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The U.S. National Animal Identification System (NAIS) & the U.S. Beef-Cattle Sector: A Post-Mortem Analysis of NAIS

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1. Introduction

The appearance of bovine spongiform encephalopathy (BSE) in the United States in late 2003 resulted in severe economic impacts to the U.S. livestock sector. U.S. exports of beef and live cattle were immediately embargoed by importing countries as a result of BSE, and markets have not fully recovered eight years later. The trade status of the U.S. beef and cattle sectors was severely harmed when trading partners used BSE as justification for increased protectionism. The trade response to one BSE-infected cow and the desire to protect the U.S. livestock industry's economic interests enhanced concerns about intentional and accidental disease outbreaks. The first BSE-infected cow identified in the United States and ongoing fears that a virulent disease (foot and mouth disease, in particular) could cost billions and destroy the U.S. livestock sector led many people to conclude that a nationwide individual animal identification system was necessary. As a result, the National Animal Identification System (NAIS) was set forth in early 2004 by a working group including both industry and government officials. The NAIS built on the National Animal Identification Plan initiated in 2002. The goal of the NAIS was nationwide 48-hour traceback of all livestock and poultry in the event of a disease emergency.

The Animal Health Protection Act (AHPA) enacted with the 2002 Farm Bill set the legal stage for the federal government to be involved in the national animal identification effort. The 2002 AHPA includes language that indicates the federal government's intention to expand regulation of livestock due to interstate commerce and related movements of pest or disease threats (O'Brien, 2006). The AHPA was interpreted as giving the U.S. Secretary of Agriculture the ability to prohibit all movement of livestock unless producers participated in the NAIS. The NAIS entailed three components: Premises registration, animal identification, and animal tracking. Premises registration was the assignment of a unique premises number to all facilities where animals are managed or held. Animal identification assigned a unique number to individual animals or lots in the case of animals that stay with the same group their entire lives. Animal tracking involved the collection of data for animal movements and the recording of those data in a central recordkeeping system which could be quickly and comprehensively accessed in the event of an animal health emergency.

A 2005 USDA document indicated that the NAIS would begin as a voluntary program, but would become mandatory in 2009 (United States Department of Agriculture - Animal and

Plant Health Inspection Service [USDA-APHIS], 2005). The USDA stated in a 2006 document that while the agency had the authority to make the system mandatory, it had chosen to make every component of NAIS voluntary at the federal level (USDA-APHIS, 2006a). In a 2008 report, the USDA designated cattle as the highest priority species with respect to NAIS implementation and presented revised timelines and benchmarks for NAIS progress by species (USDA-APHIS, 2008a). Implementation benchmarks for cattle were scaled down from previous NAIS documents, and the cattle implementation timeline was also extended. NAIS benchmarks were scaled back for other species, although not as much as for cattle.

In June 2006 the USDA published a document intended to provide guidance for “non-commercial” livestock producers and their position within the NAIS. This guide attempted to alleviate small-scale livestock producers’ concerns about the system, stating that NAIS participation was voluntary and that the NAIS would “largely focus on commercial operations and animals” (USDA-APHIS, 2006b). Critics of NAIS quickly pointed out that many statements in the report were inconsistent with other NAIS documents regarding the government’s plan to extend NAIS coverage to all livestock and livestock movements within the United States.

The federal government issued numerous grants and cost-shares to states and tribes as inducements for premises registration and spent more than \$120 million in the process; however, at the end of 2009, only 36% of premises were registered nationwide (USDA-APHIS, 2010). Some states achieved higher levels of premises registration by tying it to other state-level licenses or programs. In September 2008, the USDA issued a memorandum which stated that premises registration would be mandatory for emergency disease management or for state or federal activities involving diseases regulated through the Code of Federal Regulations. Although this memorandum was cancelled in December 2008, the USDA maintained that the federal government has broad authority to assign premises identification numbers as part of their normal animal health program activities. Recent livestock disease outbreaks in some states thus have resulted in mandatory NAIS participation for affected producers.

In June 2009, federal funding for NAIS in its current form was dropped from the fiscal 2010 spending bill by the House Agriculture Appropriations Subcommittee, with House leaders indicating that no future funds would be available for the program unless USDA developed and implemented a mandatory NAIS. The USDA conducted numerous NAIS “listening sessions” throughout the country in 2009 and received many more comments on NAIS at the Regulations.gov website.

