

Chinese farmers' attitude towards the improvement of animal welfare in their facilities

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Abstract

This study sought to investigate Chinese farmers' attitude towards animal welfare by using the Theory of Planned Behaviour (TPB). According to the TPB, an individual's intention to behave in a certain way is determined by his/her attitude towards the behaviour (specific attitude — importance — and general attitudes), the perceived behavioural control (easiness), and the supposed opinion of the people who are important to him/her (subjective norms). A total of 253 questionnaires were used, which included the three main animal productions in China (swine, poultry and cattle). Chinese farmers have perceived the improvement of animal welfare as two abstracts: general attitudes (reward-seeking, and empathic farmer); and four specific categories of actions (favourable environment, animal health, humane treatment of animals and farmers' well-being). Our analysis revealed that general and specific attitudes were the strongest predictors of farmers' intentions to improve animal welfare in the questionnaire study. In fact, Chinese farmers considered it fairly important to improve the animal welfare measures considered in the survey. In contrast, the same animal welfare measures were considered difficult to improve by the farmers as indicated by the lack of association between the easiness of improving animal welfare and the intentions. In addition, veterinarians, agricultural advisers, and scientific experts were considered to be relatively influential subjective norms as regards the activities of the farmers. This is the first study to provide an insight into the underlying meanings and values of Chinese farmers' views on improvements to animal welfare.

Keywords: animal welfare, attitudes, cattle, Chinese farmers, poultry, Theory of Planned Behaviour

Introduction

During the last sixty years, the population and urbanisation of Asian countries have risen exponentially, fuelling further demand for meat and dairy products and causing major changes to farm animal systems defined as the 'Livestock Revolution' (Brown 2003; Delgado 2003). This phenomenon has been more evident in East and South-East Asia, where the demand for bovine meat, mutton, and goat has swelled and poultry and pig meat production has risen more than ten-fold (FAO 2005). Currently, Asia accounts for 39% of global meat production, going from 10.2 to 13.5 billion during the last ten years (FAO 2016; Sinclair *et al* 2017). This increased demand for meat and dairy products has led to a scaling up of livestock and poultry sectors from traditional household production designed mainly for self-consumption or local market distribution, to intensive production on an industrial scale (Wang *et al* 2016). This

trend towards intensive, large-scale cultivation in livestock and poultry sectors, has aroused considerable concern for both the environment and food safety (Jiang *et al* 2016).

China, as is the case in many developing countries, is affected by the level of national economic development, and standards of animal welfare have tended to rank lower on the list of priorities of farmers, who are more concerned about availability and quality of feeds, production yield, and disease control (Nielsen & Zhao 2012). In addition, there remains a fundamental lack of understanding as to the importance of animal welfare among the majority of livestock stakeholders in China, leading to an absence of relevant policies to address this matter (Li *et al* 2017). For example, a survey on the attitudes to animal welfare during slaughter and transport in Asia (Sinclair *et al* 2017) revealed that Chinese respondents reported the lowest importance levels for animal welfare; they were least likely to report

that they had tried to improve animal welfare, least likely to report that they were confident they could improve animal welfare, and also least likely to report that they intended to make improvements to animal welfare compared to respondents from other assessed countries. According to Burton (2018), this resistance towards the implementation of standards of animal welfare might mainly be caused by a limited or absent knowledge and understanding of the ways in which animal welfare can impact the quality of the farm products and, ultimately, the health of consumers.

Since 2002, China's shortcomings regarding disease control measures and the use of certain proscribed substances in husbandry and food processing has led to an EU ban on the import of certain Chinese animal products, leading to government fears for potential damage to the country's economy (Zhigang 2002; Li 2009; Yan *et al* 2013; Wang & Gu 2014). For this reason, a variety of independent organisations (such as World Society for the Protection of Animals) have proposed introducing standards on the humane slaughter of pigs into the technical guidelines of Chinese livestock companies, providing training and support for slaughter managers and government inspectors as part of a national training programme (Zili & Kolesar 2012). Nationally, a large, government-funded project on farm animal welfare for chickens and pigs was launched in 2010 with the aim of establishing Chinese standards for farm animal welfare-assured husbandry (Nielsen & Zhao 2012).

Despite the influence consumers, veterinarians, and members of different pressure groups are able to exert in the debate on farm animal welfare, farmers are still best placed to directly influence the living conditions of farm animals (Kauppinen *et al* 2010). In fact, stockpeople are a primary influence on husbandry and, hence, welfare through the choices they make, their objectives, their interaction with animals and their management of animals' environment (Seabrook & Bartle 1992; Lensink *et al* 2001; Seabrook 2001; Hemsworth 2003). Studies on the interaction between farm animals and stockpeople have shown there to be a relationship between the attitudinal and behavioural profiles of farmers and the productivity and performance of farm animals (Barnett *et al* 1994). Different surveys have been performed to assess farmers' attitudes and expectations towards animal welfare and animal-friendly products in Western countries (Coleman *et al* 2003; Austin *et al* 2005; Hanna *et al* 2009; Leach *et al* 2009; Kauppinen *et al* 2010, 2012; Kielland *et al* 2010; Tuytens *et al* 2012; Hasson & Lagerkvist 2014), but no information exists on Chinese farmers' decision-making processes as regards animal welfare.

The current study aims to evaluate the attitude of Chinese farmers to animal welfare by using Icek Ajzen's 'Theory of Planned Behaviour' (TPB; Ajzen 2002), which represents the mainstream research tradition for quantitative survey methods (Kauppinen *et al* 2010). The TPB seeks to predict and explain human behaviour in specific contexts.

