

**The potential effects of implementing California  
Proposition 12 in the swine industry**

by

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## **ABSTRACT**

The inclusion of animal welfare requirements in U.S. livestock production may be argued to have started with the Animal Welfare Act of 1966, a federal law regulating animal treatment. However, animal welfare concerns have expanded in complexity over the past several decades due to the pressure of activists and lawmakers and the support of sympathetic judges. The effect of this complexity and activism is significant uncertainty in the livestock industry about its ability to sustain profitability and ensure continuous growth. While a lot of the recent activism is emanating from states with relatively small livestock production, there are implications of some of the emerging regulations for livestock producers across the country. One of such recent regulations in a small swine producing state is California's Proposition 12, which required minimum confinement areas for farm animals, including veal calves, breeding pigs, and egg-laying hens.

This research sought to evaluate the economic feasibility of implementing the confinement requirements stipulated by California's Proposition 12 on a small swine farm. The lessons from the study are applicable across U.S. swine farms selling into the national processing system the products of which are distributed across the country. The study sought to assess how changing the space requirements could affect profitability of small swine operators assuming they are retrofitting their current production barns and not starting brand new production facilities.

The implementation of Proposition 12 will immediately reduce the sow herd size. For a hypothetical swine farm currently with 500 sows, the law will reduce sow numbers to 350 for the same production facilities the farm currently has. The current labor utilization

rates on swine farms are such that labor costs per sow with the reduction in sow numbers will increase because of the lumpiness of labor use. This arises from the standard allocation of one full time labor to 250 sows, and the lumpiness of labor implies that 350 sows will require as many labor employed as 500 sows. Labor productivity is not the only performance indicator affected. Transportation and logistics efficiencies are also expected to go down, and along with these productivity losses is increased cost of production per sow. The study shows that as a result of the productivity losses emanating from the 32.1% scale loss, profitability also declines. It was estimated that the financial loss from implementing Proposition 12, holding the stated production conditions constant, may be ameliorated with at least 7.2% increase in hog prices over the average price over the past decade. Since it is not expected that the legislation will trigger premiums for compliance, it is going to put pressure on producers who are unable to significantly reduce their production costs to overcome the economies of scale loss. For all intents and purposes, the legislation is more likely to have higher adverse effects on small swine producers who are already struggling with increasing feed costs, labor costs, and downward pressure on prices.

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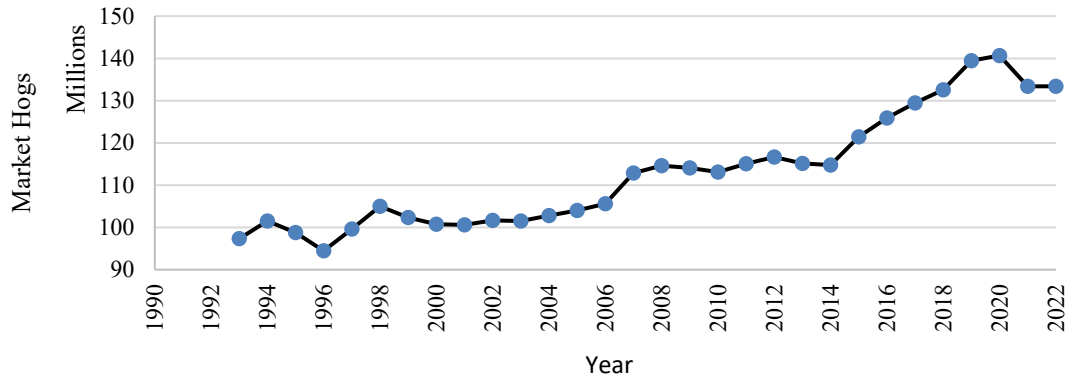
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## CHAPTER 1: INTRODUCTION

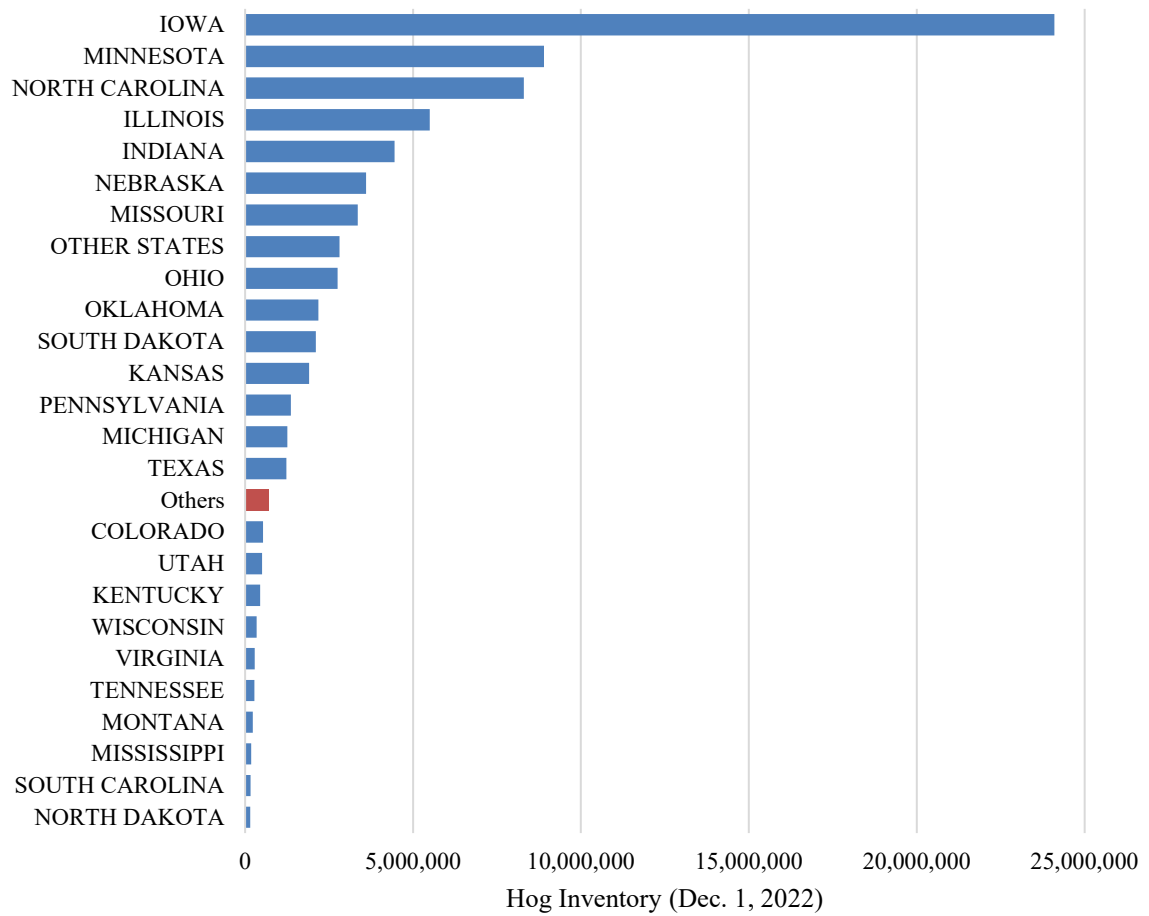
The inclusion of animal welfare requirements in U.S. livestock production may be argued to have started with the Animal Welfare Act of 1966, a federal law regulating animal treatment. However, the issue has gradually increased in complexity over recent years due to the pressure of activists and lawmakers and the support of sympathetic judges. The effect of this complexity and activism is significant uncertainty in the livestock industry about its ability to sustain profitability and ensure continuous growth. While a lot of the recent activism seems to be focused on states without large livestock production, the reach of some of the regulations emerging from the activists' activities has the potential to have significant impact on producers in states with large livestock production.

The total production value of hogs in the U.S over the past 30 years increased by about 37% between 1993 and 2022 (Figure 1.1). As of December 2022, there were 73.1 million hogs and pigs on U.S. hog farms. Iowa continues to be the largest pork producing state in the country with 23.21 million hogs, followed by North Carolina and Minnesota as of December 2022 (Figure 1.2). The figure shows that 23 states had less than 150,000 head of hogs in inventory as of December 1, 2022, and with only 85,000 head, California's share of total hog inventory in the U.S. on that date was just about 0.11%.

**Figure 1.1: U.S. Market Hogs (1990-2022)**



**Figure 1.2: U.S Hog Inventory by states on December 1, 2022**



**1.1 A Brief History of Animal Welfare Initiatives in the U.S.**

The United States has federal laws related to animal welfare as do several states in the

Union. Table 1.1 provides a list of state and federal animal welfare laws over time. It shows

that 135 years prior to the independence of the United States, Massachusetts its *Body of Liberties No. 92* which protected animals from tyranny and cruelty. New York State also enacted an anti-cruelty law in 1828 protecting horses and other farm animals from cruelty whether the animal belonged to the person doing the maltreating or to another. The first federal legislation within the animal welfare arena was the 28-hour law of 1873, which defined the transportation rules for livestock.

