

Industrial Farm Animal Production: A Comprehensive Moral Critique

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Abstract Over the past century, animal agriculture in the United States has transformed from a system of small, family farms to a largely industrialized model—often known as ‘industrial farm animal production’ (IFAP). This model has successfully produced a large supply of cheap meat, eggs and dairy products, but at significant costs to animal welfare, the environment, the risk of zoonotic disease, the economic and social health of rural communities, and overall food abundance. Over the past 40 years, numerous critiques of IFAP have been published, for both academic and non-academic audiences, mostly focusing on our obligations to animals. Here we offer a comprehensive critique of IFAP, focusing not only on our obligations to animals, but also important environmental, social, economic, and public health concerns. Our cumulative argument proceeds in five steps: (1) we briefly review the structure and key characteristics of IFAP; (2) we review the adverse effects of IFAP; (3) we review the historical development and positive rationale for IFAP; (4) we summarize previous moral critiques of IFAP, as well as defenses of it; and (5) we offer a moral critique of IFAP based on the common morality, and in particular on a principle of nonmaleficence, which we take to be the least controversial argument.

Keywords Industrial farm animal production · Animal agriculture · Industrial animal agriculture · Factory farming · Ethics · Morality · Animal welfare · Animal ethics · Public health

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Introduction

Over the past century, animal agriculture in the United States (U.S.) has transformed from a system of small, family farms to a largely industrialized model. This industrial model goes by a number of names, including ‘industrial animal agriculture,’ ‘industrial farm animal production’ (IFAP), ‘industrial animal production’ (IAP) and, more colloquially, ‘factory farming’; herein we use the term IFAP. IFAP is characterized by corporate ownership and/or control; economic consolidation and vertical integration; the extreme confinement of large numbers of animals; the use of “technological sanders” (Rollin 2001) such as growth-promoting antibiotics; the use and long-distance transport of remotely-grown concentrated feedstuffs, instead of forage- or pasture-based feeding; and tight control over the breeding, feeding and living conditions of animals so as to achieve the greatest production at the lowest cost and in the shortest amount of time (Fitzgerald 2003; Jones 2003; Singer 2002; Singer and Mason 2006; Foer 2009; Pew Commission 2008a). This model has successfully produced a large supply of cheap meat, eggs and dairy products, but at significant costs to animal welfare, the environment, the risk of zoonotic disease, the economic and social health of rural communities, and overall food abundance. The intensification of terrestrial agriculture is mirrored by the rise of intensive aquaculture, which can also exert adverse effects on the environment, food abundance and animal welfare (Cottee and Petersan 2009; Bergqvist and Gunnarsson 2011).

Over the past 40 years, numerous critiques of IFAP and industrial agriculture more generally have been published, often in academic philosophical circles (e.g., DeGrazia 1996, 2002, 2009; Garner 2005; Pluhar 1995; Rachels 1990; Regan 1975, 2001, 2004; Sapontzis 1987; Singer 1980, 1993, 2002; Thompson 1995, 2010, Zamir 2007 and many more). There is also a growing ‘popular ethical’ literature, directed at both academic and non-academic audiences, that discusses ethical problems in IFAP without necessarily couching these discussions in a particular ethical theory (e.g., Pollan 2006; Singer and Mason 2006; Foer 2009). Recently, the field of public health has begun to show interest in IFAP, as have governmental institutions such as the United Nations (U.N.) (e.g., Horrigan et al. 2002; Walker et al. 2005; APHA 2003, 2007; U.N. F.A.O. 2006; Pew 2008a, b, c, d, e; Goodland and Anhang 2009; Akhtar et al. 2009). With very few exceptions (e.g., Smith 2010), ethical critiques have concluded that IFAP is morally indefensible, at least as presently constituted. Many if not most of such ethical critiques arrive at this conclusion principally by arguments from animal welfare and animals’ moral standing, though some of these critiques also discuss the environmental and human health impacts of IFAP. In contrast, the handful of extant public health and governmental treatments of IFAP tend to emphasize IFAP’s environmental and human health impacts while relegating animal welfare to a lesser status or ignoring it entirely, though still tending to be critical of IFAP.¹

¹ The prominent exceptions to this are the Pew Commission Reports on IFAP (2008a, b, c, d, e, f, g), which do discuss IFAP’s detrimental effects on animal welfare, and which recommend a number of policy reforms in this area, including a complete phase-out of confinement agriculture within 10 years. Even so, the Pew reports do not emphasize animal welfare issues as strongly or discuss them as critically

In light of this abundant criticism of IFAP, it might be thought that the question of its ethical defensibility has been laid to rest, the conclusion being that IFAP is not morally defensible. In fact we believe this to be the case academically, but despite this IFAP remains dominant, poorly regulated, and is in fact expanding globally (Cox 2007; GAO 2003, 2008, 2010; Wolfson and Sullivan 2004). This is a major ethical and public health problem, given the scope and seriousness of IFAP's adverse effects. Looking forward, two concerns emerge as particularly important when considering how to best advance both philosophical discourse about IFAP and policy reforms to address it.

First, it is important that discussions of IFAP be as inclusive as possible when identifying morally relevant concerns and subjecting these concerns to philosophical analysis, since the addition or subtraction of a particular concern from ethical analysis may make a difference as to what conclusions are reached. For example, a utilitarian critique of IFAP focusing principally on our direct duties to animals may not go so far as to reject animal agriculture entirely, even if animals are recognized as having robust moral standing; here the specific conclusion reached might depend on other philosophical assumptions, such as whether death harms animals or non-self-conscious animals are 'replaceable' (see, e.g., Singer 1993). However, if the same critique also includes the issues of zoonotic disease risk, climate change, and human food abundance, then a different conclusion might be reached.