According to the theory, human behaviour is guided by three types of considerations: beliefs about the likely outcomes of the behaviour and the evaluations of these outcomes (behavioural beliefs), which produce a favourable or unfavourable attitude toward the behaviour; beliefs about the normative expectations of others and motivation to comply with these expectations (normative beliefs), which result in perceived social pressure or subjective norms; and beliefs about the presence of factors that may facilitate or impede performance of the behaviour and the perceived power of these factors (control beliefs), which lead to the formation of a behavioural intention (Ajzen 1971). As a general rule, the more favourable the attitude and subjective norm, and the greater the perceived control, the stronger the person's intention should be to perform the behaviour in question. Intention is thus assumed to be the immediate antecedent of behaviour (Ajzen 1971).

The major behavioural theories developed and tested for consumers in the Western world (Albaum & Peterson 1984; Lee & Green 1991), have also been validated in cross-cultural settings such as within Chinese culture (Chan & Lau 1998; Chiou 1998; Song *et al* 2006). In addition, the attitude components of the TPB are largely an individually based construct, while subjective norms, on the other hand, are more other-based, concerned with what 'others' think the person should do. Chinese people are deeply influenced by Confucian culture (Francesco & Chen 2004; Song *et al* 2006), which values social harmony based on relationships that define societal members' roles, and the perceived moral pressure the individuals experience in fulfilling such roles. For this reason, Chinese culture is considered collectivistic, compared to most Western cultures which tend to be more individualistic, whereby individuals' attitudes, judgments, and opinions can be understood as situation-specific, and affected by subjective norms (Hofstede 1980; Oyserman *et al* 2002; Park & Yang 2012). Therefore, subjective norms might be a strong predictor of individuals' behavioural intentions in the Chinese collectivist society (Chan & Lau 1998; Francesco & Chen 2004).

According to Kauppinen *et al* (2010), the best way to apply TPB to evaluate farmers' attitudes toward animal welfare is to predict the intentions of the stockpeople instead of predicting the behaviour itself because of several limiting factors outside of the actor's control, such as money, time, or one's own well-being (Ajzen 2002). Furthermore, in order to predict the farmers' intentions, their specific attitudes towards improving animal welfare must be assessed and not simply their general attitude towards animals (Kauppinen *et al* 2010). In the current study, assessment of the Chinese farmers' attitude towards improving animal welfare is carried out through also considering the farmers' perceived social norms, perceived control (how easy it would be to perform such improvements) and their behavioural intentions regarding the improvement of animal welfare.

Materials and methods

This study employed a specially modified version of the questionnaire previously used in Kauppinen *et al*'s (2010) survey, modified to be more suitable for the Chinese farmers' mindset. Specifically, during the review process, questionnaire statements were examined by three professors from veterinary and animal sciences colleges (Huazhong Agricultural University, Wuhan, China), who work closely with pig, cattle, and poultry farmers in China. According to their assessment, the statement 'it is not trivial to talk to animals' would not have been appropriate for the Chinese farmers' mindset, and it was therefore replaced with 'good farmers' training favours animal welfare'. The main reason for such a substitution is that training opportunities for Chinese farmers regarding animal handling and treatment are scarce or even absent altogether. That said, an understanding is growing amongst those researchers working closely with the Chinese livestock industry, that proper training practices should be made more available.

In addition, in the sections *Importance* and *Easiness* certain statements required further clarification before the meaning was made clear to the Chinese farmers. For instance, when the statement 'providing the animals with a favourable environment' was translated into Chinese, the translated version did not convey a clear meaning (A Jinyi [translator], personal communication 2016). In order to accurately convey the statement's true meaning, additional information was needed to properly explain the concept of 'favourable environment' such as stable environmental temperature in indoor areas, free access to clean water all the time, good indoor air quality (control of ammonia levels). Additional explanations were also added to the following statements: 'improving the quality of bedding'; 'keep animals and pens/barns cleaned'; 'taking care of animals' health' and 'avoiding painful procedures'. A two-way translation (English-Chinese and Chinese-English) of the questionnaire was performed to ensure statement meanings were not lost during translation.

Respondents were asked to comment on the activity of improving animal welfare, both generally and as specific objects of attitude. Apart from questions concerning background information, a 7-point Likert scale was used and the questionnaire was divided into five separate sections:

Importance

The respondents were required to offer their opinion on the importance of different measures to improve animal welfare. These measures were divided into four sections: i) providing animals with a favourable environment; ii) taking care of the animals' health; iii) treating the animals humanely; and iv) investing in farmer's well-being at work. Each section included four more practical measures (eg in the section concerning favourable environment: 'how importantly do you perceive providing the animals with a favourable environment?'; 'how importantly do you perceive increasing the floor space per animal?'; 'how importantly do you perceive offering more clean bedding material for the animals?'; 'how importantly do you perceive improving the quality of

the flooring? eg rubber mats, concrete, brick'. According to the TPB, the aim of this section was to collect information on the specific attitudes of the farmers towards the issue in question (Kauppinen *et al* 2010).

Easiness

A similar set of four questions and practical measures as listed above were used to ask about the respondents' perception of how easy it would be to carry out these measures on their own farms (eg 'how easy do you perceive taking care of the animals' health at your farm'). These measures aimed to evaluate the effect of perceived behavioural control (Kauppinen *et al* 2010).

Intentions

The respondents answered questions about their intention to improve the welfare of their animals (Kauppinen *et al* 2010).

Subjective norms

The respondents evaluated the extent to which the opinions of specific livestock stakeholders (slaughterhouses, veterinarians, consumers, wholesale/retailers, agricultural experts, researchers, and other farmers) was of significance to them (Kauppinen *et al* 2010).

General attitudes

The respondents had to rate the importance of ten statements on a 7-point Likert scale. The statements aimed to evaluate the role of farmers and their general attitudes towards animal welfare (Kauppinen *et al* 2010).