**Table 1.1: Animal Welfare laws in the U.S**

<b>Year</b>	<b>Name of the Policy</b>	<b>Definition</b>
1641	Body of Liberties- Massachusetts #92 Off the "Bruite Creatures"	No man shall exercise any Tyranny or Cruelties toward any brute creature which are unusual kept for man's use.
1828	First state Anti-cruelty l- New York	Every person who maliciously kills, maims, or wounds any horse, ox or other cattle, or any sheep, belonging to another, or shall malicious and cruelly beat or torture any such animal, where belonging to himself or another, shall, upon conviction, be adjusted guilty of a misdemeanor.
1873	First Federal legislation "28 Hour Law"	Animals in transportation may not be confined in a vessel or vehicle for more than 28 consecutive hours without the opportunity to unload food water, and rest for 5 consecutive hours.
1858	Humane Methods of Slaughter Act	All methods of handling and slaughtering while at the slaughterhouse must be humane. This is to prevent unnecessary suffering and create better and safer working conditions.
1966	Animal Welfare Act (AWA)	To protect the owners of dogs and cats from theft of such pets and to prevent the sale or use of stolen dogs and cats for the purpose of research and experimentation.
1970	Horse Protection Act	It is unlawful for any person to show, exhibit, sell, or transport sore horses or to use prohibited equipment or substances in these activities.
1970	AWA First Amendment- Clarification	AWA Clarified the definition of animals as all warm-blooded vertebrate animals except for horses not used in research, and farm animals used for breeding, food, fiber, etc.
1985	Food Security Act	Improved Standards for Laboratory Animals. The main thrust of the bill is to minimize the pain and distress suffered by animals used for experimentation and testing.
1985	AWA Amendment (II)	Preventing unnecessary duplication of animal experimentation, addressing public concern for laboratory animal welfare, and ensuring that research will continue to progress.
2002	AWA Amendment	Change the definition of animal to exclude; birds bred for research, rats of the genus Rattus bred for research, and mice of the genus Mus bred for research.

Source: (National Agricultural Library 2023)

The Animal Welfare Act of 1966 regulates the treatment of animals in research, exhibition, transport, and by dealers (USDA 2023). The Humane Methods of Slaughter Act (1958) required that all livestock be stunned unconscious before being slaughtered. This act was amended in 1978 and gave processing plant inspectors the right to stop slaughter

activities if they think an animal is being handled inhumanely (USDA n.d.). However, the Animal Welfare Act or any of the other federal laws do not cover farm animals used for food production. Indeed, all the Animal Welfare laws focused on post-farm gate activities or animals for research, teaching, testing, and exhibition.

In the past 20 years, however, lawmakers, industry groups, and other non-governmental organizations have focused attention on the treatment and welfare of farm animals. They have been pushing for more stringent laws to ensure humane treatment on farms. This move may be due to an increasing belief that current industry practices and federal and state laws are insufficient and inadequate in providing the level of care needed for farm animals. The move may also be driven by an increasingly more powerful coalition of advocacy groups who see animal production as a major contributor to the climate change and is looking for a way to curtail production (Kristiansen, Painter and Shea 2020, Bristow and Fitzgerald 2011). In this sense, their campaigns are not about animal welfare at all. They are about reducing or eliminating animal production as we know it. Ethan Brown, the founder of Beyond Meat is reputed to have told the Goldman Sachs' Builders and Innovators Summit 2019 that his mission demanded the urgency and scale the United States had for World War II and that his products would help solve heart disease, diabetes, cancer, climate change, natural resource depletion and animal welfare (Bloomberg BusinessWeek 2023). The order of the benefits of his initiative is important. The current advocacy groups are using the same tactics used by PETA (People for the Ethical Treatment of Animals) and earlier animal rights organizations since 1981 but with sophisticated improvements that leverage the legal system and social media.

In 1981, PETA's activists showed footage of monkeys in laboratories that had not received routine veterinary care for years. The principal investigator and lab operator, Dr. Edward Taub at the Institute for Behavioral Research in Maryland, was suspended until compliance with the AWA could be established. Taub's laboratory was never restored. Again, in 1984, although the Unnecessary Fuss publication by PETA grossly overstated the deficiencies in the Head Injury Clinic at the University of Pennsylvania, the Office for Protection from Research Risk (OPRR) found several serious violations of the guide for the care and use of laboratory animals. The OPRR put the university lab on probation, and the clinic was eventually closed. This led to the amendment of the Animal Welfare Act in 1985, which improved standards for animal research laboratory operations (Carder 2023). Market forces are driving the animal welfare issue across almost all farm animal species.

Activist groups are pressuring food companies and supermarkets to adopt stricter farm animal welfare requirements than those specified under the laws of the country. An example in swine production is the elimination of gestation crates. Gestation crates are used as individual pens for sows and gilts during pregnancy. They minimize aggression and injuries and allow farmers to provide individual care to pregnant sows and gilts. Sow and gilts in gestation crates can be fed customized feed to address any observed deficiencies and provided the appropriate medication if they are ill. The downside is that they can severely constrain the movement of pregnant sows, with the movement limited to side-to-side and back-and-forth motions.

Food retailers and consumers would like to see consistent animal welfare laws worldwide, and companies that have strong animal welfare policies would like to have the opportunity to open a dialog with their shoppers (Garlich 2022). Some groups would,

therefore, like to see EU laws apply in North America. Since 1990, PETA, The Humane Society, The Animal Legal Defense Fund, and other activist organizations have supplemented their efforts with undercover videos in poultry, veal, and pig farms. In 1995, an undercover video on a chicken farm led to the first-ever cruelty charge filed against what PETA called “factory farms”. In 1999, another undercover video was released showing pig farms in North Carolina and Oklahoma maltreating animals. This one ended in the first felony indictment of farm employees. It also drew the attention of voters and local governments to extend animal welfare laws to farm animals. In 2002, Arkansas tried and failed to pass Initiative Act 1, which aimed at prohibiting animal cruelty, marking the first attempt to regulate farm animals (Ballotpedia n.d.).

In the last several years, 14 States have passed policies addressing farm animal welfare. These policies in some states prohibit the sale of animal products from operations in other states that do not meet the state’s animal welfare requirements. It should be noted that the states that enforce these policies cover a relatively small proportion of U.S. animal production, and the most common policies are aimed at animal confinement in pork, veal, and egg hen production (Table 1.2). For example, Florida is not an important producer of hogs but has a crate ban in place. Likewise, Rhode Island, Maine, and Nevada are all negligible producers but are at the forefront of the crate bans.



**Table 1.2: States banning the Use of Crates by Species and Their Relative Share of Total U.S. Production by Hogs, Veal and Layers**

States	Hogs	Egg-Laying Hen	Veal	Share of U.S. on Farm Production	
				Hogs	Layers
<b>Arizona</b>	x		x	0.218%	0.00%
<b>California</b>	x	x	x	0.034%	3.45%
<b>Colorado</b>	x	x	x	1.886%	0.63%
<b>Florida</b>	x			0.000%	0.000%
<b>Maine</b>	x		x	0.004%	0.000%
<b>Massachusetts</b>	x	x	x	0.009%	0.040%
<b>Michigan</b>	x	x	x	1.763%	4.407%
<b>Ohio</b>	x	x	x	3.211%	9.954%
<b>Oregon</b>	x	x		0.009%	0.543%
<b>Rhode Island</b>	x	x	x	0.002%	0.000%
<b>Kentucky</b>			x	0.780%	1.450%
<b>Nevada</b>		x		0.000%	0.000%
<b>Utah</b>		x		1.165%	1.522%
<b>Washington</b>		x		0.017%	1.729%

Source: State and Local Animal Welfare Laws | National Agricultural Library (usda.gov).

In states with farm animal production policies (Table 1.3), the amount of pork, veal, and eggs produced is limited compared to the amount consumed. For example, California produced 1% of the pork consumed in this state. Therefore, these products are imported from other States. The problem is that egg, pork, and beef products from operations using prohibited practices such as raising animals in cages are restricted unless producers change their way of producing and adopt the production practices required by these States (Ufer 2023).

**Table 1.3: Farm Animal Welfare Propositions Adopted by Voters**

<b>Year</b>	<b>Name of the Policy</b>	<b>Definition</b>
<b>2006</b>	Arizona Proposition 204 Humane Farm Initiative	Prohibit the cruel and inhumane confinement of pregnant pigs or calves raised for veal and establish misdemeanor penalties for doing so.
<b>2008</b>	California Proposition 2 Farm Animal Confinement Initiative	Prohibited the confinement of pregnant pigs, calves raised for veal, and egg-laying hens in non-confine spaces.
<b>2016</b>	Massachusetts Question 3 Animals	Prohibited certain methods of farm animal containment.
<b>2018</b>	California Proposition 12 Farm Animal Confinement Initiative	The measure prohibited the confinement of pregnant pigs, calves raised for veal, and egg-laying hens in a manner that does not allow them to turn around freely, lie down, stand up, and fully extend their limbs.

Source: (Ballotpedia n.d.)

## **1.2 Research Problem and Research Question**

The research problem focuses on the potential threat to livestock producers as a result of the increasing number of ballot initiatives and legal cases in favor of animal welfare and rights. By narrowing the research problem to livestock producers, we can capture their challenges and evaluate them to explore potential strategies to sustain their operations and livelihoods.

The research question limits the investigation to hog production and single proposition: What are the strategic implications of California's Proposition 12 on livestock producers in the country? The study uses a hypothetical farm to conduct the analysis given the diversity of operations across the country and their target markets. The answers to this question should help hog farmers with the characteristics of the hypothetical farm to gain

some direct insights of the impact of the law. It should also help farms that differ in species, size, and scope to extrapolate the results to their own situation. We see the research also providing the tools to help explore the potential implications of other policies that impinge on production agriculture in a rapidly changing period.