Second, from a political standpoint an inclusive critique will best satisfy a principle of 'economy of moral disagreement' (see Guttman and Thompson 2004). This principle directs us to minimize moral disagreement when deliberating about policy choices by focusing first on where individuals agree, and by not necessarily pressing disagreements about *why* a particular policy is correct if everyone agrees that it is. A critique of IFAP based solely on a single issue, such as animal welfare, environmental pollution, or food abundance, will be less likely to gain political support than an inclusive critique focusing on all relevant issues. Similarly, a critique showing that IFAP is morally indefensible as judged from a variety of normative ethical positions will have broadest appeal, since it shows that the conclusion is overdetermined and not dependent upon any particular moral perspective.

Based on these concerns, there remains a need for resources that comprehensively critique IFAP. Many discussions of IFAP's adverse effects highlight some and downplay or ignore others. More resources summarizing the variety of ethical

Footnote 1 continued

as do many philosophical treatments. That public health and governmental treatments of IFAP should fail to discuss animal ethics per se, or should fail to discuss it in a robust manner, is not surprising. Public health, and the common morality more generally, have always been anthropocentric, and the now-robust philosophical literature relating to animal ethics does not yet correlate to broad, sustained and serious discussion of animals' moral standing in Western culture more generally. Simply put, animals' moral standing may be viewed by these large institutions as either a non-issue, or as a 'third-rail' issue that is too politically contentious to engage directly.

critiques would also be helpful. And, since any particular ethical theory or set of assumptions will be accepted by some persons but not others, there remains a need for a broad critique against IFAP that does not depend on controversial moral assumptions (or depends on the fewest controversial assumptions).

Our goal in this paper is to offer a reasonably comprehensive moral critique of IFAP, concentrating on terrestrial agriculture and in particular the U.S. situation, though many aspects of IFAP are similar in other countries. We leave the important issue of aquaculture to another occasion, though we note that many of the concerns discussed here apply to it. While we cannot discuss all of the many articles and books that have to date been published on IFAP, we do attempt to provide a critique that discusses the major costs, benefits and moral arguments relevant to this topic.

Our cumulative argument proceeds in five steps. First, we briefly review the structure and key characteristics of IFAP. Second, we review the adverse effects of IFAP. Third, we review the historical development and positive rationale for IFAP. Fourth, we summarize previous moral critiques of IFAP, as well as defenses of it. Fifth, we sketch a moral critique of IFAP based on the common morality, and in particular on a principle of nonmaleficence, which we take to be the least controversial approach. Though the question of what should replace IFAP is equally important to the critique of IFAP, we concentrate here on providing a comprehensive critique of this agricultural system. If our cumulative argument is successful, then we will have shown that from any reasonable moral perspective, IFAP is not morally defensible, and this will be valuable when moving discussion and policy forward.

A Brief Description of IFAP

IFAP can be defined in terms of both logic and practice. Fitzgerald (2003) identifies five components that are definitive of industrialization, including “large-scale production, specialized machines, standardization of processes and products, reliance on managerial (rather than artisanal) expertise, and a continual evocation of ‘efficiency’ as a production mandate” (p. 23). As applied to animal agriculture, this industrialization has resulted in a number of hallmark features. First, and perhaps most definitively, large numbers of animals are confined in one area, usually indoors in the case of chickens, pigs and dairy cattle. Beef cattle are kept outside in feedlots, and some dairy cattle also are kept in outdoor or wall-less enclosures. Animals may be kept in cages, crates, pens, or tethered in stalls, and animal stocking density (the number of animals in a given area) is usually very high. Animals’ freedom of movement is almost always very restricted (Foer 2009; HSUS n.d.[1-2]; Pew 2008a, b, c, d, e; Popescu et al. 2013; Singer 2002; Singer and Mason 2006).

Feeding, watering and lighting systems are often automated. Because large numbers of animals in one area produce more manure than the soil can accommodate, IFAP systems often involve the construction of manure ‘lagoons,’

into which manure can drain from animal housing facilities (Foer 2009; Pew 2008a, b, c, d, e).

For a number of reasons, animals in IFAP settings are typically fed formulated feeds, as opposed to more traditional grazing on pasture, foraging, or being fed table scraps or spoiled food (as pigs sometimes were). These feeds contain a number of ingredients, but usually a significant percentage of cereal crops, such as corn, wheat or soy (Horrihan et al. 2002; Pimentel and Pimentel 2003; Sapkota et al. 2007). From a pragmatic standpoint, as large numbers of pigs, chickens and dairy cows were moved indoors, it became impossible to accommodate traditional, outdoor modes of feeding. From an economic standpoint, the historical industrialization of crop agriculture resulted in an overproduction of cereal crops, and animal feed represented one way to use crop excesses (Pollan 2006). Furthermore, because cereal crops are heavily subsidized, farmers can purchase these feeds for much less than they would cost on the open market, and even less than they cost to produce (Pew 2008a, e; Pollan 2006). Finally, these formulated feeds can allow for increased animal productivity, such as faster weight gain or increased milk production, as compared to pasture-based or forage feeding (National Cattleman's Beef Association 2006; Pollan 2006; Realini et al. 2004; UN FAO 2012).

The intensive use of fertilizers and pesticides in crop growing is generally considered characteristic of industrial agriculture. While these activities are not specific to IFAP, they are more significant in IFAP as compared to alternative agricultural systems. Anywhere from 40 to 60 % of all nitrogen fertilizer use is for cereal crops destined for animal feed (McWilliams 2009; Wallinga 2009), and as discussed below the animals return only a fraction of this feed input in edible calories; hence overall pesticide and fertilizer use is higher in IFAP than it would be in a plant-based agricultural system requiring less overall crop production, even if that crop production system were an industrialized one using significant fertilizer and pesticide inputs; we would also expect less pesticide and fertilizer use if animals were pastured in an extensive system instead of being fed grains.

