respect animal welfare by producers.

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