### **1.3 Objectives**

The overall objective of this research is to assess the potential effect of California's Proposition 12 on pork producers in the U.S. and identify strategic initiatives that they may use to sustain their operational and financial performance in spite of the law. This is a proactive approach to the changing environment agriculture and livestock producers are increasingly encountering. The specific objectives are as follows:

1. Describe the evolution of animal welfare issues in the U.S. to the passing of California's Proposition 12.
2. Assess the impact of Prop 12 on a case swine farm's productivity.
3. Based on the results from Objective 2, provide some pragmatic strategies that pork producers may use to accentuate the benefits of Proposition 12 and reduce or eliminate its challenges to their financial and operational performance.

It is hypothesized that the letter and spirit of Prop 12 is such that it will have an adverse effect on pork producers. It is argued that the main impact on pork producers' performance will be through reduction in sow numbers compared to the status quo and an increase in labor cost because of the lumpiness of labor in the production process. If the trend in prices and per capita consumption of pork and pork products continue in the direction they have, then Prop 12's effect on the pork industry will be negative, as forecast by numerous researchers (Love 2023, McGrath 2023).

## **CHAPTER II: LITERATURE REVIEW**

This section aims to provide an overview of prior literature related to Proposition 12 and other animal welfare initiatives in the U.S. The chapter is organized into two sections. The first reviews the literature on animal welfare and performance in livestock production in. It explores what is usually measured as indicators of performance and explores which one should be focused on in an environment of animal welfare politics and economics. The second continues from the first, exploring the legal and legislative dynamics affecting animal production in the EU as potential insights for understanding the U.S. trends.

### **2.1 Animal Welfare and Performance in Livestock Production**

While financial numbers have been calculated for grow-finish operations, there is little published information for the breeding and farrowing stages. Reich and Klingenstein (2006) analyze the production costs and financials of breeding and farrowing naturally raised pigs in a hoop production system. The study examines costs per weaner pig for various facilities and herd management techniques. Labor and feed costs are the most significant cost factors. Labor costs can vary based on the operator's management strategy, so a sensitivity analysis was conducted to test its influence on the cost of producing a weaned pig (Reich and Kliebenstein, Economics of Breeding, Gestation and Farrowing Hogs in "Natural Pork" Production; Financial Comparison 2006). They discuss the variables included in the estimation of hog supply and feed input demand equations. Their variables included lagged breeding stock, hog output price, farm wage, feed cost, sow price, conditional standard deviations of stochastic prices, interest rate, number of pigs per litter, and a trend variable representing increased use of marketing contracts by hog producers. The econometric analysis suggested three different phases in the demand for

breeding herd, except for a period of inaction or sluggishness. This confirms that there is a fixed nature to sow investment. The rate at which the breeding herd adjusts to investment and disinvestment is found to be slightly different. There is evidence of a connection between breeding stock and the supply of hogs. The findings highlight the importance of considering investment rigidity when estimating hog output supply and demand for fixed and variable inputs. However, the simulation results indicate that the price elasticities do not differ significantly between the investment and disinvestment phases. Nonetheless, the simulation does show that the equilibrium configuration is responsive to changes in the output price trend (Reich and Kliebenstein 2006).

To what extent have animal welfare initiatives affected performance and performance measures on livestock production establishments? Henningsen et al. (2016) proposed a theoretical framework for evaluating the relationship between animal welfare and performance on livestock farms. Using the Danish hog industry, they tested their model and found wide variations among indicators. This implies the need to select performance indicators carefully when exploring the potential implications of animal welfare policies on farms. Temple and Manteca (2020) explore the blind spot in most of these advocacy initiatives in assuming that intensive production systems have higher tendencies for animal welfare problems. They challenge the point of view that extensive production systems are advantageous for animal welfare. Their research concludes that animal welfare problems are more likely to be found on extensive systems if the four animal welfare domains are the central foci – nutrition; environment; health; and behavior. From their perspective, extensive systems are more heterogenous and variable in all aspects of the four foci. They point to neonatal complications and disease spread as well as early detection of potentially

fatal problems. Finally, they note that infrequent handling can impair the human-animal relationship which can have an adverse effect on animal welfare. Their paper recommends pursuit of practice-led innovations and knowledge-supported strategies with producers.

Balzani and Hanlon (2020) argue that the whole issue of animal welfare is complex and identify the various disciplines that participate and contribute to our understanding of the issue. Included in these disciplines are animal science, veterinary, psychology, sociology, and agricultural economics. They also observe, accurately, that farmers are key to the realization of animal welfare standards. Their paper explores 30 years of factors that have contributed to farmers' perspectives on animal welfare. These perspectives are often ignored in the current debate and advocacy initiatives. Balzani and Hanlon's work identified 11 internal factors and 15 external factors that influenced farmers' perspective on animal welfare. The internal factors included farmer knowledge, empathy, personality, values, and human-animal bond. The external factors were economics, communication, and time and labor. Across all the papers reviewed by Balzani and Hanlon, farmers' knowledge and cost implications of farm animal welfare were the most frequently reported factors. Unfortunately, the economics of the current advocacy initiatives, such as Proposition 12, hardly consider these important issues of interest to those who will be directly affected by this legislation.

## **2.2 Continuing Legal and Legislative Dynamics in Animal Production Agriculture**

Europe Union Council directive of December 2008 established minimum standards for the protection of pigs. The European Union standards for the area available for gilts and sows are 24.2188 sqf/sow, slightly bigger than the U.S. standard of 24 ft/sow. According to the European requirement for group housing for pregnant sows by 1 January 2013, pregnant sows will not be housed in crates or cages except during farrowing events.

European Union policymakers promised to phase out cages for 300 million farmed pigs, egg-laying hens, rabbits, and other species in 2021. A contributor to Vox, a small online publication that has a goal “to ensure that everyone, regardless of income or status, can access accurate information that empowers them,” Jonathan Moens described the EU’s move as “the most ambitious plan ever by any government to end the cruel practice” (Torrella 2023). The EU has not implemented this plan as at the time writing because of challenges in bringing food price inflation down as a result of weather, Russia-Ukraine war, and lobbying by the European meat industry. There are some rumors that the EU is scrapping the initiative all together because of “broader fights over the Europe’s Green New Deal” (Torrella 2023). Yet, the trajectory of Prop 12 in the U.S. can be compared to the situation in the EU and Brazil, with the same accusations that livestock farmers fail to see animals as emotional beings.

California Department of Food and Agriculture (CDFA) verifies and controls the laws implemented in the state of California by certifications and audits performed by third-party certified institutions. Gaiato (2023) analyzes how consumer perception of the animal welfare certification impacts brand equity. The study was conducted in two stages: a causal research with a 2x2 design involving two scenarios and two brands, and a descriptive stage exploring the relationships between variables, such as prior knowledge of the Animal Welfare certification seal, brand awareness, and purchase intention. The study found that the animal welfare certification seal positively impacts brand equity and is essential for consumers when purchasing products. In a separate study, Oliveira (2018), using a survey method, assesses the degree of consumer knowledge on food safety along with issues such as animal welfare, traceability, and socio-environmental responsibility. Also included are

themes such as product certification, government regulation, ethics concerning the treatment of animals intended for human consumption, and food security. The study results suggest that certification brands ensure a higher quality standard; consumers are expected to assign a higher brand equity. What is not evaluated is mandated production methods and their effect on brand equity. We do not believe that mandated production systems can extract premiums from the market.



## CHAPTER III: DATA AND METHODS

Recall that the motivation for this study was to explore the strategic implications of California's Proposition 12 on livestock producers in the country. The literature review explored the ongoing effect of changes in animal welfare regulations on performance metrics in livestock production and how the changing environment could affect the welfare of producers. In this chapter, the data and methods used to explore the impact of Proposition 12 on a hypothetical hog farm's performance are explored in two sections. The first describes the data and the second presents the methods.

### 3.1 Data

The National Agricultural Statistical Service (NASS) and Economic Research Service (ERS), both agencies within the U.S. Department of Agriculture (USDA), collect data on various aspects of the U.S. agricultural sector. One of NASS's comprehensive datasets is the census and survey dataset on the production and market statistics of the country's agricultural industries at the county, state, and national levels. The full datasets may be accessed from <https://quickstats.nass.usda.gov/>. To develop the hypothetical hog farm, the research drew on NASS survey data for time series data on litter rate, death loss, live weight, price received, and sows/gilts bred. From ERS, the research procured components and total production cost, prices, and revenues. The research also drew on information published by Meta Farms (<https://www.metafarms.com/>) for industry and farm level production and market information. Finally, the researcher interviewed swine and hog industry personnel – producers, technicians, operations, nutritionists, construction service providers, and others to fill in gaps in the public data and provide context for those data.

The parameters for the hypothetical farms are summarized in Table 3.1. The farm is assumed to be a single 250 x 40 square feet barn housing 500 sows. Under the status quo, the gestation crates are 7 x 2 square feet, and the building is divided into three sections with four side aisles and three central hallways for easy handling. The Prop 12 remodeling of the barn removes all crates, and pens are rebuilt with G-stalls. In so doing, all walking aisles are eliminated, leaving a main hallway to help maximize all production area. This remodeling reduces production capacity from 500 to 350 sows to meet the 24-square-foot requirement.