The questionnaire was sent to 1,000 Chinese farmers, covering 600 pig (145 complete questionnaires received), 235 cattle (88 complete questionnaires received), and 165 poultry farmers (20 complete questionnaires received) from the provinces of Central, East and North-East China, representing areas showing the greatest density of farming activity (Fu *et al* 2012). Farmers were contacted via agricultural social media groups of Huazhong Agricultural University (Wuhan, China), and the Centre Diseases Control (CDC) of Hubei Province (China). QQ (similar to Skype) and Wechat (a hybrid of Whatsapp and Facebook) were used since they are the preferred social media forums in China. Questionnaires were delivered via a weblink of surveymonkey.com (1999–2018 SurveyMonkey) which allowed respondents to access content using their phones, computers or tablets. The link remained open from November 2017 to April 2018, allowing farmers to complete the survey at their convenience.

Statistical analysis

Data were analysed using SPSS 20.0. The Wilcoxon signed rank test was used to determine whether any differences existed between the means of the variables in the initial data. Principal Component Analysis (PCA) with a Varimax rotation was employed to find summary variables that could be used in subsequent analysis. Negative statements were altered to reflect a positive form; for example, 'farmers should not sympathise with their animals' was translated into 'farmers should sympathise with their

animals'. Since the questionnaire consisted of several theoretically distinct patterns (specific and general attitudes, perceived behavioural control, and subjective norms), these patterns were treated as separate units.

The PCA components were formulated using the same criteria as adopted by Kauppinen *et al* (2010): a variable was usually included in a component if it had a loading exceeding 0.3 and did not load on any other component. In addition, if the largest loading on a component exceeded 0.5 and there was a loading less than 0.4 on any other component, then the variable was also included. The components with eigenvalue below 1.0 were ignored. The consistency of each component was then evaluated using Cronbach's α test where only values > 0.6 were considered to be consistent. The components were then used to compute scores by averaging the variables that satisfied the criteria above. Components showing substantial non-normality were log- or square root-transformed and each intention item was treated as a separate variable.

To examine the connection between specific and general attitudes, perceived behavioural control, subjective norms, and intentions, partial correlations were calculated with the dimension of the farm (categorised according to the number of animals [small: 0–500; medium: 500–2,000; and big: $< 2,000$]) and the line of production (swine, poultry, cattle) as controlling variables. Missing values were excluded pair-wise. Only correlations equal to or greater than 0.3 with $P < 0.01$ were considered relevant, since correlations of less than 0.3 are negligible in social sciences, although statistically significant (Ajzen & Fishbein 1980).

To further test the Theory of Planned Behaviour, the structural equation model (SEM) using Amos Graphics 25 was applied to the data. A measurement model was specified where PCA components substituted for observable variables, and specific and general attitudes, subjective norms, perceived behavioural control and intentions served as latent variables. For example, the four PCA components of easiness (environment, health, humane treatment, and the farmer's own well-being) defined the latent variable perceived behavioural control. The sole exception is general attitudes, which was defined by two separate variables, a reward-seeking farmer and an empathic farmer (Kauppinen *et al* 2010) which described the two general values found in the PCA. In addition, a structural equation path model was modified and tested with a maximum likelihood estimation method to determine the adequacy of the TPB in explaining the farmers' intention to improve animal welfare. We evaluated the applicability of the model by the comparative fit index (CFI) and the Root Mean Square Error of Approximation (RMSEA) (Kauppinen *et al* 2010).

Results

Description of the original data

The descriptive analysis showed that the measures to improve animal welfare were considered important but difficult to put into practice. A seven-point Likert scale was used, ranging from 1 (extremely important) to 7 (indifferent). For example, the farmers considered taking care of animals' health (2.36 [± 1.31]), providing animals with a favourable environment (2.54 [± 1.34]), and taking care of their own well-being (2.61 [± 1.38]) as the most important means to improve animal welfare. The easiness did not show significant differences among the means of the measures considered. Nevertheless, taking care of the animals' health (3.59 [± 1.43]), and treating the animals humanely (3.77 [± 1.55]) were relatively easy measures to follow. Similar trends were observed in the subjective norms, where no specific category of stakeholder was deemed significantly influential. Despite this result, veterinarians (3.32 [± 1.61]), and researchers (3.35 [± 1.78]) were perceived as more important among the stakeholders listed in the subjective norms, compared to the slaughterhouse workers, traders, and other farmers who showed the least significance. The farmers considered treating animals humanely (1.84 [± 0.85]) and taking care of their health (1.86 [± 0.89]) amongst the most favoured intentions. The farmer's obligation to treat his or her animals well was the most important issue at the level of general attitudes (2.33 [± 1.16]) (Table 1).

Principal Component Analysis (PCA)

The specific animal welfare improvement measures are grouped into three main objects. For example, the importance of improving animal welfare measures are grouped in 'farmer's well-being', 'animal health', and 'favourable environment', except for 'humane treatment' whose items were included within the component 'animal health'; the easiness measures are grouped in 'favourable environment', 'farmer's well-being', and 'humane treatment', except for animal health whose items were included within 'favourable environment' (Tables 2, 3). General attitudes appeared as two separate dimensions: the respondents were profiled using the same classifications adopted by Kauppinen *et al* (2010): 'reward-seeking farmer' and as 'empathic farmer' (Table 4). Subjective norms were loaded into four components: the first was concerned with the extent to which stakeholders understood the issue of animal welfare. The second was concerned with the extent to which stakeholders, such as slaughterhouse staff, wholesale/retailers, veterinarians, consumers, and other farmers, emphasise the importance of animal welfare; the third was concerned with the extent to which the opinion of veterinarians, agricultural advisers, and research specialists on animal welfare influenced the farmers' activity; the fourth dimension was concerned with the extent to which the opinion of slaughterhouse staff, wholesale/retailers, consumers, and other farmers on animal welfare could affect farmers' activity. Altogether, these components accounted for 54–66% of the variance.

Table 1 The means (\pm SD) and statistically significant differences within each section (indicated with different superscripts) between the variables of the original data (n = 253).