IFAP is characterized by the use of “technological sanders” (Rollin 2001)—pharmaceutical or biological innovations that allow for increased production efficiency, and which also allow farmers to partially combat adverse effects introduced by industrialization itself. Antimicrobials are frequently added to animals' feed or water to combat immunological stress from overcrowding and production-associated diseases such as mastitis or liver abscesses, and to promote faster weight gain (Foer 2009; Pew 2008a, b; Pollan 2006; Rollin 2001). In the United States, bovine somatotrophin (BST, bovine growth hormone) is also frequently used to increase milk yield in dairy cows (USDA APHIS 2003). Since at least the post-World War II era, if not earlier, animals have been selectively bred to produce more meat, milk or eggs in a shorter amount of time and more efficiently (Arthur and Herd 2012; Dawkins and Layton 2012; Garry 2004; Foer 2009; Pew 2008a, e; Star et al. 2008). For example, in the past 50 years selective breeding has allowed broilers (meat chickens) to reach a given weight in about 1/3 of the time formerly required, and using much less feed. Carcass meat yields for broilers have also increased dramatically due to greater muscling and overall weight gain

(Havenstein et al. 2003a, b). These developments are typically lauded as significant achievements by industry.

From an economic standpoint, IFAP is characterized by farms that are corporate-owned and/or corporate-controlled, instead of farms that are both owned and managed by individuals or families. In a process known as ‘vertical integration,’ distinct phases of the agricultural supply chain, such as crop growing, feed formulation, animal breeding, raising animals, slaughtering animals, and food processing and distribution, are increasingly controlled by large corporate integrators (Pew 2008a, b, c, d, e, f, g). In addition to vertical integration, there has been significant economic consolidation within the agricultural sector, meaning that fewer companies control ever more of the market share. Across all of agriculture, the largest 10 % of U.S. farms now account for more than two-thirds of the total value of production (Ikerd 2009). As concerns animal agriculture, 54 % of animals are now concentrated on 5 % of farms (Pew 2008c). Four companies control 80 % of the meatpacking industry (Ikerd 2009). Perhaps most significantly, while large corporate integrators own only a small percentage of farms, many farmers are now contract growers, meaning that while they may own their land and buildings, they sign a contract with a large integrator (e.g., Tyson or Smithfield) to raise animals that are owned by the integrator. The integrator controls all aspects of how the animals are bred and raised, and sets the price that the grower will receive. Many contract growers report no open-market alternative to their contract (Pew 2008g). In addition, increases in scale and mechanization have resulted in significantly fewer farmworkers as compared to pre-industrial agriculture. In 1870, approximately 50 % of the U.S. population lived and worked on farms; today, that number is less than 2 % (Alston et al. 2010). Farm laborers are increasingly unskilled, low-wage earners, and many live below the poverty line (Pew 2008g).

It is not known exactly how many of the ~10 billion animals slaughtered each year in the U.S. come from industrial-style farms, but one recent estimate puts it at 99 % (Foer 2009). It should be emphasized that there is no precise, analytic definition of ‘industrial farm animal production’ that sets forth a list of necessary and sufficient conditions for an animal farm to be considered ‘industrial.’ Many of the features just described seem to occur together, but some farms may be characterized by some such features and not others. This presents no great obstacle to the present analysis. While common features of IFAP are discussed and critiqued together here, ethical analysis for individual features is still possible, and furthermore the ethical critique of IFAP does not depend on all possible features being instantiated. Rather, the co-occurrence of these features overdetermines the conclusion that IFAP is morally indefensible.

Several alternatives to IFAP exist and will be referred to throughout the paper. One of these is a non-industrial animal agriculture, which has been variously described as sustainable, pasture-based, organic or extensive (there can be substantive differences between these terms—pasture-based agriculture need not be organic as defined by federal regulations, for example—but they are frequently used as rough synonyms, and are opposed to IFAP). For present purposes we refer to this model as ‘sustainable, pasture-based’ or ‘extensive’ animal agriculture. While such a model may admit of different variations, for best comparison purposes to

IFAP we stipulate this model as one where animals are not intensively confined; are allowed to forage or graze on pasture as opposed to being fed formulated feed using cereal crops; are not given antimicrobials or biologics for growth promotion or production purposes (though we endorse antimicrobials for medicinal purposes); and where animal welfare is assiduously attended to, including the breeding of animals not suffering from breed-associated disease due to intensive selection for production gains. Such a model would also include slaughterhouses with slowed-down line speeds as compared to the present standard, so as to better protect animal welfare and worker safety. Plant-based agriculture is another important alternative to IFAP, and could be conducted with or without monoculture and heavy herbicide/pesticide use, for example.

The Costs of IFAP

IFAP has been subject to sustained criticism because of its many adverse effects; here we review these adverse effects.

Nutritional Considerations

Industrial farm animal production exists solely for the purpose of producing large supplies of cheap animal products to sell to the consumer public. However, it is becoming increasingly clear that diets rich in animal products—which are facilitated by if not dependent upon IFAP models—contribute significantly to our growing burden of chronic disease and preventable death. Diet-related health conditions of significant public health concern include obesity, type-II diabetes, some cancers, and cardiovascular disease. The statistics here are sobering. For example, The Centers for Disease Control and Prevention (CDC) estimates that \$147 billion a year are spent on obesity-related disease (CDC 2012). 34 % of adults and 17 % of children in the U.S. are obese, and these numbers are projected to grow (Newby 2009; CDC 2012). Obesity is associated with an increased risk of several diseases and disease risk factors including diabetes, arthritis, asthma, hypertension, and hypercholesterolemia (Yach et al. 2004). The CDC estimates that diabetes affects 25.8 million people in the U.S., or 8.3 % of the U.S. population. Diabetes is the seventh-leading cause of death in the U.S., is a major cause of heart disease and stroke, and is the leading cause of kidney failure, non-traumatic lower limb amputations, and new cases of blindness amongst adults in the U.S. (CDC 2013c). According to the American Cancer Society (ACS), more than 580,000 Americans die of cancer each year, and while there are many cancers with many causes, ACS estimates that approximately one-third of cancers are linked to poor diet, physical inactivity, or overweight (ACS 2013). And at 12.7 % of global deaths, heart disease is the number one cause of death in the world (Finegold et al. 2013).