**Table 3.1: Hypothetical Farm Parameters**

<b>Farm Production</b>	<b>Status Quo</b>	<b>Prop 12</b>
<b>Sows</b>	500	350
<b>Farrowing interval<sup>1</sup></b>	2.35	2.35
<b>Farrowing rate<sup>1</sup></b>	92%	92%
<b>Pigs weaned/sow<sup>1</sup></b>	11.69	11.69
<b>Hogs (cwt)</b>	2.84	2.84
<b>Total pigs weaned per year</b>	12,636	9,615
<b>Weight of pigs weaned (cwt)</b>	35,855	27,283
<b>Nursery-Finisher survivability<sup>2</sup></b>	95%	95%
<b>Marketed head (pigs)</b>	12,004	9,134
<b>Marketed weight (cwt)</b>	34,061.40	25,917.70
<b>Sow weight</b>	475	475

Source: (1) MetaFarm.com; (2) USDA-NASS

The farrowing interval (FI) for the farm was assumed to be 2.35 (MetaFarms 2019) and the number of pigs weaned per sow per litter was 11.69 (USDA-NASS 2023). The farrowing rate was assumed to be 92% and the average weight of marketed hog 283.75 pounds. Assuming a 95% nursery-finisher survival rate of 95%, the total number of pigs marketed by the farm is estimated at 12,004. To comply with California’s Proposition 12, the barn can house no more than 350 sows. Holding all things constant, the production

under the new regulation decreases from 12,004 marketed pigs per year to 9,134, a production decrease of about 24%.

The gestation labor input time and cost estimates under the status quo and Prop 12 are presented in Table 3.2. Recall the assumption that the labor requirement was one full time equivalent per 300 sows. With 500 sows under the status quo, therefore, the farm employs two people and the same two people will be required for 350 sows under Prop 12. With the same hourly wage of \$16.48, the effective per hour cost per sow under the status quo was about 3.296 cents compared to 4.709 cents under Prop 12. Working through this inefficiency from the start leads to a labor cost per cwt of \$0.84/year under the status quo and \$1.02/year under Prop 12, an increase of about 31%, holding all other dimensions of labor use unchanged.

**Table 3.2: Impact of Prop 12 on Gestation Labor Cost**

<b>Gestation Labor</b>	<b>Status Quo</b>	<b>Post Prop 12</b>
<b>Labor cost/hour</b>	\$16.48	\$16.48
<b>Labor/300 sows (people)</b>	2	2
<b>Labor Cost/cwt/hour</b>	\$0.0010	\$0.0013
<b>Number of weeks to gestation</b>	20	20
<b>Number of working days per week</b>	6	6
<b>Number of paid hours per day</b>	7	7
<b>Gestations/year</b>	2.45	2.45
<b>Total labor hours/sow/year</b>	4116	4116
<b>Labor cost/cwt</b>	<b>\$0.84</b>	<b>\$1.10</b>

Source: MetaFarm.com

### 3.2 Methods

The gross profit associated with the status quo operation and Prop 12 using the same capital are compared. Production is explored over 10 years under the foregoing assumptions to evaluate the long-term implication of Prop 12 on the hypothetical farm. Prices and costs are assumed to follow the same distribution as seen in the prior 10 years.

Therefore, we use the average price and cost of the previous 10 years and their standard deviations to generate three 100 random projections and used their averages as projections for the prices and variable costs for the 10 years of production from current (2023) to 2032. All production parameters are held unchanged as specified above. We also recognize the remodeling cost that would occur under Prop 12. It was estimated at \$300/sow, which means that for the 350-sow operation, the remodeling cost (I) is projected to be \$105,000. The NPV for the two systems, *a* (status quo) and *b* (Prop 12), are specified as follows:

$$\begin{aligned}
 NPV_a &= \sum_{t=0}^T \frac{GP_a}{(1+d)^t} \\
 NPV_b &= \sum_{t=0}^T \frac{GP_b}{(1+d)^t} - I
 \end{aligned}
 \tag{1}$$

where GP is the gross profit and d is the discount rate. The biggest challenge in using NPV is determining the appropriate discount rate. In this study we used the historical prime rate from July 2023 which was 8.5% (Chase 2023). The analyses were conducted using Microsoft Excel. The analyses explored the effect of three scenarios under each operational situation: the base scenario, best case scenario; and worst-case scenario. Thus, in addition to the simulation of prices and variable costs described above, two more prices and variable costs were generated with smaller and broader standard deviations but the same means to describe the best case and worst-case scenarios. It was assumed that the relative probabilities of these scenarios occurring were, respectively, 50%, 30% and 20% for base, best case, and worst-case scenarios. These scenarios and average prices and costs are presented in Table 3.3. The NPVs were estimated under the conditions presented in the table. The table shows that the price under both production conditions is the same since it is the same hog being produced. Normally, using more “humane” production system should

attract a premium. However, because Prop 12 is mandated, it is assumed that there is no premium for compliance but rather a penalty for non-compliance.

**Table 3.3: Mean Price and Variable Cost (per cwt) under Alternative Scenarios and Production Conditions**

	<b>Base Case</b>	<b>Best Case</b>	<b>Worst Case</b>
<b>Status Quo</b>			
Price	\$131.44	\$135.01	\$123.57
Variable Cost	\$106.76	\$100.36	\$109.66
Scenario Probabilities	50%	30%	20%
<b>Prop 12</b>			
Price	\$131.44	\$135.01	\$123.57
Variable Cost	\$108.28	\$101.79	\$111.22
Scenario Probabilities	50%	30%	20%

## CHAPTER IV: RESULTS

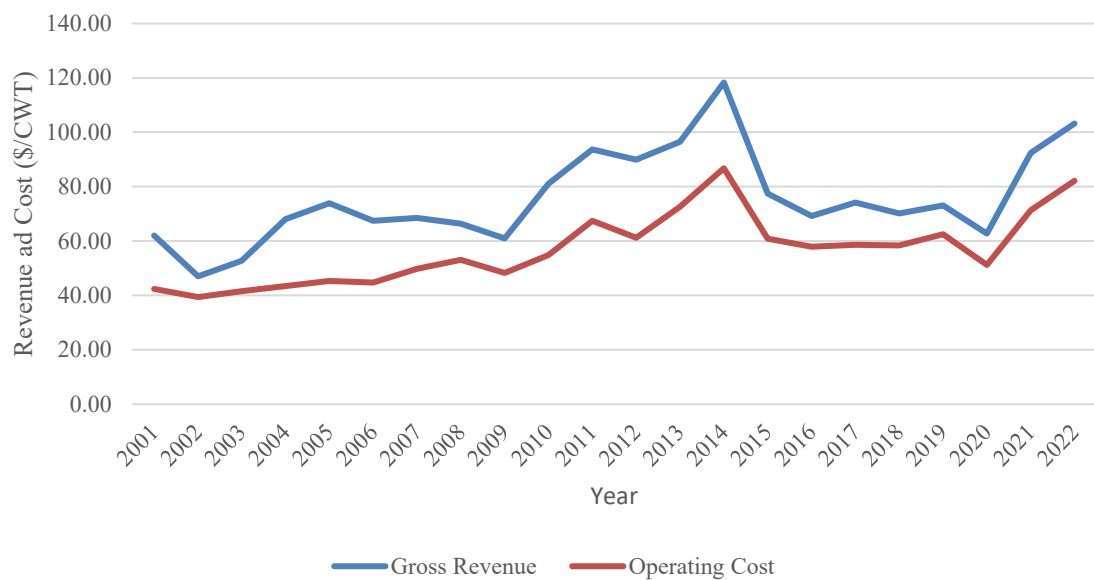
The foregoing chapter presented the assumptions, data, and methods for undertaking the comparison of production performance under the status quo and under Prop 12 constraints. The critical impact of Prop 12 is a reduction in the number of sows that may be produced in the same production facility. We noted that this reduction increased the labor costs associated with managing gestation sows but nothing else. In this chapter, the results of the analyses are presented. The first section presents the trends and summary statistics of the critical financial variables – costs, revenues, gross profits, and gross margin – from the historical data gathered from USDA. It also presents the forecasts based on historical information with the view of presenting a directional overview of the industry’s financial situation even in the absence of Prop 12. The second section presents the results for the alternative scenarios. The final section explores the sensitivity of the results to alternative critical parameters, such as price and probabilities of the occurrence of the scenarios.

### 4.1 Cash Flow Analysis

Using USDA data from 2001 through 2022, Figure 4.1 shows the undiscounted revenues and variable (operating) costs for U.S. hog production. While both variables are trending up, the industry has been experiencing some significant challenges over the years. For example, as recently as 2020, revenue per cwt of production was at about the same level as it was in 2001. The average revenue and operating costs over the 21 years and their standard deviations are as follows: Revenue (Mean: \$75.87; SD: \$17.06; CV: 22.5%); and Operating Cost (Mean: \$57.01; SD: \$13.02; CV: 22.8%). The correlation coefficient was estimated at 92.5%, implying a strong correlation between revenues and operating cost.