Section		Mean (\pm SD)	Difference*
The importance and easiness of improving animal welfare			
Each part includes 4 sub-questions with 7 answering options: 1 = extremely important/easy - 7 = not important/impossible			
<i>How important/easy do you perceive....</i>			
Providing the animals with a favourable environment	Importance	2.54 (\pm 1.34)	a
	Easiness	4.11 (\pm 1.31)	b
Taking care of the animals' health	Importance	2.36 (\pm 1.31)	c
	Easiness	3.69 (\pm 1.43)	d
Treating the animals humanely	Importance	2.85 (\pm 1.45)	e
	Easiness	3.77 (\pm 1.55)	d
Investing in the workers/your motivation and well-being	Importance	2.61 (\pm 1.38)	a
	Easiness	3.99 (\pm 1.34)	f
The farmers' intentions to improve animal welfare on their farms in the near future:			
7 answering options: 1 = very likely - 7 = very unlikely			
<i>In the near future, how likely are you too...</i>			
Build or restructure facilities that improve animal welfare on the farm		2.31 (\pm 1.11)	a
Take care of the animals' health and treat diseases more intensively		1.86 (\pm 0.89)	b
Treat the animals more humanely		1.84 (\pm 0.85)	b
Improving workers well-being		2.08 (\pm 0.94)	a
The Subjective Norms			
Each part includes 3 sub-questions with 7 answering options: 1 = very much - 7 = not at all			
<i>How much does the opinion of these stakeholders affect your activities?</i>			
<i>How much do these stakeholders emphasise the importance of animal welfare?</i>			
<i>How much do these stakeholders understand the issue of animal welfare?</i>			
Slaughterhouse/dairy		4.196 (\pm 1.96)	a
Wholesale/retail trade		4.410 (\pm 1.94)	a
Veterinarian		3.320 (\pm 1.69)	b
Consumers		3.946 (\pm 2.05)	ac
Agricultural adviser		3.759 (\pm 1.78)	c
Researchers and specialists		3.347 (\pm 1.78)	b
Other farmers		4.420 (\pm 1.87)	a
General Attitudes: 7 answering options: 1 = strongly agree - 7 = strongly disagree			
1 Animal welfare is the most important issue on my farm		3.1304 (\pm 1.35)	a
2 I always do my best to improve the welfare of my animals		2.8775 (\pm 1.29)	b
3 Improving animal welfare is economically profitable		2.9644 (\pm 1.64)	ab
4 It is good for my image to improve animal welfare		2.5929 (\pm 1.27)	bc
5 A farmer is obligated to treat his/her animals well		2.332 (\pm 1.162)	c
6 A high yield is evidence of good animal welfare		3.8261 (\pm 1.58)	d
7 Animal welfare should not cost too much money		3.6482 (\pm 1.47)	d
8 Improving animal welfare gives great satisfaction		3.3083 (\pm 1.43)	a
9 Good farmers' training favours animal welfare		2.6008 (\pm 1.15)	b
10 Farmers should not sympathise with their animals		5.8182 (\pm 1.55)	e

* Different letters denote significant differences among variables ($P < 0.05$); same letters indicate lack of significant difference ($P > 0.05$) among the variables.

Table 2 Components of the attitudinal pattern 'Importance'.

Importance of improving animal welfare by	Communality	Farmers' well-being	Animal health	Favourable environment
Providing the animals with favourable environment	0.384			0.524
Giving the animals more space to move around	0.516			0.686
Improving the quality of flooring	0.507			0.620
Improving the quality of bedding	0.429			0.647
Alleviating the pain or euthanasing sick animals	0.315		0.489	
Improve preventative medicine	0.483		0.627	
Avoiding painful procedures, (such as de-horning, beak trimming)	0.490		0.635	
Avoiding any physical abuse to the animals	0.718		0.758	
Treating animals as living beings	0.690			0.603
The farmers having enough leisure and holidays	0.697	0.777		
Keeping an easy schedule for the farmers	0.661	0.757		
Investing in farmers' motivation and well-being at work	0.677	0.762		
The farmers/workers enjoy their work	0.579	0.715		
Eigenvalue		5.875	1.656	1.135
Variance explained % (Total 54.162%)		36.720	10.351	7.091
Cronbach's		0.825	0.721	0.717
Mean (\pm SD) response		2.61 (\pm 1.38)	2.46 (\pm 1.34)	2.60 (\pm 1.39)

Response means range between 1 and 7 of the Likert scale: 1) extremely important; 2) very important; 3) moderately important; 4) important; 5) slightly important; 6) almost indifferent; and 7) not important at all.

Table 3 Components of the attitudinal patterns 'Easiness'.

Easiness of improving animal welfare by	Communality	Favourable environment	Farmers' well-being	Humane treatment
Providing the animals with favourable environment	0.471	0.575		
Increase floor space for animals to move around	0.449	0.546		
Improving the quality of flooring	0.386	0.612		
Keeping the animals and pens/barns clean	0.566	0.715		
Keeping report of animals' changes in behaviour	0.515	0.670		
Improve preventative medicine	0.534	0.672		
Avoiding any physical abuse to the animals	0.632			0.735
Treating animals as living beings	0.721			0.779
Avoiding force handling animals	0.766			0.844
The farmers having enough leisure and holidays	0.602		0.680	
Keeping an easy schedule for the farmers	0.661		0.791	
Investing in farmers' motivation and well-being at work	0.534		0.689	
The farmers/workers enjoy their work	0.498		0.682	
Eigenvalue		4.555	1.462	1.317
Variance explained % (Total 56.420%)		35.039	11.246	10.1341
Cronbach's		0.758	0.792	0.760
Mean (\pm SD) response		3.849 (\pm 1.357)	3.987 (\pm 1.335)	3.677 (\pm 1.581)

Response means range between 1 and 7 of the Likert scale: 1) extremely easy; 2) very easy; 3) fairly easy; 4) not easy, but not difficult; 5) quite difficult; 6) difficult; and 7) impossible.