Chronic, diet-related disease not only imposes a significant burden on the health and well-being of the public, it also imposes a significant financial burden in healthcare-associated costs. The United States spent \$65.6 billion in 2008 on stroke-related care and \$92 billion on diabetes-related care; \$183 billion in 2009 for heart

disease; and \$77.4 billion in direct medical costs and \$201.5 billion total for cancer in 2007 (Swartz 2010; ACS 2013).

The relationship between these statistics and IFAP is that diets containing few or no animal products are associated with positive outcomes as concerns several nutrition-related health variables. As discussed below, vegetarians have a lower risk of cardiovascular disease; obesity; type-2 diabetes; prostate, breast and colon cancer; and all-cause mortality as compared to omnivores. Dewell and colleagues suggest that a low-fat *vegan* diet may offer further protection against many chronic diseases (Dewell et al. 2008).

According to the large cohort study EPIC-Oxford, ischemic heart disease rates were 24 % lower in life-long vegetarians and 57 % lower in life-long vegans compared to non-vegetarians (Appleby et al. 2002). Several studies also show that vegetarians and vegans have a lower blood pressure (Appleby et al. 2002; Pettersen et al. 2012) and lower LDL and total cholesterol (Fraser 2003) than non-vegetarians. One study showed that 82 % of those following a low-fat, vegetarian diet, along with other lifestyle modifications, showed regression of atherosclerosis after 1 year, while the control showed progression (Ornish 1990). In the 5-year follow-up study, those in the interventional group saw more regression of stenosis, while the control group saw more progression of atherosclerosis and had more than twice as many cardiac events (Ornish et al. 1998).

Vegan and vegetarian diets are associated with lower body mass index (BMI) than meat-containing diets (Newby 2009; ADA 2009). For example, in the Adventist Health Study-2 vegans had a slightly lower BMI than lacto-ovo vegetarians and both vegan and vegetarian diets showed substantial promise to protect against obesity over non-vegetarian diets (Tonstad et al. 2009). Vegan diets may also be effective at controlling long-term weight gain (Rosell et al. 2006). Several studies have shown that a vegan diet is effective at producing significant and sustained weight-loss (Barnard et al. 2005; Turner-McGrievy et al. 2007). Vegetarian diets may also be acceptable for the prevention of childhood obesity (Sabate and Wien 2010).

The lower BMI of vegetarians as compared to non-vegetarians is associated with lower risk of cancer (World Cancer Research Fund 2007); the even lower BMI of vegans may confer additional benefit (Davey et al. 2003). Studies suggest that vegetarian diets are protective against colorectal, prostate (Fraser 1999), and breast cancer (Taylor et al. 2007), as well as general cancer rates (Key et al. 2009); though in the EPIC-Oxford Study there was an increased risk of colorectal cancer among vegetarians (Key et al. 2009). Data from the Adventist Health Study-2 suggests that vegetarian diets confer protection from gastrointestinal cancers and vegan diets confer a lower risk for overall and female-specific cancer (Tantamango-Bartley 2013). The increased consumption of fruits and vegetables is consistently shown to be protective against many cancers (World Cancer Research Fund 2007). Meat consumption, in particular red meat, processed meat, and grilled, cured, and smoked meat and fish show an increased risk of many cancers (World Cancer Research Fund 2007; Cross et al. 2007; Chan et al. 2011). Data from the European Prospective Investigation into Cancer and Nutrition study suggest that dairy consumption may increase risk of prostate cancer (Allen et al. 2008); however, data on dairy

consumption and prostate cancer risk is inconsistent. One study found that a vegan diet, along with other lifestyle modifications, might affect the progression of early, low grade prostate cancer after 1 year (Ornish et al. 2005) and 2 years (Frattaroli et al. 2008). While many components of a vegan diet may be protective against several cancers, more research is needed to strengthen our understanding of vegan diets and cancer risk (Craig 2009).

Vegan and vegetarian diets may be protective against diabetes. Data from the Adventist Health Study-2 found that for both black and non-black participants, vegetarian diets were associated with a significant reduction in diabetes, with even more reduction associated with a vegan diet (Tonstad et al. 2013). Two other large cohort studies have also found an increased risk of diabetes correlative with increased meat consumption, especially processed meat (Fung et al. 2004; Song et al. 2004). A low-fat, vegan diet has also shown to be effective at treating type 2 diabetes (Barnard et al. 2006, 2009a). Importantly, several studies also suggest that a vegan diet is acceptable to adhere to for the purposes of disease prevention and reversal studies (Barnard et al. 2004, 2009b).

These health benefits are not only good for individuals' well-being, but might also save the United States significant sums in healthcare-related expenses. One study estimates that meat consumption—which doesn't account for other animal products like dairy and eggs—may contribute between \$28.6 and \$61.4 billion to our healthcare costs in 1992 dollars (Barnard et al. 1995)—adjusted for inflation, this works out to \$47.4–\$101.76 billion in 2012 dollars (Bureau of Labor Statistics n.d.).

The American Dietetic Association (ADA) asserts in its most recent position paper that “appropriately planned vegetarian diets, including total vegetarian or vegan diets, are healthful, nutritionally adequate, and may provide health benefits in the prevention and treatment of certain diseases. Well-planned vegetarian diets are appropriate for individuals during all stages of the life cycle, including pregnancy, lactation, infancy, childhood, and adolescence, and for athletes” (ADA 2009). As compared to omnivorous diets, plant-based diets are higher in dietary fiber, n-6 fatty acids, magnesium, folic acid, vitamins C and E, iron,² and phytochemicals; and are generally lower in calories, saturated fat and cholesterol.

However, plant-based diets are also lower in long-chain n-3 fatty acids, retinol, vitamin D, calcium, and zinc as compared to omnivorous diets. Furthermore, vitamin B-12 cannot be obtained from plant sources, and so must be obtained through vitamin-fortified foods, supplements, or nutritional yeast (Davey et al. 2003; ADA 2009). While persons following plant-based diets may in some cases have to pay special attention to their intake of micronutrients, for most persons in the developed world this will not be an issue. In some cases (e.g., iron) this may just require eating slightly larger portions to compensate for the lower bioavailability of plant-based nutrients. Since many foods (e.g., cereal, orange juice, soy milk) are vitamin-fortified, extra attention may not always be required. And a vitamin or supplement can easily provide any micronutrients not already obtained through

² Plants contain non-heme iron, while animal tissues contain heme iron. While plants contain more overall iron than animal products, heme iron is more bioavailable than non-heme iron.

other sources.³ Hence the charge of some critics that plant-based diets require excessive planning or care (e.g., George 1994) seems overstated.