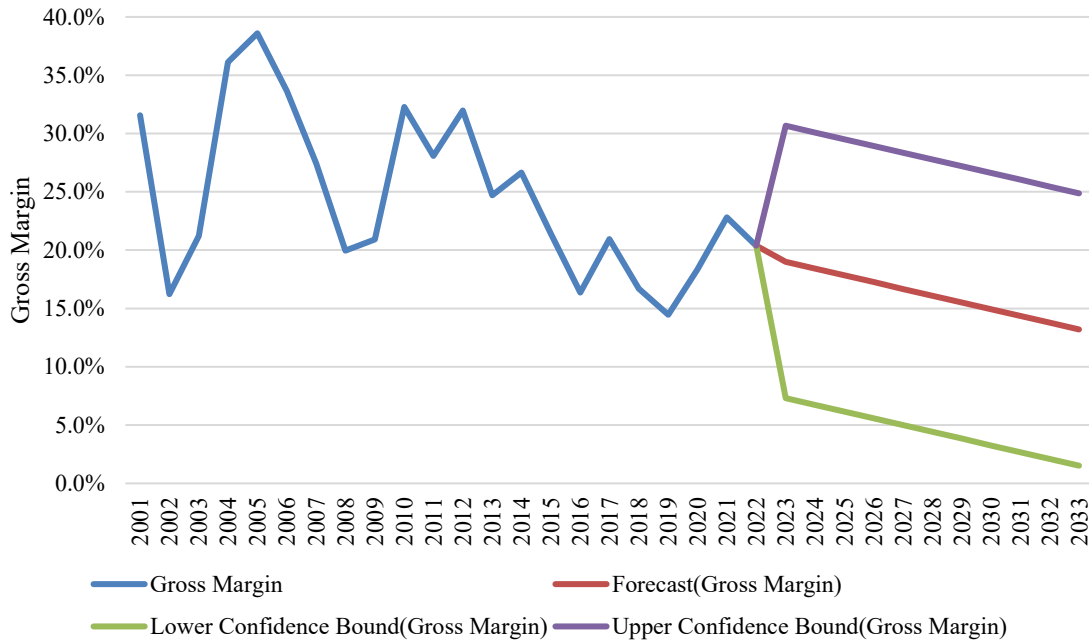
Notwithstanding, the respective average annual growth rates for revenues and operating costs were estimated at approximately 1.86% and 2.62%. Since costs are growing faster than revenues, the long-term outlook for the industry’s gross profit, if nothing changes, is not rosy. This is revealed in the trend in gross margin for hog production over the period under analysis (Figure 4.2). It shows that the gross margin has been declining at an average rate of 2.2% per annum. The forecast of gross margin reaches about 13.2% by 2033 assuming the historical conditions hold. The lower bound of the 95% confidence interval shows a gross margin forecast in 2033 of 1.5% and the upper bound of the 95% confidence interval of 24.9%, which will just be about the realized gross margin in 2013, some 20 years earlier.

**Figure 4.1: Historical Trend in Gross Revenue and Operating Cost in the U.S. (2001-2022)**



Source: USDA-NASS

**Figure 4.1: Gross Margin and Forecast with 95% Confidence Interval for the US Hog Industry (2001-2033)**



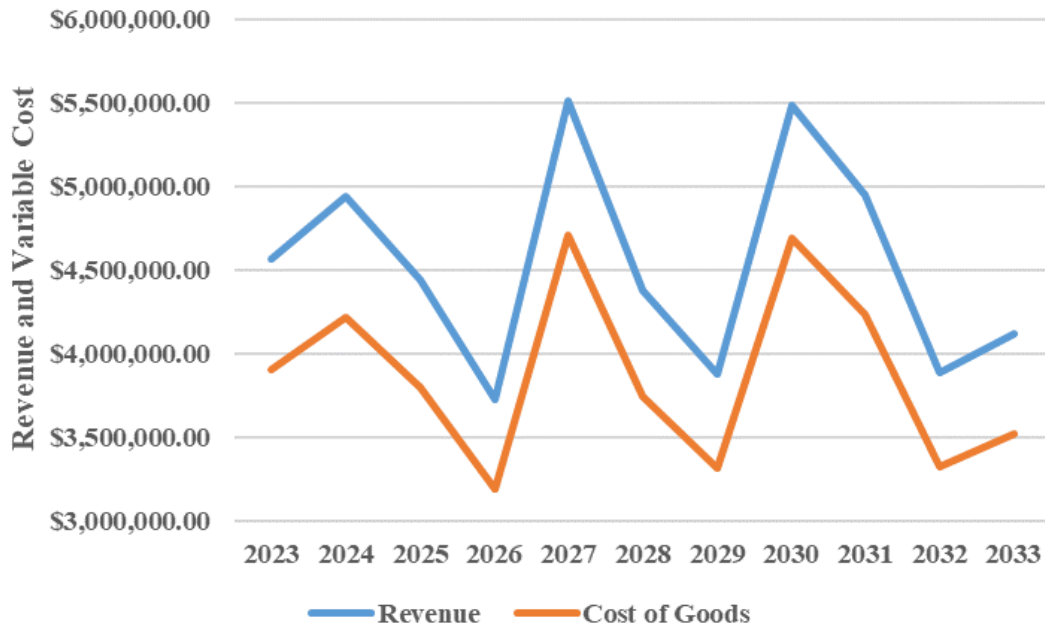
Source: USDA-NASS

#### 4.2 The Base Scenario

Based on the assumptions specified in Table 3.1 and Table 3.2, the projected financials under the base scenario for the status quo are presented in Figure 4. 1 (revenues and variable costs) and Figure 4. 2 (gross profit). They were developed under the price and cost projections described in Chapter III. There is a strong correlation between revenues and operating costs which defines a trend in revenues and variable costs. The peak revenue of about \$5.5 million coincided with peak variable cost of approximately \$4.7 million in 2027. Over the 11-year duration, the average revenue and variable costs were about \$4.5 million (SD: \$0.62 million) and \$3.8 million (SD: \$ 0.53 million), respectively. Their coefficients of variation were about 14% each, which confirms the nature of the development of the forecast parameters.

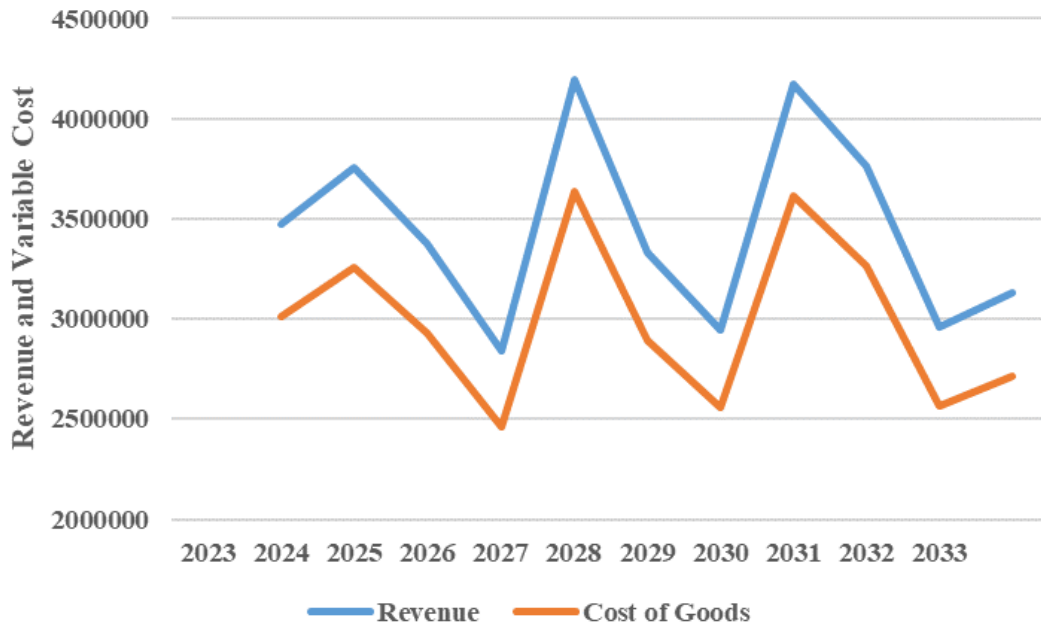


**Figure 4. 3: Projected Revenue and Variable Costs Under the Base Scenario for the Status Quo Production System (2023-2033)**



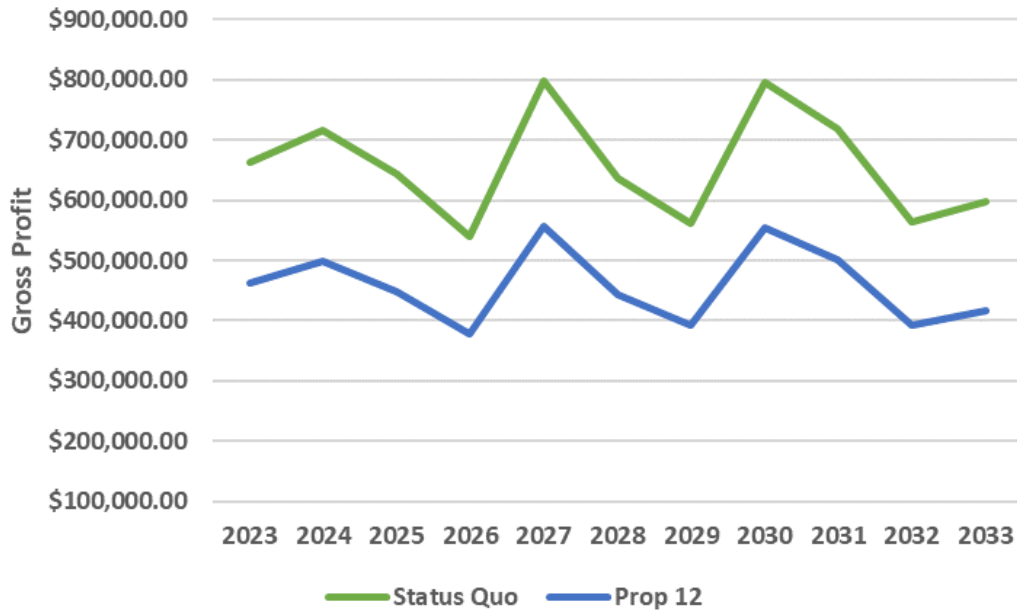
The revenue and variable cost trend under Prop 12 production system for the base scenario are presented in Figure 4.3. There is a strong correlation between revenues and operating costs which defines a trend in revenues and variable costs. The peak revenue of about \$4.19 million coincided with peak variable cost of approximately \$3.63 million in 2027. Over the 11-year duration, the average revenue and variable costs were about \$3.44 million (SD: \$0.47 million) and \$2.99 million (SD: \$ 0.41 million), respectively. Their coefficients of variation were about 13.8% each, which confirms the nature of the development of the forecast parameters.