Since the inception of NAIS, the federal government has asserted that the future economic viability of the U.S. livestock industry rests on improved disease management through nationwide animal identification and traceability. However, over the last several years, many U.S. livestock producers raised concerns about the security and confidentiality of premises and animal data provided to the national system, increased liability on the part of producers as a result of traceback to the farm level, the costs of NAIS participation, and the overall feasibility of the system. Opponents of NAIS claimed it was unconstitutional, a violation of their property rights, inconsistent with religious beliefs, an invasion of their privacy, and a loss of freedom. They did not believe USDA’s assurances that NAIS information would not be subject to Freedom of Information Act requests or that use of the information would be restricted to animal health emergencies. The 2009 “listening sessions”

were dominated by NAIS opponents, with a small minority of session participants speaking out in favor of the system. The comments posted at Regulations.gov were nearly unanimous against NAIS.

In February 2010, the USDA announced that it was abandoning the NAIS (USDA-APHIS, 2010). The agency indicated that it was going to “revise prior animal identification policy and offer a new approach to achieving animal disease traceability” (USDA-APHIS, 2010). The new approach will apparently only apply to animals moving interstate, although the operational details of the approach have yet to be developed. The agency’s February 2010 Factsheet also stated that the new approach intends to “help overcome some of the mistrust caused by NAIS.”

For almost a decade, proponents maintained that NAIS would protect producers’ animals, investments and neighbors, and that “as producers become increasingly aware of the benefits of the NAIS and the level of voluntary participation grows, there will only be less need to make the program mandatory” (USDA-APHIS, 2006a). The USDA stated that NAIS would help protect U.S. livestock and poultry from disease spread, maintain consumer confidence in the food supply, and retain access to domestic and foreign markets (USDA-APHIS, 2007). In 2010, the federal government was forced to admit that arguments in favor of NAIS had fallen flat with a large segment of U.S. livestock producers.

The cattle industry was designated by the USDA as having the highest priority for full NAIS implementation; however, the cow-calf portion of the beef cattle sector was very resistant to NAIS (evidenced by continuously extended timelines and increasingly modest benchmarks for implementation). The economic, structural, and socio-cultural reasons for cow-calf producer resistance are the subject of the rest of this paper. If future livestock disease traceability efforts in the United States are to be successful (and disease catastrophes are to be avoided), it is absolutely essential that the context of cow-calf producer resistance to NAIS be fully understood. The objective of this paper is to describe the context and implications for the post-NAIS traceability framework.

2. Overview of U.S. agriculture and the beef-cattle sector

The history of U.S. agriculture is dominated by a relentless march toward increased concentration. Ever fewer numbers of farms are producing an ever larger percentage of total agricultural output. Of the 2.2 million farms enumerated in the 2007 Census of Agriculture, 10% generate almost 85% of the value of all agricultural sales (United States Department of Agriculture - National Agricultural Statistics Service [USDA-NASS], 2009). The remaining 90% of farms are responsible for 15% of output value. U.S. agriculture wasn’t always this concentrated and much of the history of U.S. settlement and economic development is one of smallholders supporting their household through agricultural production, while generating a small marketable surplus. Technological changes occurring throughout the 19th and 20th centuries worked to increase productivity and drive down per unit production costs; new lands and resources were brought into production, and real prices for agricultural commodities plunged. As the relative purchasing power of raw agricultural commodities decreased, so did farm household incomes. Extreme structural upheaval occurred, many farms failed and millions of farm families exited agriculture. Their land was subsequently absorbed by survivor farms which grew larger. The remaining farms were successful as long as they managed to stay on the technology treadmill or otherwise survive decreasing real prices for their products. Consequently, many farm households now achieve

acceptable income levels as a result of non-farm income sources. One-third of all U.S. farms have consistently negative net farm incomes and nearly 83% of total national farm household income in 2004 originated from off-farm sources (Hoppe et al., 2007). At first glance, it would seem that negative net farm incomes should prompt continued outmigration of people and resources from agriculture. But, it isn't happening.