The preceding discussion suggests that from the standpoint of public health nutrition, a widespread shift to plant-based diets would be optimal, at least in the developed world. Obviously such a shift would bring with it the demise of IFAP. What is perhaps more important for present purposes is the recognition that persons in the developed world consume far too many animal products—about 250lbs per capita (Daniel et al. 2011)—that this high level of consumption is associated with numerous and significant public health burdens, and that this high level of consumption is both facilitated and promoted by IFAP. Even operating on the assumption that omnivorous diets can be healthy and ethically defensible, it remains true that persons in the developed world need to drastically cut their consumption of animal products in order to combat the public health problems discussed here, and doing so would also eliminate IFAP, as demand for animal products would fall to a point not consistent with high-volume industrial production.

Other Public Health Impacts of IFAP

IFAP exerts additional, adverse effects on the public's health, including risks of infectious and food-borne disease, and risks of chronic disease from toxicants. Between 60 and 80 % of total antibiotic production in the U.S. goes to animal agriculture, with much of this representing non-therapeutic use for growth promotion (Mellon et al. 2001; Pew 2008b). Antimicrobial use in IFAP has been closely linked with the emergence of antimicrobial-resistant (AMR) strains of multiple species of bacteria, and some of the antimicrobials in question are critical to human health (Mellon et al. 2001; Pew 2008b; Rinsky et al. 2013). There is also evidence that when agricultural antibiotic use is ceased, resistance rates can decline (Sapkota et al. 2011; Pew 2008b). Overall, antimicrobial resistance is a serious public health problem, accounting for many emerging infections worldwide, and is associated with increased morbidity and mortality, tens of billions of dollars in additional costs each year, and longer hospital stays (Pew 2008b). Even more significantly, unchecked AMR might bring with it the collapse of the modern healthcare system, for example because complication rates from major surgeries would rise precipitously (Smith and Coast 2013).

IFAP is associated with increased foodborne illness as compared to non-industrial animal agriculture. While the most common cause of foodborne illness is norovirus, which is not associated with animal agriculture, the remaining four of the top five causes of foodborne illness are all linked to animal agriculture (CDC 2013a). Foodborne illnesses of animal origin are not unique to IFAP, being possible with any kind of animal agriculture, but close crowding of animals typical of IFAP

³ There are, of course, persons who will not be able to follow a plant-based diet, for example because they do not have access to vitamin supplements or specific vitamin-fortified foods. In the developed world, the number of such persons is expected to be small. In addition, we do not address here arguments from naturalness, which would negatively evaluate plant-based diets if such diets cannot provide all necessary nutrients 'naturally.' It is not clear that this is true of plant-based diets, but even if it were there are good reasons to reject arguments from naturalness (see, e.g., Telfer 2004).

facilitates immunosuppression and the spread of some non-commensal pathogens, such as *Salmonella* and *E. coli* 0157 (Arthur et al. 2010; Manale 2006; Todd and Narrod 2006). Fecal cross-contamination of carcasses at slaughterhouses further increases the risk of foodborne illness (Abbey et al. 2012; Rasschaert et al. 2008) and is presumably facilitated by the high line speeds and mechanization characteristic of large industrialized slaughterhouses; high line speeds also make adequate inspection of carcass contamination difficult (Garrett 2000). Overall, 48 million people develop food-borne illness each year in the U.S., with 128,000 hospitalizations and 3,000 deaths (CDC 2013a).

Furthermore, IFAP creates risks for zoonotic disease transmission, the most significant being the risk of a pandemic influenza outbreak. Both poultry and swine carry influenza viruses. Swine in particular can serve as ‘mixing vessels’ for both human and avian strains of influenza (Greger 2006; Ma et al. 2009). The spread and mutation of influenza viruses are facilitated by the close crowding of animals in CAFOs (Greger 2006; Akhtar 2013). Mutated strains of these viruses could cause a pandemic amongst humans, and indeed there is reason to think that this is a reasonable probability. A 2009 H1N1 influenza pandemic was of swine origin, and the 1918 “Spanish Flu,” which may have killed as many as 100 million people, is thought to be of animal origin (Greger 2006; Garten et al. 2009). There have been a number of recent outbreaks of highly pathogenic avian influenza (HPAI), with evidence in more than one of these outbreaks of limited human-to-human transmission (Greger 2006; Neumann et al. 2009; CDC 2013b). As with the loss of effective antimicrobials, it is difficult to overstate the effect that an HPAI pandemic would have. Remarking on the 1997 avian influenza outbreak in Hong Kong, an influenza expert from the World Health Organization stated “Imagine if that virus obtained a little additional capacity to be freely transmitted in humans...a large proportion of the population of the world would presumably have died” (as quoted in Greger 2006).

Finally, pesticides exert a number of negative health effects, including unintentional poisonings (58,000 in 2002 alone) and likely contributions to a number of chronic diseases, including several kinds of cancer and neurologic diseases (Wallinga 2009). Organophosphate pesticides have also been implicated in the development of autism spectrum disorders (D’Amelio et al. 2005). As previously discussed, the use of large amounts of cereal crops for animal feed in IFAP increases total agricultural use of pesticides as compared to alternative systems.