Table 4 Components of the attitudinal patterns general attitudes in correspondence with the TPB.

The general attitudes	Communality	A reward-seeking farmer	An emphatic farmer
Animal welfare is the most important issue in my farm	0.595	0.763	
I always do my best to improve the welfare of my animals	0.700	0.837	
Improving animal welfare is economically viable	0.667	0.809	
It is good for my image to improve animal welfare	0.620	0.809	
A farmer is obligated to treat his/her animals well	0.640	0.800	
A high yield is not evidence of good animal welfare	0.491		0.585
It is acceptable for animal welfare to cost too much money	0.522		0.721
Improving animal welfare gives great satisfaction	0.612	0.721	
Good farmers' training favours animal welfare	0.477	0.689	
Farmers should sympathise with their animals	0.610		0.773
Eigenvalue		4.467	1.465
Variance Explained% (59.32%)		44.668	14.655
Cronbach's		0.891	0.506
Response mean (\pm SD)		2.829 (\pm 1.370)	4.431 (\pm 1.818)

Response means range between 1 and 7 of the Likert scale: 1) strongly agree; 2) mostly agree; 3) agree; 4) not agree, but not disagree; 5) disagree; 6) mostly disagree; and 7) strongly disagree.

Correlations between the components of the PCA

There were a number of connections between the attitude components and the four behavioural intentions, and the correlation coefficients were discrete. The general attitude of 'the reward-seeking farmer' ($\rho = 0.478$; $P < 0.001$), the specific attitudes regarding the importance of animal health ($\rho = 0.402$; $P < 0.001$), a favourable environment ($\rho = 0.444$; $P < 0.001$), and perceiving as subjective norms the influence of the opinion of veterinarians, agricultural advisers, and researchers/specialists on farmers' activities, and the extent to which researchers and the agricultural advisers emphasise the importance of animals' welfare ($\rho = 0.317$; $P < 0.001$) correlated with the intention to provide a favourable environment. Stressing the importance of animal health ($\rho = 0.323$; $P < 0.001$), the general attitude of 'the reward-seeking farmer' ($\rho = 0.457$; $P < 0.001$), and the provision of a favourable environment for animals ($\rho = 0.301$; $P < 0.001$) were correlated with the intention to treat animals humanely. The intention to take care of the farmer's well-being was correlated with the importance of providing a favourable environment ($\rho = 0.338$; $P < 0.001$), and 'the reward-seeking farmer' ($\rho = 0.422$; $P < 0.001$). The analysis did not depict any correlation between the perceived behavioural control (easiness to improve animal welfare) and the intentions, as well as between the farms' size and the production type.

The Structural Equation Model (SEM) of attitudes

The measurement model was specified by defining the latent variables, which were represented by the four elements of attitudes formulated with the PCA. There were only two observed PC variables defining the latent variable

general attitudes; therefore, we combined general and specific attitudes into one single latent variable, named 'attitudes'. This first structural path model (Figure 1, top) with a maximum likelihood estimation did not provide a good fit for the data ($\chi^2 = 357.599$, $df = 102$; $P < 0.0001$, RMSEA = 0.100, CFI = 0.787, AIC = 425.599, BIC = 545.734) and had to be modified. Firstly, we omitted the direct connection between the perceived behavioural control and the intentions and, second, we allowed the perceived behavioural control, the attitudes, and the subjective norms to correlate with each other. The modified model (Figure 1, bottom) provided an acceptable fit to the data ($\chi^2 = 263.267$, $df = 100$; $P < 0.0001$, RMSEA = 0.080, CFI = 0.874, AIC = 335.267, BIC = 462.469). According to the second model, the attitude (consisting of the general and the specific attitudes) was the strongest predictor of the behavioural intentions. The perceived behavioural control did not directly predict the intentions but showed a strong connection with the attitudes and the subjective norms that were related to each other. The subjective norms directly predicted the intentions, but their connections with the attitudes were stronger. This modified model with a slight deviation from the TPB described our data more accurately than the first model, which adhered strictly to the theory.

Discussion

Improving animal welfare as specific and general actions

The questionnaire responses revealed a conflict between the specific attitudes and the perceived behavioural control of the welfare-improving actions: the Chinese farmers perceived the actions as important but relatively difficult to carry out. According to Rosenstock (1974), the likelihood that an inter-

Table 5 Components of the subjective norms pattern.

The subjective norms		Communality	PCA1	PCA2	PCA3	PCA4
Slaughterhouse/dairy	A	0.660				0.774
Wholesale/retail trade	A	0.652				0.768
Veterinarian	A	0.444			0.538	
Consumer	A	0.466				0.517
Agricultural adviser	A	0.734			0.795	
Researchers & specialist	A	0.626			0.752	
Other farms	A	0.398				0.409
Slaughterhouse/dairy	B	0.710		0.728		
Wholesale/retail trade	B	0.709		0.729		
Veterinarian	B	0.670		0.630		
Consumer	B	0.566		0.660		
Agricultural adviser	B	0.783			0.643	
Researchers & specialist	B	0.718			0.616	
Other farms	B	0.588		0.706		
Slaughterhouse/dairy	C	0.680	0.710			
Wholesale/retail trade	C	0.715	0.784			
Veterinarian	C	0.647	0.709			
Consumer	C	0.512	0.682			
Agricultural adviser	C	0.699	0.619			
Researchers & specialist	C	0.644	0.606			
Other farms	C	0.562	0.710			
Eigenvalue			8.208	2.085	1.602	1.288
Variance Explained % (Total 65.76%)			39.088	9.930	7.629	6.133
Cronbach's			0.869	0.856	0.847	0.710
Mean (\pm SD) response			3.927 (\pm 1.899)	4.010 (\pm 1.924)	3.388 (\pm 1.745)	3.627 (\pm 1.876)

Response means range between 1 and 7 of the Likert scale: 1) very much; 2) very; 3) moderately; 4) little; 5) very little; 6) indifferent; and 7) not at all.