U.S. farm-level commodity production is very diverse although 98% of U.S. farms are family farms, organized as proprietorships, partnerships, or family corporations that do not have hired managers (Hoppe et al., 2007). U.S. family farms range from small limited resource operations, to the extremely large industrialized farms that account for the majority of farm-level production. The USDA estimated that in 2004 57% of U.S. farms were retirement or residential/lifestyle farms, and that these farms' off-farm income as a share of total household income was 98% (Hoppe et al., 2007). According to the USDA, rural-residential farms account for only 7% of the value of production and include 35% of farm assets (including land). Small farms of all types, defined as having annual sales of less than \$250,000, are 90% of farms, generate 25% of production value, and hold 68% of farm assets. Small farms, and especially retirement and residential/lifestyle farms, tend to specialize in the production of beef cattle, primarily cow-calf enterprises (Hoppe et al., 2007). There are several economic reasons for this specialization, including lower labor and management intensity (desirable to operators who are retired or who hold full-time non-farm jobs), relatively low cash costs of beef cattle production, and favorable tax treatment.

Productivity gains in U.S. agriculture over the last century have been astounding. However, the beef cow-calf industry is a notable exception to the productivity increases which characterize agriculture overall. This is due to the biological limitations of bovine reproduction. The rate of reproduction in cattle continues to be stable and low, with one cow rarely producing more than one calf. Natural twin production continues to be an unusual occurrence in beef cattle herds, and often results in extra production costs and/or sterile female offspring. By comparison, the U.S. hog industry has been characterized by steady increases in piglets/litter and litters/sow/year. Genetic advances and the adoption of industrialized confinement production by the hog industry in the post-World War II era led to dramatic increases in productivity, decreases in real hog prices, and industry concentration. The lack of equivalent productivity gains in beef cattle production are reflected in the much less drastic decrease in the real purchasing power of the calf commodity over the last half century, and an unconcentrated cow-calf sector.

The nature of the bovine digestive system also has contributed to relatively low productivity gains and limited adoption of capital and management intensive technologies in U.S. cow-calf production. Land-extensive calf production processes continue to be used in much of the cow-calf sector because the beef animal functions as a scavenger, using and transforming low value forages produced on marginal lands into a higher-valued product. Land-extensive production processes are generally not compatible with management intensive technologies, adoption of which is driven by the need and opportunity to increase returns per unit of capital and management input.

Most of the advances in technology and increases in efficiency in the beef industry have occurred beyond the farm gate at the feeding and packing levels. The feedlot and meat packing sectors have dramatically increased in size and concentration to achieve economies of scale. The beef feeding sector is increasingly dominated by a small number of extremely large operations, while the four largest beef packers controlled 84% of the market in 2007 (Hendrickson and Heffernan, 2007).

The beef cow-calf sector is the foundation of the beef cattle industry. Cow-calf production is not concentrated, dispersed nationwide, and occurs in every state, with an estimated 33 million national beef cow inventory living on almost 765,000 farms and ranches (USDA-NASS, 2009). Cow-calf operations produce the calves (or the animal frames - including skeleton, internal organs, and hide) upon which the cattle feeding sector accumulates meat using higher energy feed resources (usually under confinement conditions).

The USDA's National Animal Health Monitoring System (NAHMS) divides cow-calf producers into three groups: Those who have cow-calf herds primarily for income objectives (14% of producers), those whose beef cow-calf operation is a supplemental source of family income (72%), and those who keep cattle for some reason other than for providing family income (e.g., pleasure) (14%) (USDA-APHIS, 2008b). Differences in management practices for calving, animal health, feeding, marketing, and record keeping for different types of cow-calf operations are statistically significant and strikingly obvious in the NAHMS survey results (USDA-APHIS, 1998). Management of non-primary income herds is consistently less intensive, and productivity indicators for the herds are less favorable.

The technologies used in cow-calf production have not changed greatly over the last century, although some advances in cow-calf productivity have been made through selective breeding, use of veterinary pharmaceuticals, and improved forage management. Cow-calf production in the United States continues to be characterized by low entry costs, low cash production costs, low technology requirements, and low management intensity. Cow-calf operations also have lower exit probabilities than other farm enterprises because of their compatibility with off-farm work (Hoppe & Korb, 2006).