Costs to Farmworkers and Rural Communities

IFAP exerts a number of social, economic and health-related costs on rural communities in which concentrated animal feeding operations (CAFOs) are located. Agriculture is associated with one of the highest workplace accident rates (Von Essen and McCurdy 1998), and while some major causes of agricultural accidents (e.g., tractor roll-overs) do not relate to IFAP specifically, working conditions in CAFOs and slaughterhouses are documented to be very poor. “CAFO workers typically endure long hours, low pay and high health risks,” summarizes one article

on the subject (Schrum 2005). Between 30 and 60 % of CAFO workers have chronic respiratory disease, and as many as 70 % experience some form of respiratory irritation (Merchant et al. 2002; Pew 2008f, g; Schrum 2005). Another review (Von Essen and McCurdy 1998) noted a high incidence of hearing loss (65 %) and musculoskeletal problems (70 %) in swine and dairy workers, respectively, and IFAP models might exacerbate such problems, for example by increasing noise levels due to high-intensity indoor rearing of pigs. CAFO workers are more likely than the general population to contract a variety of zoonotic diseases, including brucellosis, leptospirosis, hepatitis E, Salmonellosis, and, notably, influenza. CAFO workers are also more likely than the general population to become infected with antimicrobial-resistant (AMR) bacteria, such as methicillin resistant staphylococcus aureus (MRSA) (Pew 2008f, g; Rinsky et al. 2013).

These health effects extend to rural communities more broadly, which are at an increased risk of respiratory diseases such as asthma, zoonotic diseases, and possibly neurologic disease. The Pew Commission notes that “neighbors of CAFOs have developed health problems such as upper respiratory issues, digestive tract disorders, and eye problems...Neighbors of confinement facilities have also experienced increased levels of mood disorders including anxiety, depression, and sleep disturbances attributable to malodorous compounds...There have been more than 70 papers published on the adverse health effects of the confinement environment by authors in the United States, Canada, most European countries, and Australia” (Pew 2008g).

CAFOs often make associated communities aesthetically unpleasant and difficult to live in because of strong odors, the deterioration of water bodies, and flies (Pew 2008f, g). For example, one resident of a town near a CAFO remarked “people...cannot enjoy a fresh morning’s air and can’t inhale without gagging or coughing due to the smell.” Another remarked “there is a very offensive odor that at times has taken my breath. ...It is hard to perform necessary maintenance on our property” (as quoted Singer and Mason 2006, p. 30). As a general rule, the building of CAFOs often depresses nearby property values, though at times property values might increase (Keeney 2008). Corporate consolidation has resulted in a decrease in economic investment in rural communities. Large farms making more than \$900,000 annually invest less than 20 % of their revenue locally, in comparison to >90 % for small farms making less than \$100,000 annually (Pew 2008g). Similarly, the transition from husbandry-based agriculture to an industrial model requiring less worker skill has resulted in a depression of incomes. 45 % of all farm workers aged 25 years or older earn less than the poverty threshold for a family of four, and over one third earn less than \$15,000 annually. Overall, IFAP-associated communities are associated with greater crime, poverty, and depression, and a lesser sense of control and self-determination by residents, as compared to rural communities not associated with IFAP (Pew 2008g).

Occupational health and safety is also a major issue in slaughterhouses. Not only is modern slaughter highly mechanized, but for the past three decades slaughter lines have been operating at progressively higher speeds in the name of efficiency, for example by processing up to 120 chickens per minute (Garrett 2000; Human Rights Watch 2004; Singer and Mason 2006). This leads to a high rate of traumatic

injury and a high rate of chronic injury from repetitive movements (e.g., repeating the same cutting motion thousands of times in a shift). Slaughterhouse workers face a risk of injury that is 2.5 times greater than the national manufacturing average and 4 times as high as the overall rate for private industry. These statistics are probably significantly lower than the actual number because of underreporting (Human Rights Watch 2004, Chapter IV). Furthermore, worker training and safety precautions are often inadequate in slaughterhouses. Human Rights Watch conducted a comprehensive investigation of slaughterhouse worker health & safety, including multiple site visits and interviews with dozens of workers. The resulting report, *Blood, Sweat, and Fear*, summarizes the situation thusly: “[workers] contend with conditions, vulnerabilities, and abuses which violate human rights. Employers put workers at predictable risk of serious physical injury even though the means to avoid such injury are known and feasible. They frustrate workers’ efforts to obtain compensation for workplace injuries when they occur. They crush workers’ self-organizing efforts and rights of association. They exploit the perceived vulnerability of a predominantly immigrant labor force in many of their work sites. These are not occasional lapses by employers paying insufficient attention to modern human resources management policies. These are systematic human rights violations embedded in meat and poultry industry employment” (Human Rights Watch 2004, pp. 1–2). Nebraska Applesseed, a non-profit, non-partisan public interest law project, interviewed 455 meatpacking workers for their 2009 report *The Speed Kills You*, and came to similar conclusions (Nebraska Applesseed 2009).

Cost to the Environment and Food Security

IFAP contributes significantly to climate change and environmental pollution. Animal agriculture contributes anywhere from 18 to 51 % of global anthropogenic greenhouse gas (GHG) emissions (UN FAO 2006; Goodland and Anhang 2009; McMichael et al. 2007). It is also the leading cause of ammonia pollution in the U.S., at about 75 %, which can affect community quality of life on a regional scale. Locally, particulate airborne emissions from CAFO facilities significantly affect rural community health, as described above (Pew 2008c, f). Agriculture accounts for 30 % of the world’s landmass, and 70 % of agricultural land is used for livestock (UN FAO 2006). Agriculture uses 87 % of freshwater resources in the U.S. IFAP is more water-intensive than non-industrial animal agriculture and uses 100-fold more water than plant-based agriculture (Pew 2008a, c). This is exacerbating dangerous water shortages and depletions of the water table already present in some parts of the U.S. and the world (Pew 2008a, c). In 2012, a group of Swedish scientists predicted that for reasons of water scarcity alone, the world would need to transition to a largely vegetarian diet by 2050 if the global population is to be fed (SIWI 2012).