A: How much does the opinion of these stakeholders affect your activities;

B: How much do these stakeholders emphasise the importance of animal welfare; and

C: How much do these stakeholders understand the issue of animal welfare.

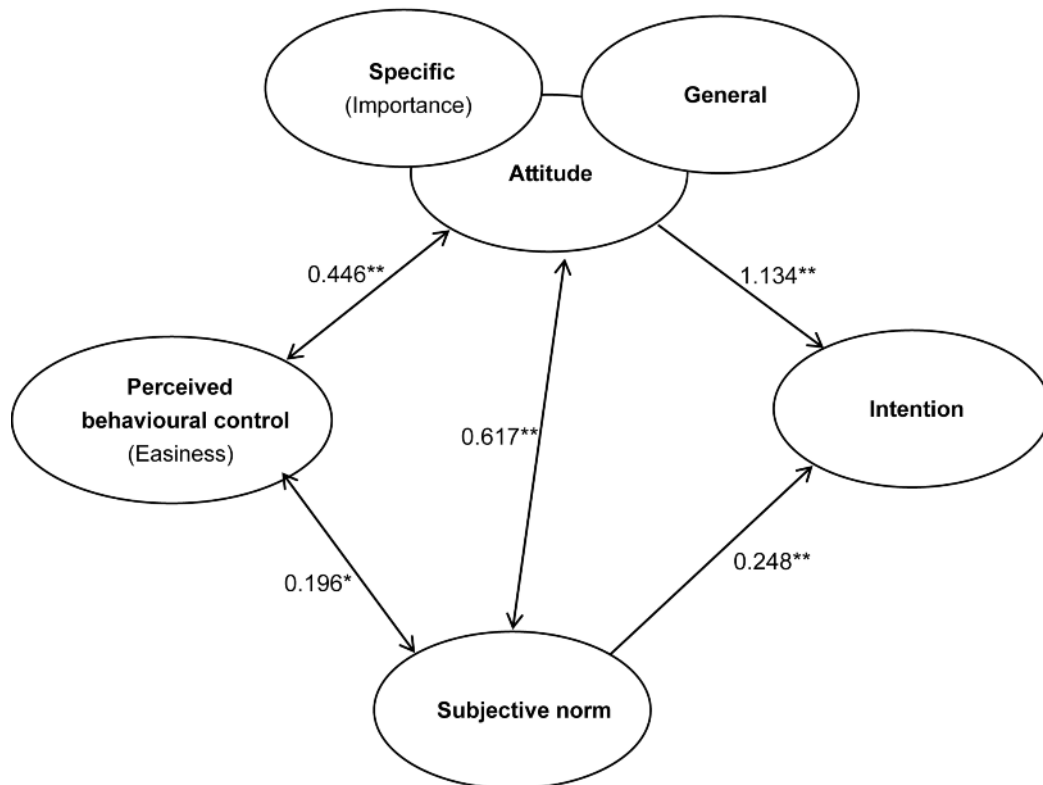
vention would be implemented depends on three major factors: i) the individual's perception of the severity of the problem; ii) what perceived benefits will be derived from implementing the intervention; and iii) what barriers are perceived to inhibit implementation of the intervention (efforts required to implement the intervention, financial cost of making change, social pressures against changing) (Whay 2007).

In the current study, Chinese farmers considered taking care of animal health; a particularly important group of actions but difficult to implement in practice. Over the last twenty years, Chinese farmers have witnessed a variety of major animal epidemics, such as SARS, avian influenza, foot and mouth disease and more recently, African swine fever, all of

which necessitated large numbers of animals being removed from the supply chain and had a considerable impact on the livestock market (McOrist *et al* 2011). For example, in 2007, an outbreak of 'high fever blue-ear disease', complicated by further outbreaks of highly virulent porcine reproductive and respiratory syndrome (PRRS), classical swine fever (CSF) and porcine circovirus-associated diseases caused by porcine circovirus 2 (PCV2) saw 9% of the Chinese pig population eliminated from the livestock market (approximately 50 million animals) (McOrist & Done 2007; Tian *et al* 2007).

Further aggravating the situation, there are issues concerned with low potency and titre of Chinese vaccines that are manufactured for such notifiable diseases. This reduction in

Figure 1



Structural Equation Modelling (SEM). Standardised regression weights (single-headed arrows) and correlations (double-headed arrows) between the elements of the TPB in two separate models. ** $P < 0.01$; * $P < 0.05$.

efficacy limits protection from disease (McOrist *et al* 2011), while imported vaccines are not permitted by the Chinese government. Moreover, only a limited number of provincial veterinary laboratories offer any sort of pathology, microbiology, or epidemiology, services crucial in limiting the extent and the duration of disease outbreaks (McOrist *et al* 2011).

Additionally, Chinese farms are further constrained by limited quarantine facilities as well as reduced scope to provide isolation for new additions. Vulnerability to viral infection is also increased by a failure to recognise the importance of age separation (particularly in pigs) (McOrist *et al* 2011). These deficiencies further complicate efforts by Chinese farmers to improve the health and welfare of animals on their farms (Garforth *et al* 2013). In fact, our study showed that farmers rated the provision of a favourable environment second only to animal health, despite the inherent difficulties this creates. Providing animals with adequate living conditions is generally considered to be associated closely with preventive medicine (Rushen *et al* 2007). However, a lack of funding, not to mention the logistical difficulties of altering the structure and management practices of farms could limit the scope for improvements to the farm environment and, by association, better control of animal health (McOrist *et al* 2011; Fasina *et al* 2012).