**Figure 4. 4: Projected Revenue and Variable Costs Under the Base Scenario for the Prop 12 Production System (2023-2033)**



The projected gross profit under the Status quo production system trended down the first few years and then followed the sinusoidal pattern seen in the revenue and variable costs presented in Figure 4.4. Total gross profit over the 11-year duration under the status quo production system was approximately \$7.2 million, with an average gross profit of about \$0.65 million (SD: \$0.09 million). The coefficient of variation for gross profit was estimated at 13.8%, suggesting that a unit change in the average gross profit changed its standard deviation by about 14%. The NPV at 8.5% discount for the gross profit under the base scenario was estimated at a little over \$4.6 million. The gross profit under the Prop 12 production system reveals a strong correlation between revenues and operating cost which definite a trend in revenues and variable costs. The total gross profit under the Prop 12 production system was about \$4.93 million, with an average of \$0.45 million (SD: \$0.06 million). The larger standard deviation than the average gross profit yielded a coefficient of variation of 107.3%. The NPV was approximately \$3.10 million.

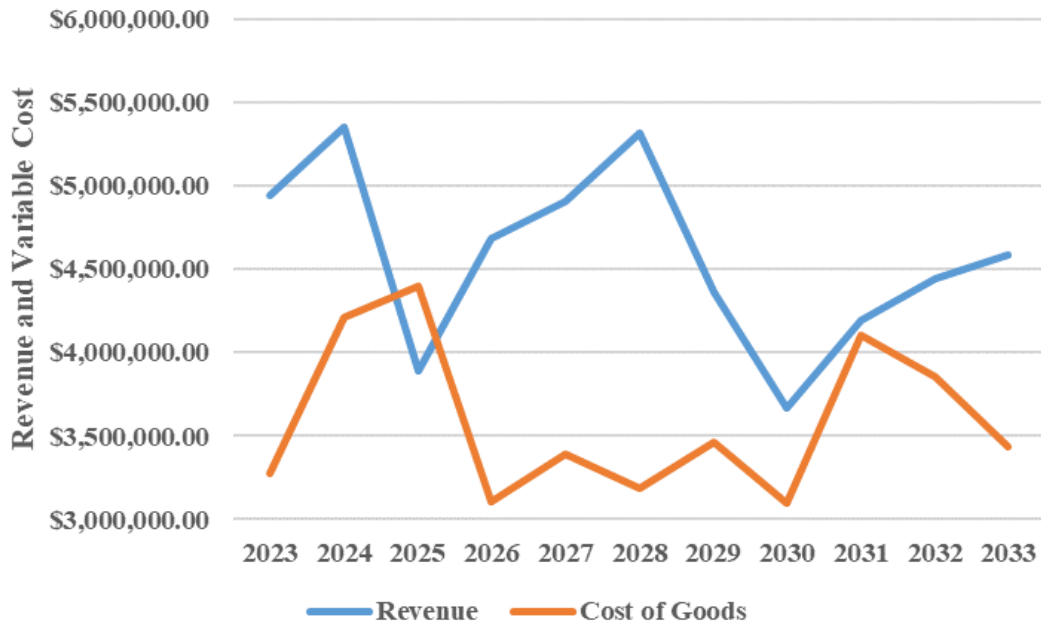
**Figure 4. 5: Projected Gross Profit Under the Base Scenario for Status Quo and Prop 12 (2023-2033)**



**4.3 Best-Case Scenario**

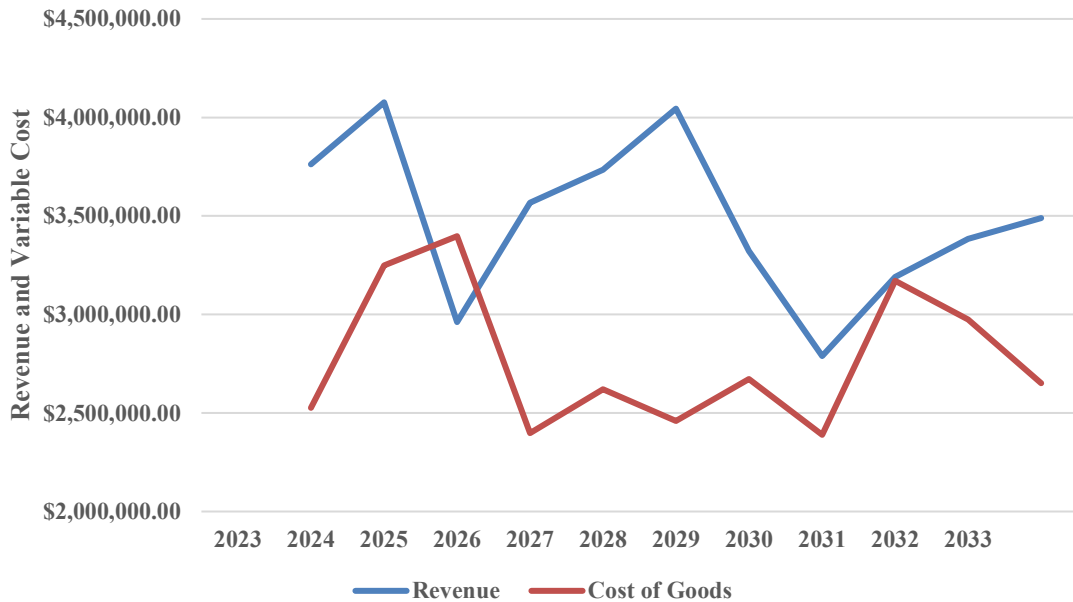
The revenue and variable cost trend under the status quo production system for the best-case scenario are presented in Figure 4.5. The peak revenue for the best-case scenario for the status quo production system was about \$5.35 million in 2024 and the peak variable cost was approximately \$4.4 million in 2025. Over the 11-year duration, the average revenue and variable costs were about \$4.08 million (SD: \$0.54 million) and \$3.59 million (SD: \$ 0.46 million), respectively. Their coefficients of variation were about 13.2% and 13.0%, respectively.

**Figure 4. 6: Projected Revenue and Variable Costs Under the Best-Case Scenario for the Status Quo Production System (2023-2033)**



The revenue and variable cost trend under Prop 12 production system for the best-case scenario are presented in Figure 4.6. The peak revenue of about \$4.07 million in 2024 and peak variable cost of approximately \$3.39 million in 2025. Over the 11-year duration, the average revenue and variable costs were about \$3.48 million (SD: \$0.411 million) and \$2.77 million (SD: \$0.36 million), respectively. Their coefficients of variation were about 11.8% and 13%, respectively.

**Figure 4. 7: Projected Revenue and Variable Costs Under the Best-Case Scenario for the Prop 12 Production System (2023-2033)**



Total gross profit over the 11-year duration for the best-case scenario of the status quo and Prop 12 production systems are presented in Figure 4.7. The total gross profit under the status quo was approximately \$10.83 million, with an average gross profit of about \$0.98 million (SD: \$0.76 million). The coefficient of variation for gross profit was estimated at 77.6%, suggesting that a unit change in the average gross profit changed its standard deviation by about 77.6%. The NPV at 8.5% discount for the gross profit under the best-case scenario was estimated at a little over \$7.14 million. The gross profit under the Prop 12 production system reveals larger variability which is based on the increased volatility expected in the industry as it adjusts to the new legislation in its first decade. The total gross profit under the Prop 12 production system was about \$7.71 million, with an average of \$0.71 million (SD: \$0.58 million). The larger standard deviation than the average gross profit yielded a coefficient of variation of 107.9%. The NPV was approximately \$5.06 million.