Agriculture is the leading cause of waterborne pollution, and much of this is due to runoff of manure from CAFOs into waterways. IFAP produces 500 million tons of manure each year, more than three times that of the entire U.S. human population, and the amount of manure generated in a small area by IFAP operations overwhelms the ability of soil to accommodate it (Pew 2008d). This leads to

contamination of major waterways, leeching of nutrients from the soil, and dangerously low levels of oxygen in the water (hypoxia) that can result in major coastal dead zones unable to support life (Pew 2008c, d). In addition, livestock grazing contributes substantially to soil erosion, and grazing also contributes to water loss and pollution by increasing surface water flows and decreasing the ability of soil to absorb water (McWilliams 2009; Pew 2008c). Overall, animal agriculture is responsible for 55 % of soil and sediment erosion and is responsible for the pollution of 186,000 miles of waterway in the U.S., and oceanic dead zones caused by agriculture can be as large as 25,000 km² (Pew 2008c).

Animal agriculture uses a large amount of fossil fuels, with between 4 and 39 kcal (average 25) of fossil-energy input required for 1 kcal of meat output. By comparison, 1 kcal of plant protein presently uses 2.2 kcal of fossil-energy input (Pimentel and Pimentel 2003; Pew 2008c). As already discussed, IFAP requires more pesticide and fertilizer input than alternative agricultural systems, which partly explains its large use of fossil fuels, and which also translates into increased loss of nitrogen into water and subsequent eutrophication.

Many persons in the world already suffer from malnutrition, food insecurity, or even starvation, and these problems will likely only worsen as the global population grows. While food insecurity is a multifactorial problem, and at present stems largely from distribution and spoilage problems (Barker 2007), as the global population continues to grow total food supply will soon become an issue. Hence it is important to consider what kind of agricultural system will produce the largest amount of food. A large percentage of cereal crops are used to produce feed for animals in concentrated animal feeding operations (CAFOs). For example, in the U.S. 80 % of the corn crop, 22 % of the wheat crop and 98 % of the soy crop goes to animal agriculture (EPA 2009; Pennsylvania Soybean Board 2013). Worldwide, 45 % of all grains and 60 % of coarse grains (including maize, sorghum, barley, rye, oats and millet) goes to animal agriculture (UN FAO 2002). Farm animals convert only a small fraction of the calories they consume into edible meat, thus making IFAP a very inefficient way to produce food. For example, the U.S. livestock population consumes more than 7 times as much grain as is consumed directly by the entire American human population, and the amount of grains fed to U.S. livestock is sufficient to feed about 840 million people who follow a plant-based diet (Pimentel and Pimentel 2003).

Cost to Animals

IFAP imposes massive harm upon animals. Approximately 9 billion animals are raised and killed in the U.S. per year to provide food. This includes about 8.5 billion chickens, 30 million cattle, 100 million pigs and 250 million turkeys (Humane Society of the United States 2013). Worldwide, the number climbs to about 45 billion animals (Akhtar 2013). Whether death per se harms sentient but non-self-conscious animals has been a point of debate amongst philosophers, but a good case can be made that it does under normal circumstances because it deprives them of future opportunities for satisfaction, and furthermore arguments to the contrary have been shown to be problematic (DeGrazia 1996, 2002; Sapontzis 1987; Harman

2011). If this is true, then based solely on the number of animals killed, IFAP inflicts massive harm upon animals. In addition, the way modern food animals are bred, fed and housed specifically results in a large number of ‘production-associated’ diseases and deformities. Such maladies are too numerous to list in detail, but representative examples include mastitis, ketosis, abscesses and lameness in dairy cattle; feedlot bloat and abscesses in beef cattle; lameness, feather-pecking, respiratory problems, ascites, sudden death and broken bones in poultry; and musculoskeletal problems and tail-biting in pigs (Singer 2002; Julian 2005; Singer and Mason 2006; Rollin 2009; Foer 2009; Dawkins and Layton 2012). It is important to stress that these production-associated diseases are largely and sometimes wholly an artifact of IFAP systems.

While the degree of animal confinement depends on species and specific housing system, as a general rule poultry, pigs, veal calves and many cattle in IFAP systems are closely confined. Particularly for poultry and pigs, but also for cattle at times,⁴ the extent of confinement is such that animals cannot walk or even turn around, as exemplified by gestation crates, veal crates, battery cages, and tie stalls.⁵ Often the animals are kept in barren environments, on uncomfortable surfaces (e.g., hard, slatted or concrete floors), and lack environmental enrichment or opportunities for positive socialization. Where animals are able to interact with each other, such as in sow pens and broiler sheds, animals are grouped so closely together that they cannot escape from each other, leading to fighting, injury and even death. Overall, close confinement prevents animals from satisfying most if not all of their preferences, and is associated with physical discomfort, injury and mental distress (HSUS n.d.[1]; Singer 2002; Weaver and Morris 2004; Singer and Mason 2006; Pew 2008a, e; Foer 2009; Popescu et al. 2013).

So-called ‘processing procedures’ represent another category of harm to animals in industrialized systems. Because close confinement and the continual disruption of social groups leads to in-fighting amongst animals, pigs’ tails and a portion of birds’ beaks will be often cut off (debeaking) to prevent biting and pecking. This is typically done without anesthesia and debeaking in particular may cause lasting pain or difficulty eating. Piglets are also castrated and have their teeth clipped, while cattle are castrated, dehorned or debudded, and sometimes have their tails docked as well—again almost always without anesthesia (Singer 2002; Lewis et al. 2005; Singer and Mason 2006; Pew 2008a, e; Benson and Rollin 2004; Fulwider et al. 2008; Foer 2009). Even more invasive surgical procedures such as the spaying of

⁴ Examples of intensive confinement for cattle include high-density feedlots and certain stall housing systems for dairy cattle.