In contrast to our study, Kauppinen *et al* (2010) found farmers' desire to take care of their own well-being was rated most important. While here, the same measure

ranked third, behind the provision of a favourable environment for the animals. This does not imply that the Chinese farmers attributed less importance to their own well-being. On the contrary, there may in fact be a strong connection between the health of the animals and the well-being of the farmers. As noted earlier, an enhanced risk of disease outbreak constitutes a considerable burden to Chinese farmers, for whom the loss of livestock represents considerable damage to their sense of well-being.

Generally speaking, our questionnaire revealed a value dichotomy also observable in the study of Kauppinen *et al* (2010): an instrumental value identified by the 'reward-seeking farmer' which represented the majority of Chinese respondents; and an intrinsic value, corresponding to the concept of 'an empathic farmer' representing a minority of the respondents. This form of dichotomy is not dissimilar to that demonstrated in other questionnaire studies assessing farmers' attitudes towards animals (Lund *et al* 2004; Porcher *et al* 2004; Austin *et al* 2005). Indeed, this dichotomy may have at its root, farmers' perception of animal welfare, ie: i) those that view animal welfare as a means of achieving economic results ('reward-seeking farmer'); and ii) those viewing animal welfare as a way of satisfying moral and ethical considerations in their production systems ('empathic farmer') (Hubbard *et al* 2006; Bock & van Huick 2007; Hansson & Lagerkvist 2014). According to Porcher *et al* (2004) and Bruckmeier and Prutzer (2007),

the type of farming system the farmers are working for could play a role in influencing their attitudes toward animals. For example, either industrial farming (extensive farming systems) or the collective or familial systems could contribute to the construction or the repression of the affective involvement of farmers towards animals (Porcher *et al* 2004; Bruckmeier & Prutzer 2007). Therefore, it is possible that the intensification and industrialisation of livestock and poultry sectors that China has experienced in the last 30 years might have influenced the prevalence of the ‘reward-seeking farmer’ who places greater emphasis on the technical and economic values of farming activities, leaving little room for empathy — an attitude not compatible with the requirements of economic competition (Porcher *et al* 2004; Devendra 2007; Li 2009).

In direct contrast to the work of Kauppinen *et al* (2010), here it was not possible to carry out qualitative interviews of Chinese farmers. Kauppinen *et al* stated that the qualitative analysis better explains the results of the quantitative analysis represented by the questionnaires. Specifically, in the survey of Finnish farmers, the dichotomy encountered in the ‘General attitudes’ (‘emphatic’ and ‘reward-seeking’ farmers) of qualitative interviews was slightly different to the questionnaire study. This difference was characterised by the difficulties of Finnish respondents prioritising one value over another, leading to overlapping of the two values (Kauppinen *et al* 2010). In our study, all we are able to do is state the presence of a dichotomy in the component of ‘General attitudes’, but it is not possible to clarify whether this defines the presence of two separate groups or merely an overlapping of the two values.

Intentions predicted by specific attitudes, subjective norms, and perceived behavioural control

The farmers’ intentions to improve animal welfare were best explained through their attitude towards the specific welfare-improving actions spelt out in the questionnaire. A positive attitude towards animal health, providing animals with a favourable environment was associated with the intention to improve animals’ living conditions and treat them humanely. In fact, improving the animals’ living conditions by enhancing their social environment and living facilities could also be interpreted as a way of improving the animals’ health (Kauppinen *et al* 2010). For example, high quality flooring promotes hoof health as well as providing good lying areas, thereby favouring the animals’ resting time leading to a subsequent increase in production (Mouattotou *et al* 1998; Fregonesi & Leaver 2002; Bøe *et al* 2006; Rushen *et al* 2007). In addition, it has been shown that rough and aversive handling of farm animals by the stockperson can substantially reduce the animals’ health (and therefore their welfare) with a decrease in productivity (Waiblinger *et al* 2002; Rushen *et al* 2007).

The desire to improve farm facilities showed an association with the intention to enhance farmers’ well-being. A study on Chinese farmers showed a positive relationship between the enhancement of the farms’ environment, via the introduction of new technology, and farmers’ well-being (Wu *et al* 2010).

It is also possible that improving animals’ facilities could lead to better working conditions for farmers, subsequently enhancing their sense of well-being. According to Hansson and Lagerkvist (2014), the improvement of animal welfare on-farm can have a strong association with farmers’ expectations regarding their working environment, and the extent to which these expectations are met.

Being a ‘reward-seeking farmer’ was associated with the intention to treat animals humanely, to provide them with a favourable environment, and the intention to enhance farmer well-being. In general, farmers with an instrumental view on animal welfare will perceive improvements in the above measures as ways of enhancing the farm’s economic output (Mouattotou *et al* 1998; Rushen *et al* 2007; Kauppinen *et al* 2010).

Subjective norms also affected Chinese farmers’ intentions. For example, the influence of veterinarians, agricultural advisers and researchers/specialists on the activities of Chinese farmers, not to mention the extent to which these stakeholders emphasised animal welfare, was associated with the intention to provide animals with a favourable environment. In fact, those individuals exposed to sources of information are better placed to choose a particular measure to implement (Garforth *et al* 2013). Scientific input from veterinarians, researchers/specialists and agricultural advisers could play a significant role in encouraging farmers to invest in animals’ living conditions through improvements in the quality of the farm’s facilities. That said, the information delivered by these stakeholders could still be mediated by the farmers’ own assessment (Garforth *et al* 2013). As Kauppinen *et al* (2010) noted, it is impossible to know categorically whether information originating from veterinarians, researchers/specialists and agricultural advisers influenced farmers’ intentions, or if the farmers instigated the process themselves and sought help from the stakeholders.