**Figure 4. 8: Projected Gross Profit Under the Best-Case Scenario for Status Quo and Prop 12 (2023-2033)**



#### 4.4 Worst-Case Scenario

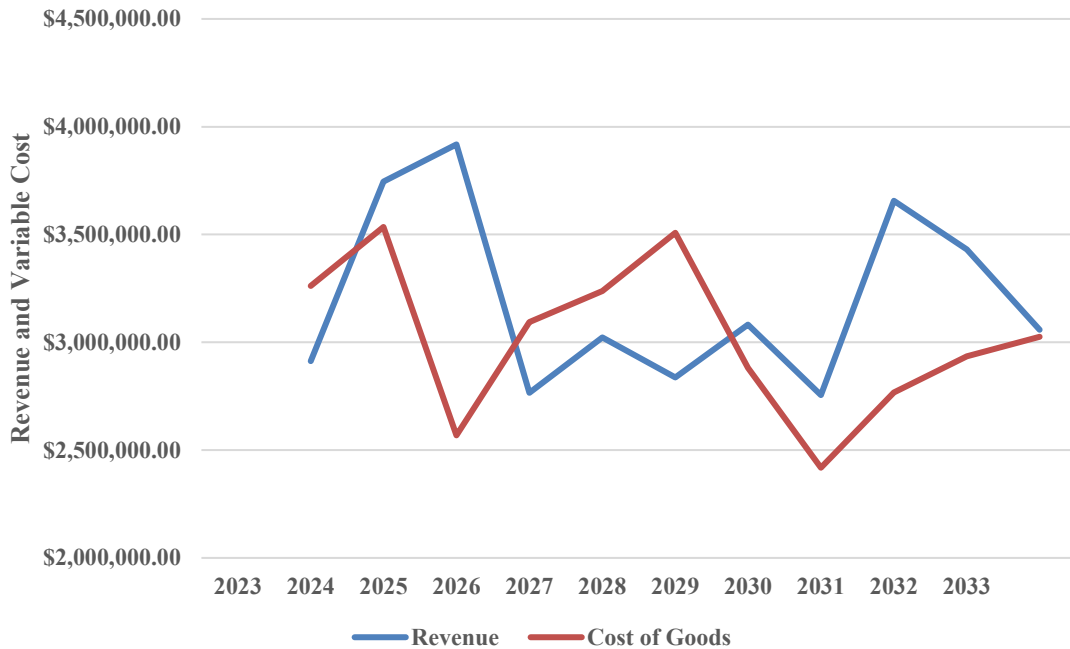
The revenue and variable cost trend under the status quo production system for the best-case scenario are presented in Figure 4.7. The peak revenue for the worst-case scenario for the status quo production system was about \$5.14 million in 2024 and the peak variable cost was approximately \$4.58 million in the same year. Over the 11-year duration, the average revenue and variable costs were about \$4.2 million (SD: \$0.54 million) and \$3.91 million (SD: \$ 0.46 million), respectively. Their coefficients of variation were about 13% and 11.8, respectively. Which confirms the nature of the development of the forecast parameters.

**Figure 4. 9: Projected Revenue and Variable Costs Under the Worst-Case Scenario for the Status Quo Production System (2023-2033)**



The revenue and variable cost trend under Prop 12 production system for the base scenario are presented in Figure 4. 5. The peak revenue of about \$3.91 million in 2025 and peak variable cost of approximately \$3.53 million in 2024. Over the 11-year duration, the average revenue and variable costs were about \$3.19 million (SD: \$0.41 million) and \$3.02 million (SD: \$0.35 million), respectively. Their coefficients of variation were about 13% and 11.8%, respectively.

**Figure 4. 10: Projected Revenue and Variable Costs Under the Worst-Case Scenario for the Prop 12 Production System (2023-2033)**

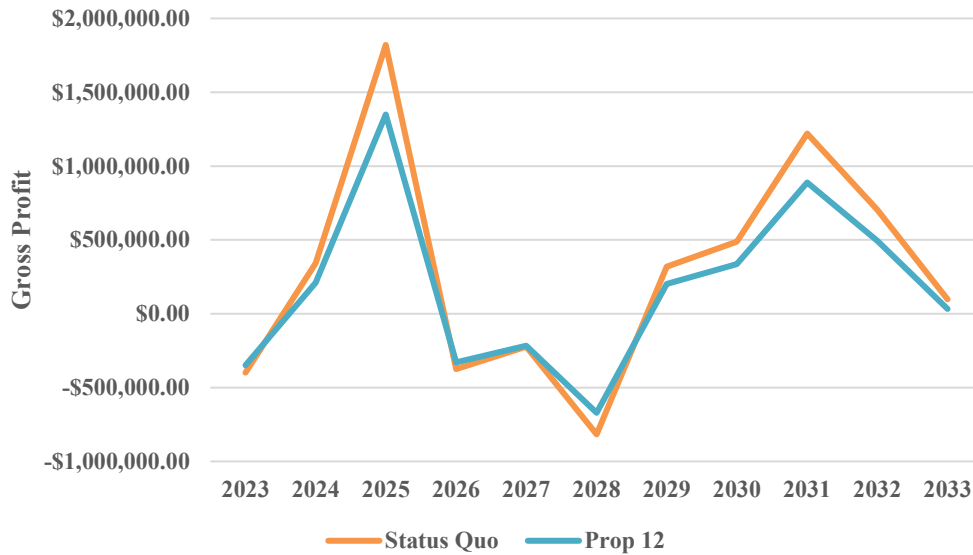


Total gross profit over the 11-year duration for the worst-case scenario of the status quo and Prop 12 production systems are presented in Table 4.10. The total gross profit under the status quo was approximately \$3.17 million, with an average gross profit of about \$0.28 million (SD: \$0.76 million). The coefficient of variation for gross profit was estimated at 265%, suggesting that a unit change in the average gross profit changed its standard deviation by about 265%. The NPV at 8.5% discount for the gross profit under the base scenario was estimated at a little over \$1.8 million. The gross profit under the Prop 12 production system reveals larger variability which is based on the increased volatility expected in the industry as it adjusts to the new legislation in its first decade. The total gross profit under the Prop 12 production system was about \$1.84 million, with an average of \$0.17 million (SD: \$0.58 million). The larger standard deviation than the average gross



profit yielded a coefficient of variation of 102.6%. The NPV was approximately \$0.96 million.

**Figure 4. 11: Projected Gross Profit Under the Worst-Case Scenario for Status Quo and Prop 12 (2023-2033)**



#### 4.5 Summary Results and Simulations

It was assumed that the probability of the base scenario prevailing was 50% compared to 30% and 20% for the best-case and worst-case scenarios. Using these probabilities, the expected NPV of gross profit from the three scenarios for the status quo production system was estimated at about \$4.8 million compared to \$3.2 million for Prop 12 production system (Table 4. 1). Thus, the status quo’s NPV exceeded that for Prop 12 by about \$1,542,413 over the 11 years for the hypothetical farm operating 500 sows and 350 sows under the two systems. The effect of shifting from the status quo to Prop 12 production system is a loss of about 32.1% in NPV at 8.5% discount rate.

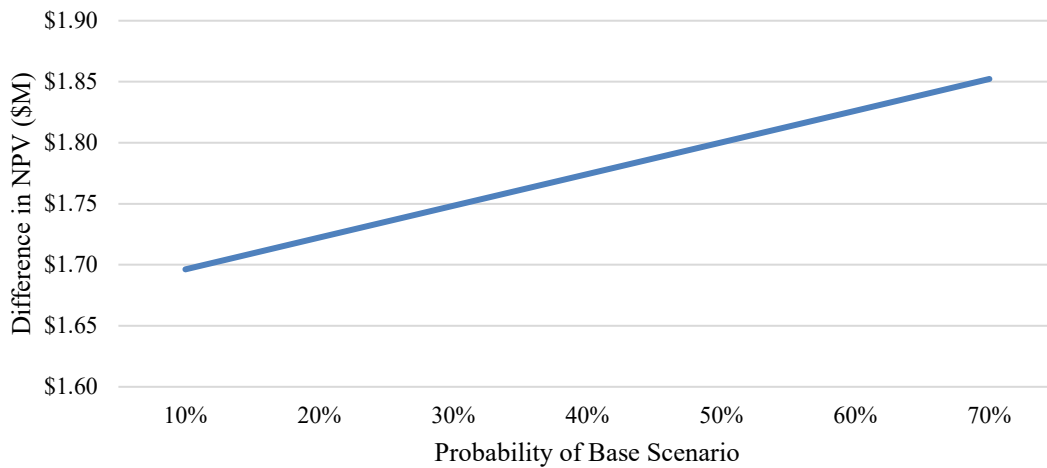
**Table 4. 1: Base Run Results and Effect of Prop 12 on Hypothetical Hog Farm**

<b>Gross Profit NPV</b>	<b>Base</b>	<b>Best Case</b>	<b>Worst Case</b>	<b>Expected</b>
Probability	50%	30%	20%	
Status Quo	\$4,602,513	\$7,147,373	\$1,800,031	\$4,805,475
Prop 12	\$3,103,177	\$5,061,172	\$965,607	\$3,263,062
Difference	\$1,499,336	\$2,086,201	\$834,424	\$1,542,413

#### **4.6 Effect of the Probability of the Base and Best-Case Scenarios on the Difference Between Status Quo and Prop 12 Performance**

The probability of the worst-case scenario occurring was fixed at 20% and the base and best-case scenarios parameterized from 10% to 70% and from 70% to 10%, respectively to investigate their effect on the difference between the NPV of gross profit under the status quo and Prop 12 production systems. The results for the changes in the base scenario are presented in Figure 4. 10. They show that each percentage increase in the probability of the base scenario's probability of occurrence increases the difference between the Expected NPV of the gross margins for status quo and Prop 12 by about \$2,600 holding the worst-case probability at 20%. The sensitivity of the worst case was not explored since the results are obvious.