The technological stability of the U.S. cow-calf industry is evidenced by the small change in the average size of a U.S. beef cow herd over the last ~30 years (it went from 40 in 1974 to 43 in 2007) (USDA-NASS, 2009). By comparison, the average size of a U.S. milk cow herd went from 26 in 1974 to 133 in 2007. Nationally, almost 80% of U.S. beef cow-calf operations have fewer than 50 cows with these farms accounting for 29% of the country's beef cow herd.

Most research exploring U.S. cow-calf producers' motivations has been conducted in the West by investigators interested in rangeland management and public land policy issues. For example, the desire to have a rural lifestyle was found to inflate the value of farms and ranches in the West (Gosnell & Travis, 2005) while a relatively small percentage of ranchland value can be explained by livestock income in the Southwest (Torell et al., 2005). Gentner & Tanaka (2002) found that half of western public land ranchers earn less than 22% of their total income from ranching, that a ranch business "profit motivation" is a relatively low-ranked objective for all types of ranchers, and that public land ranchers are strongly motivated to be in ranching for tradition, family, and lifestyle reasons (i.e., consumptive objectives). Similarly, Cash (2002) noted that most U.S. beef cattle producers are not actually in the business of farming.

The multiple roles of livestock in traditional societies have long been recognized by anthropologists, human ecologists, and other social scientists. In traditional societies, livestock are mobile stores of wealth and status. And even though the United States has a very advanced economy, cattle continue to be viewed as "banks-on-the-hoof" by cow-calf producers (Eastman et al., 2000), who say that when they "need the money" is a key factor in determining when they market their cattle (Lacy et al., 2003). For many cow-calf producers, cattle and the land used to produce them are investments, savings, and financial safe-havens. Cattle provide emergency funds, and are also a stable supply of high quality

meat for family consumption. Similar to their counterparts in traditional societies, cattle are also a source of identity and a cultural touchstone for many U.S. cow-calf producers. Pope (1987) concluded that “romance, recreation, the achievement of a desired social status, or simply the maintenance of a family tradition” are the primary motives for many western U.S. cattle producers. Identity objectives are financially feasible, compatible with other lifestyle and household objectives, and are encouraged by the nation’s tax system. Lifestyle goals, particularly the desire to live in the country, were the most highly ranked strategic ranch goals among small-acreage livestock producers interviewed by Rowan (1994).

Technological advances, structural adjustment in response to technology, economies of size, and the wringing out of cultural identity objectives have not occurred at the cow-calf producer level as they occurred throughout much of U.S. agriculture in the 20th century. As a result, household-level cow-calf production has maintained more of its traditional economic, social, and cultural character than any other geographically dispersed agricultural commodity sector in the United States today.

3. The NAIS pushback

The trend of fewer numbers of ever-larger beef feeding and packing operations throughout the United States has led many cow-calf producers to be concerned about the structure of the overall beef industry, the negative effects of downstream concentration, and their belief that they are at the losing end of the structural change. Many believe that prices received by cow-calf producers are depressed as a result of non-competitive market behavior by feeders and packers. Domestic cow-calf producers feel threatened by the market impacts of imported feeder cattle from Mexico and imported fed cattle from Canada. Live cattle imports are viewed favorably by a majority of feeders and packers, who generally welcome the flow of the animals into the U.S. market. Many in the cow-calf sector vigorously promoted country of origin labeling (COOL) for U.S. beef. COOL was opposed by feeders and packers as a result of their integration with the rest of the North American as well as the global cattle-beef markets.

The schism between the cow-calf sector and the feeding and packing sectors led to the creation of a new industry lobbying group, the Ranchers-Cattlemen Action Legal Fund, United Stockgrowers of America (R-CALF USA). R-CALF consistently appeals to cow-calf industry fears about trade liberalization and global market integration, property rights erosion, loss of freedoms, and invasions of privacy. R-CALF was opposed to the NAIS. The National Cattlemen’s Beef Association (NCBA) represents cow-calf producers, as well as feeders and packers. In the view of R-CALF, the NCBA and the United States Department of Agriculture do not represent the interests of “independent cattlemen.” The NCBA publishes *Beef Magazine*, was very supportive of the NAIS, and was a key player in the effort to establish a centralized, NCBA-affiliated, privately held database for animal tracking information. In 2005 *Beef Magazine* reported that 76% of survey respondents said a national system of individual animal ID and traceback was needed for health monitoring purposes, and 63% indicated such a system should be mandatory. According to the magazine, 83% of cattle producers who responded to their survey individually identify their cattle and 12% use electronic ID tags. These results are very different from USDA NAHMS 2007-08 survey results, which found that 53% of U.S. cow-calf producers use no form of individual calf identification and less than 1% of producers use electronic ID technology (USDA-APHIS, 2009a). In 2006, the Cattle Industry Work Group (established by the USDA to develop NAIS