In general, the literature on farmers’ adoption of techniques that facilitate improvements to animal welfare (including Kauppinen *et al* [2010]), often identify ‘other farmers’ as an important subjective norm (Garforth *et al* 2013). The contrary has been shown here, whereby the comments or actions of ‘other farmers’ appears to have little or no bearing on respondents’ decisions regarding improvements to animal welfare. Similar results were also found in the study of Garforth *et al* (2013), in which farmers in the UK did not consider ‘other farmers’ a significant subjective norm.

Nevertheless, it is important to emphasise that China is considered one of the highest of the ‘collectivist’ nations (Hofstede Cultural Dimension Scale 2011), which means people are more likely to act in the interest of the group as opposed to the individual. This tendency creates an environment in which individuals are subjected to strong pressure from significant others, and are more willing to comply with their opinion (Ham *et al* 2015). This tendency might explain the direct effect on the intention to improve animal welfare by subjective norms observed in the SEM analysis, even though such an influence was stronger on attitudes. The reduced direct influence of subjective norms on intentions encountered in the current survey compared to that

observed in other studies using the TPB in Chinese culture (Chan & Lau 1998; Chiou 1998; Song *et al* 2006) may be symptomatic of the social changes that Chinese farmers have experienced in the last three decades (Yip *et al* 2007). Precisely, the unprecedented income growth that China experienced since the market-oriented reforms of the 1980s has left behind basic social programmes causing changes in social norms (Yip *et al* 2007).

The easiness of improving animal welfare as an indicator of perceived behavioural control was not significantly associated with any of the intentions. This result was also observed in the study of Kauppinen *et al* (2010) who noted the impact of economic resources on farmers' ability to carry out their intentions. The same result was also observed in the SEM, which revealed a connection between the Chinese farmers' attitudes and their intentions as well as a connection between the subjective norms and the intentions. However, no connection was shown between intentions and perceived behavioural control measures. In addition, here (as in the study of Kauppinen *et al* [2010]), perceived behavioural control measures were evaluated by asking respondents to estimate how easy it would be to carry out measures improving animal welfare on their farms. Respondents were not required to offer their opinions on their actual control over the desired outcomes. These conditions most likely caused the observed gap between the measures of perceived behavioural control (easiness) and the intentions (Kauppinen *et al* 2010).

In addition, Kauppinen *et al* (2010) better explained the lack of connection between the perceived behavioural control and the intention through analysis of the qualitative interviews. In fact, it was observed that the major factor causing the lack of connection between intentions and perceived behavioural control was the farmers' well-being. On the contrary, in the current survey, it is not possible to define which measure was responsible for the missing connection between perceived behavioural control and intentions because of the absence of the qualitative analysis. We may only speculate that both the improvement of animals' health and living conditions could exert a certain influence in determining the lack of connection between perceived behavioural control and intentions. More specifically, if the Chinese farmers perceived improvements to the health and facilities of their animals as hard to achieve, it could also have an impact on their own well-being (McAllister 1981). In general, in the agricultural sector studies, it has been shown that 'attitudes' were the most important predictors of behavioural intentions (Thompson & Panayiotopoulos 1999; Wolff 2012).

In our study, the response rate of the questionnaires was 25%. This low rate could be explained by the period of the survey coinciding with the Spring Festival season (a major cultural event in China), which is traditionally a busy time for poultry and pig producers. During this period (from December to February), pig and poultry producers send their animals for slaughter and processing. And, once the Spring Festival finishes, pig and poultry farmers are busy with new arrivals and re-starting the production cycle. Furthermore, a clear under-representation of poultry farmers was observed and this low participation could have been the result of an outbreak of avian influenza which

occurred during the study period. Cattle production, on the other hand, was unaffected by any seasonal fluctuations.

Our study method imposed certain limitations and possible bias on the findings we describe. As described, the survey was conducted entirely online and, although this allowed questionnaire uptake via a variety of formats, it may also have excluded a small cohort of farmers unable to access the internet or unconnected to the CDC farmers' online groups. Moreover, our sample cannot be considered representative of the entire population of farmers as a whole, since the provinces of West (Xingjiang, Qinghai), South-West (Yunnan), and South China (Guangdong and Fujian) were not included in the analysis.

Animal welfare implications

The current study is the first of its kind to be performed in China, and it offers a first glimpse at Chinese farmers' perceptions of improvement to the welfare of animals in their facilities. Chinese farmers perceive this improvement in the form of two abstracts, general attitudes (reward-seeking, and empathic farmer), and four specific categories of actions (favourable environment, animal health, humane treatment of animals, farmer's well-being). Conflict arose between that which farmers considered important in regards to improvement of their facilities and the inherent difficulty of implementing these actions — emphasising a lack of resources and basic support which curtails consistent enhancement of animal welfare in China.

Briefly comparing our study to that of Kauppinen *et al* (2010) reveals a number of similarities, irrespective of the cultural differences between both sets of respondents. The SEM analysis depicted the same structural model for both situations: the lack of direct connection between perceived behavioural control and intentions; a direct influence of the subjective norms on the intentions and the attitudes; a stronger direct influence of the attitudes on the intentions. These similarities might be a result of commonality when it comes to farmers' universal approach to animal production as well as general factors influencing implementation of measures to welfare. Specific components, such as farmers' attitude towards their animals, pressure of social norms, and availability of resources could be representative of the major differences separating Chinese and the Finnish farmers.

In a practical sense, this study could hopefully provide guidelines for possible improvements to animal welfare in China. For example, veterinarians, agricultural advisers and scientific experts were considered quite influential social norms by the Chinese farmers. Identifying those components deemed more significant by the farmers provides a useful guide for effective persuasive messages to target such elements (HeeSun Park 2000). For example, encouraging the development of animal welfare-related programmes, specifically addressing veterinarians, agricultural advisers, and scientific experts could be helpful. In fact, an improvement of the knowledge about animal welfare by these social norms might allow them to directly influence Chinese farmers' activity, and therefore facilitate the implementation of animal welfare measures in China.

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