**Figure 4. 1: Difference Between Expected NPV of Gross Margins for Status Quo and Prop 12 Production Systems Under Alternative Probability of Occurrence for Base Scenario**

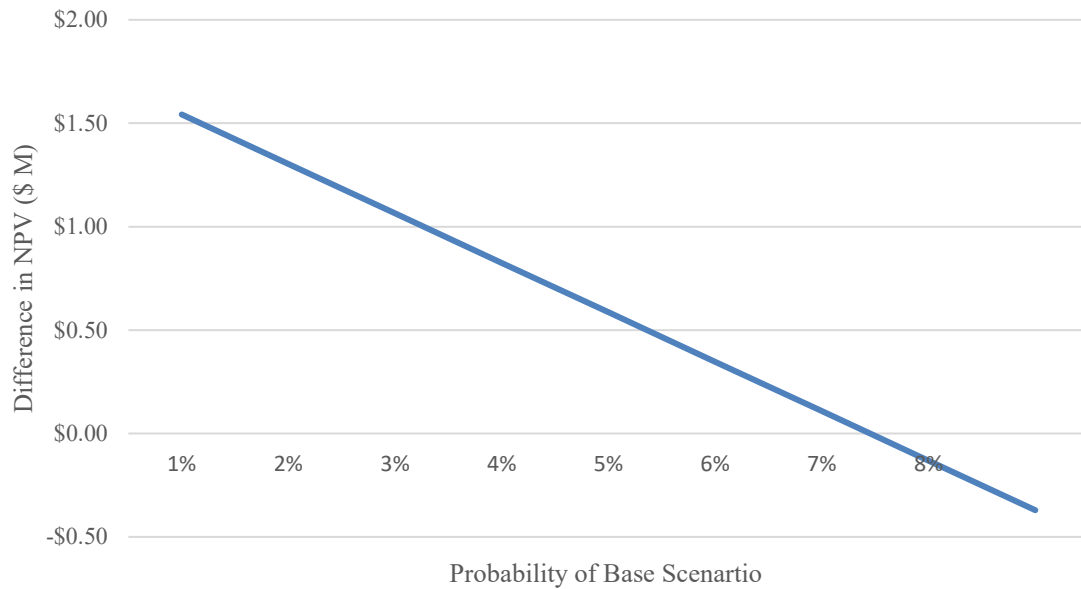


#### **4.7 Effect of Price Premium on Prop 12 on the Difference in Between Status Quo and Prop 12 Performance**

We have assumed that because Prop 12 is a mandated policy, the market is more likely to penalize people for non-compliance instead of rewarding them for compliance. However, with a potential reduction in pork supply emanating from the policy, we can envisage a situation where consumers choose to bid up the price for pork and pork products. In the process of doing that, processors would also bid up the price for hogs, and provide signals for farmers sitting on the shelf to adopt Prop 12 production systems. The effect of the premium price on the difference between the two production systems is summarized in Figure 4.12. It shows that for each percentage increase in the price premium, starting at parity (Price Premium = 0%), the difference between the two production systems decreases by \$239,168. If hog farmers producing under Prop 12 can secure a price premium greater than 7%, then they would erase the performance disadvantage (lower production and productivity) associated with Prop 12. This price is within the realm of possibility since the \$140.64 high was crested four times in the

simulated hog prices. However, given the current and projected market conditions for pork products vis-à-vis other animal protein, it is hard to conceive of a price premium that is consistently higher than 7% of the average current prices.

**Figure 4. 2: Effect of Price Premium on Difference Between Expected NPV of Gross Margins for Status Quo and Prop 12 Production Systems Under Alternative Hog Price Premiums**



## **CHAPTER V: SUMMARY AND CONCLUSIONS**

There has been significant progress by animal welfare advocacy groups over the past several decades in changing the regulatory environment affecting livestock production in the United States. The overarching motivation for this study was exploring how the recently passed Proposition 12 in California would affect the financial performance of hog farmers. This chapter presents the summary of the results of the study and its conclusions. It also provides some strategic direction for hog farmers in how they might deal with the challenges presented by the legislation. The chapter is divided into three sections. The first presents the summary results emanating from the study. The second presents the conclusions and suggestions for further studies. The final section presents some strategic insights for hog farmers to consider in dealing with the challenges of Prop 12.

### **5.1 Summary**

The main findings of this study are as follows:

1. Animal welfare has been important to U.S. lawmakers for many centuries.

However, it has only been in the past few decades that farm animal welfare has made it to their radar screens. Through a number of undercover reports, advocacy groups created a perception that livestock farmers were more cruel to their animals than not. This engendered several ballot initiatives in several states in attempts to control these supposed abuses and also curb what has become known as “factory farming.”

2. A series of initiatives in California has attracted national attention because of California’s market size and its tendency to translate its domestic issues onto the national stage. It passed its cage-free eggs initiative and followed that with several

increasingly stricter animal welfare initiatives, one of which, Proposition 12, is the focus on this study. Proposition 12 eliminates gestation crates in swine production.

3. The study found that sow capacity will decrease to 350 in order to comply with Prop 12 if the only changes a 500-sow operator made were to remove the gestation crates and re-organize a 40 x 250 square foot barn. Holding all things constant, it also found that labor cost per hundred weight of production increased because of the loss of efficiency in labor use. On average, a farm requires one full-time labor for 300 sows. At 500, the farm has two employees focused on sows. The same number of employers are required for the 350 sows since that exceeds the 300 sows per person. This implies that the lumpiness of labor.
4. The financial analysis shows that the implementation of Prop 12 on the hypothetical farm would lead to a 32.1% reduction in gross margin over 10 years. This was equivalent to \$1.54 million over 11 years of production at an 8.5% discount rate.
5. Although we do not expect a premium, the disadvantage for Prop 12 compared to the status quo may be eliminated if the hypothetical farm can somehow procure at least 7.2% price premium from a processor purchasing their hogs. While the effective price with this premium has been seen before, it is very unlikely for it to be sustainable.
6. Therefore, it is concluded that Prop 12 will adversely affect pork producers because it will reduce the intended capital install capacity. While it is expected, like all other situations, that the industry will adjust to the new regulations, the path to superior profitability compared to the status quo seems extremely uncertain.

## 5.2 Conclusion

The current wave of animal welfare initiatives is expected to increase in the coming years. The financial and other hardships that these initiatives are creating for producers were evident in the data and in our conversations. The study's objective was to discover opportunities and challenges related to Prop 12 from the perspective of farmers discovered no credible opportunity that could enhance a farmer's financial performance. However, the very nature of the law is such that it reduced operational capacity and introduced inefficiency into the farmer's operations. Production was found to be feasible under all scenarios developed in an effort to understand the dynamic environment into which pork producers around the country are being thrown in California customer' attempts to enhance their state's animal welfare laws.

The primary cost of the policy amounted to a loss of 32.1% of gross profit over 10 years in net present value. Apart from the perceived enhancement in sow comfort, it is envisaged that total hog production will decline – the source of the lost gross profit. To minimize this, a producer has several alternatives. Given that the stipulation of the law is very specific, the first winning strategy is to comply with the law. The next step is to explore where costs can be limited in the production process. Farmers may look at everything they do and eliminate everything that does not create value, reduce those things that do not capture their marginal cost in the market, and increase those things that customers want but cannot get enough. They should also look at their operational and market space and find things their customers would like which they are now getting from somewhere. This is what Kim and Mauborgne (2005) framed into their ERIC model – eliminate, reduce, increase, and create.

Although complying with the regulation would reduce sow numbers to 350, because the labor required for that number of sows is not different from that required for 600 sows, it might make sense to minimize labor cost by increasing in capacity and incorporating technology that promotes efficiency. This would reduce the average cost of labor and increase revenues from the excess labor capacity. It could produce savings considering higher feed volume and veterinarian services.

It is important to create a relationship with a processor who understands the difficulty producers are experiencing in complying with Prop 12. This means hog farmers must get out of the commodity mindset and introduce a different and superior value proposition. By engaging in a non-market relationship, the producer can improve the welfare effects on the farmer over and above the law's requirements. If they are producing some or all of their feed, they might organize it such that their processor customer can procure the target-specific niche and high-value customers. This could allow the processor to pay the estimated 7-plus percent premium, allowing the center to be as economically feasible as the status quo.

### **5.3 Recommendations for Future Research**

As with all future-focused research such as this one, there are many things that could have been done that were not done. Some of these potential researchers are outlined here for consideration. We assumed the number of sows would be reduced from 500 head to the maximum for compliance. The study did not find the optimum production level to maximize operational performance. It is recommended that a potential researcher interested in this topic explore the minimum operational size to maximize gross profit and comply with the regulations.



The research did not consider the farmer's supply chain. Incorporation of the supply chain and its adjustments emanating from the law could illuminate the farm's provide alternative paths to success. The static analysis presented here does not. For example, it is known from economic theory that enforcement of Prop 12 standards on imports into California would force the pork processors and their supply chain to make production, feed, processing, and other adjustments to protect performance erosion ion of performance. It is recommended that such a system dynamics study of the response to Prop 12 be conducted to help offer novel insights to producers and their supply chain partners.

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