guidelines and standards for the cattle industry) declared electronic ID technology (specifically, radio frequency identification (RFID)) as the technology to be used to individually identify cattle under NAIS (USDA-APHIS, 2006c).

Although originally conceived as a means to deal with animal health emergencies (zoonotic and otherwise), NAIS proponents and technology vendors consistently emphasized the valuable management benefits to producers from individual animal identification and performance record keeping (particularly in their RFID and electronic forms). NAIS proponents and technology vendors have assumed that management intensification and the tools to accomplish it are desired by producers. However, cow-calf production is an intrinsically low-management intensity activity. It is a land-extensive activity and one where it is often not desirable, necessary, or feasible for producers to increase management intensity or capital investments. NAIS proponents touted individual animal identification's role in maintaining international market access and cattle and meat trade flows. This justification has not been well received by cow-calf producers who believe international trade is a threat to their industry. In their opinion, shutting off beef exports would be a small price to pay for shutting off the live cattle imports with which they directly compete.

For the cow-calf sector, NAIS became an attempt to impose a technology mandate and modernization on an industry where cow reproductive limitations, producer household and personal objectives, and cattle's efficient use of low-value forage have limited and will continue to limit technology adoption and modernization. Much of cow-calf producer opposition to NAIS was founded on fears that they would pay for the NAIS while the feeding and packing sectors would benefit from animal tracking and performance information derived from the electronic data.

Cow-calf producers' fears about the costs of NAIS were confirmed in a 2009 USDA benefit-cost analysis of the system (USDA-APHIS, 2009b, 2009c). The analysis concluded that beef cow-calf operations would incur 79% of the total annual beef cattle industry cost of a fully implemented NAIS. Given existing economies of size, the cost of an individual cow-calf animal ID system with full traceability ranged from a low of \$2.48 per head for the largest operations to a high of \$7.17 per head for the smallest operations. These data supported NAIS opponents' long-running contention that NAIS would benefit large agribusiness at the expense of the smallest farming and ranching operations in the country.

4. Conclusion

A few years ago, the author of this paper was forcefully told by a USDA official that anyone who wanted to "produce or market cattle in the United States" would have to comply with NAIS. This official clearly did not recognize what a critical wedge issue NAIS would become within the U.S. beef-cattle industry. He and the broad complex of government animal health personnel, large agribusiness interests (particularly feeders and packers), and established industry associations failed to appreciate the deep distrust many cattle producers have of them. The proponents of NAIS also seem to have been unaware or dismissive of the deeply ingrained socio-cultural aspects of cow-calf production and traditional small-scale lifestyle agriculture in the United States. Although this paper focuses on the cow-calf sector, many traditional small-scale producers of other species objected to the NAIS using arguments similar to those of cow-calf producers.

Serious miscalculations by government officials about livestock producers and owners fed and strengthened grassroots-level resistance to increased animal health regulations. NAIS

proponents in government and the private sector sent too many conflicting messages to NAIS skeptics. Official NAIS reports and documents that appeared on and disappeared from the USDA's website following criticism added to confusion, suspicion, and hostility regarding NAIS. As a consequence, new disease management risks have been created and the ability of the nation to effectively deal with real animal health emergencies has been compromised. The level of suspicion created by NAIS among traditional livestock producers led to an environment where, should a disease such as FMD arise in the United States, many producers will not respond as they should in a true emergency. Rather, they will suspect that a false emergency is being used to expand government control of their activities. Efforts to implement livestock movement control, quarantine, condemnation, and depopulation will be hampered and defied by some producers. Under these circumstances, disease outbreaks could be catastrophic for the entire nation.

The USDA appears to have recognized the suspicions and potential for civil disobedience within the livestock sector which resulted from the NAIS experience, as evidenced by official statement that the new animal disease traceability framework has trust issues to overcome (USDA-APHIS, 2010). However, memories of NAIS will negatively affect whatever form a federally-promoted traceability framework takes in the future. Cow-calf producers' distrust of federal regulation and their suspicions about relationships between large agribusiness NAIS supporters and the federal government are unlikely to moderate under any new federal traceability program. NAIS became part of the paranoia smaller (and many larger) producers feel about industry structure and market power relationships within the U.S. beef-cattle sector. The USDA's recent statements that the new traceability framework will apply only to animals moving interstate will not mollify many cow-calf producers, as the vast majority of beef calves produced in the United States cross state lines at some point in their lives (even if they are first sold "locally"). Specifically, the February 2010 statement from USDA-APHIS that small producers who sell animals "to local markets" will not be a part of the new disease traceability framework has yet to be operationally defined.

Unfortunately, much federal and state credibility has been lost in the rush to mandate a culturally insensitive, high technology, management-beneficial, and trade-oriented animal identification program. NAIS represented an enormous leap in government involvement in the beef cow-calf sector. From the beginning of NAIS, government was under the impression that it was dealing with an "industry"; however, much of U.S. livestock production is deeply grounded in culture and lifestyle. Expanded regulation of culture and lifestyle choices was an uphill battle for NAIS, and will continue to be so in the future. USDA's unsuccessful efforts to promote NAIS as a management tool and as a means for supporting trade carried little weight with the large percentage of non-management intensive, non-trade oriented cow-calf producers. These producers' concerns about competition from U.S. imports of feeder and fed cattle aren't going away simply because federal animal disease traceability efforts are being renamed.

Successful animal disease management in the future will require significant rebuilding of trust between state and federal animal health officials and grassroots-level producers. This will require that animal health officials credibly demonstrate their independence from large-scale agribusiness and from identification technology vendors.

Previous disease management and eradication programs (e.g., scrapie, brucellosis) haven't required producer investments in electronic eartags and other equipment. Furthermore, a comprehensive, nationwide, 48-hour traceback objective probably is infeasible under *any*

existing and future technology and management assumptions, regardless of what technology vendors say.

The USDA-APHIS announcement that future federal animal disease traceability efforts will apply to animals moving interstate means that any new program is likely to have much in common with NAIS. A future federally-influenced traceability program will thus encounter resistance and disease management will be compromised because of the NAIS experience. The loss of federal credibility and increased mistrust of government which resulted from NAIS has made the United States beef industry vulnerable to trade barriers and protectionism. The U.S. beef industry needs international trade, and post-NAIS, also needs programs that assure the quality and safety of U.S. beef products to overseas buyers. The demise of NAIS and potential cow-calf producer resistance to future government-mandated traceability systems have created a vacuum that industry-driven quality assurance or process verification programs can fill. In the wake of NAIS, an industry-driven system that covers willing buyers and sellers and financially rewards specific attributes or processes will be more successful than government regulation at holding and growing international markets for U.S.-produced beef.

Even though NAIS was not implemented, animal disease hazards haven't disappeared. In their recent factsheet, the USDA indicated that post-NAIS animal disease management and traceability efforts will be led by the states and tribal nations (USDA-APHIS, 2010). NAIS-related damage control needs to be high on the agenda for state and tribal agencies responsible for animal disease management. Whatever reservoirs of trust grassroots livestock producers have for state- or tribal-level animal health agencies desperately need to be refilled before new or well-known pathogens emerge to threaten livestock or human health throughout the United States.

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Radio frequency identification (RFID) is a technology that is rapidly gaining popularity due to its several benefits in a wide area of applications like inventory tracking, supply chain management, automated manufacturing, healthcare, etc. The benefits of implementing RFID technologies can be seen in terms of efficiency (increased speed in production, reduced shrinkage, lower error rates, improved asset tracking etc.) or effectiveness (services that companies provide to the customers). Leading to considerable operational and strategic benefits, RFID technology continues to bring new levels of intelligence and information, strengthening the experience of all participants in this research domain, and serving as a valuable authentication technology. We hope this book will be useful for engineers, researchers and industry personnel, and provide them with some new ideas to address current and future issues they might be facing.

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