⁵ Smithfield, the largest pork producer in the U.S., has recently agreed to phase out sow gestation crates in favor of pen housing systems. As of the time of writing, Smithfield has transitioned approximately 30 % of its animals to these pen systems, with a commitment to phase out gestation crates completely by 2017. While this commitment represents a significant step forward in the effort to improve farm animal welfare, it should be viewed in light of numerous qualifications. First, the pen housing systems to which Smithfield is transitioning, while less restrictive than gestation crates, still tend to be characterized by high animal stocking density and a lack of psychological enrichment. Second, the gestation crate phase-out is voluntary, and many other producers have not taken similar steps. Third, Smithfield was recently purchased by a Chinese company, Shuanghui International Holdings, and it is unclear whether, in light of this sale and the voluntary nature of the ban, gestation crates will be reintroduced.

heifers may frequently be conducted using only restraint and no anesthesia (Rollin 2010). Because of economic constraints, individual animals in industrialized systems typically receive little or no veterinary care, with the focus instead being on herd management (Rollin 2006; Pew 2008e).

Unwanted animals are frequently killed in manners that raise concerns about pain and distress. For example, male chicks, which are of no use in laying operations, are typically killed “by use of a highspeed vacuum system that sucks chicks through a series of pipes to an electrified ‘kill plate’” (HSUS, n.d.[2]) Male chicks may also be ground up alive or killed with carbon dioxide or argon gas. While argon does not appear to be aversive to the animals, carbon dioxide is (Humane Slaughter Association 2006; Duncan 2004), and while maceration produces a quick death, it is questionable whether it produces a painless death. In addition, piglets who are not gaining weight quickly enough or are otherwise ‘poor doers’ may be killed by ‘thumping,’ where the piglets are picked up by their hind legs and slammed to produce head-trauma (Blackwell 2004; Foer 2009).

Slaughter and transport for slaughter represent another category of harm to farm animals. Animals may be shipped long distances to slaughter, and the only legislation covering this is the so-called ‘28-hour rule,’ which allows animals to be transported for up to 28 h before any mandated rest, food, water or exercise; furthermore, animals are often exposed to extremes of heat and cold during transport (Wolfson and Sullivan 2004). Farmers and food animal veterinarians long-ago coined the term “shipping fever” to describe respiratory disease in feedlot cattle that is characteristically associated with the stress of transport (Urban-Chmiel and Grooms 2012). Furthermore, animals are often handled roughly during transport, and this can result in its own set of problems. For example, due to a combination of osteoporosis and rough handling, approximately 30 % of ‘spent’ laying hens arrive at the slaughterhouse with broken bones (Duncan 2004; Foer 2009).

The United States Humane Methods of Slaughter Act requires stunning of food animals prior to bleeding, skinning and dismemberment, but does not apply to poultry, who are conscious during the slaughter process (Hirsch 2003; Wolfson and Sullivan 2004). Both the U.S. government and eyewitness accounts of slaughterhouse practices indicate that the Humane Slaughter Act is inadequately enforced (GAO 2010; Foer 2009). Animals may be scalded, skinned or dismembered while partly or fully conscious. This is partly and perhaps mostly attributable to the high line speeds characteristic of slaughterhouses in the industrial model, which do not allow for appropriate care in ensuring that animals are stunned. Other sadistic abuses at slaughterhouses, such as ramming animals with forklifts, beating them with pipes, chasing them into scalding tanks, stomping on them, or holding electric prods in their eyes, have been documented and do not appear to be rare, perhaps resulting from the stressful workplace environment for slaughterhouse workers and the dehumanizing nature of the work (Singer and Mason 2006; Foer 2009).

IFAP Imposes Avoidable Harm

While agriculture by necessity disrupts wild nature, and while it might be impossible to maintain an agricultural system capable of feeding the global population without

imposing some kind of adverse effect(s), many if not most of the adverse effects discussed here would be mitigated or even eliminated were we to transition to an agricultural system without IFAP. A plant-based agricultural system would decrease overall pesticide and fertilizer use, since it would (at least at present) need to produce fewer crops overall.⁶ If and when total food production becomes an issue, a predominately plant-based agricultural system will produce more food overall.⁷ It would completely eliminate farm animals' contributions to antimicrobial resistance, zoonotic disease, climate change, airborne pollution from ammonia and CAFO dust, soil erosion and water pollution from manure runoff. It would also eliminate harms to animals and harms to slaughterhouse workers, since there would be no farm animals (outside of such species being kept as companions) or slaughterhouses. The transition to a plant-based diet for the public would improve many health-related outcomes pertaining to diet, as already discussed. Other adverse effects of IFAP, namely those relating to the economic structure of corporate-controlled agriculture, would not be eliminated with the adoption of plant-based agriculture per se, but nonetheless are eliminable if we as a society so choose—for example, laws could be passed to eliminate the effective monopoly that allows integrators to dictate all terms of a contract.

A smaller-scale, pasture or forage-based, sustainable animal agricultural system could also be instantiated that would ameliorate many of IFAP's adverse effects. Keeping animals in less crowded conditions, and in housing more suited to their natures, would not only improve animal welfare, but would result in less manure concentrated in a given area, and thus less manure runoff. The selective breeding of animals for high production, which has been accompanied by animal welfare problems, could be reversed. Eliminating the use of antimicrobials as growth promoters would radically reduce IFAP's contributions to AMR, and keeping animals in a lower stocking density would reduce the risk of infectious disease spread amongst animals that is partly abated by such antimicrobial use. Lower stocking densities would also reduce the risk of zoonotic disease outbreaks, e.g., pandemic influenza, since intensive confinement has been shown to accelerate pathogen mutation (Akhtar 2013). Feeding animals on pasture or forage would allow more cereal crops to be used for human consumption, though this would require a significant scaling-back of total animal production, since pasture or forage systems support fewer animals per acre (Matheny 2003). In turn, this would result in fewer animals being raised overall, which would reduce animal agriculture's environmental impacts⁸ and contributions to climate change, as well as improve public health nutrition-related outcomes, since overall per capita consumption of

⁶ One analysis estimates that were we to transition to a plant-based agricultural system, we could actually let some land currently used for farming purposes transition back to a wild state, with all of the aesthetic and environmental benefits (e.g., greater carbon sequestration, habitat for wildlife) that this entails. See (Stehfest et al 2009).

⁷ The only caveat to this is that some land can only be used for grazing and not for crop growing. Whether this land should be used for animal production is an issue not explored here.

⁸ One important caveat here is that overgrazing results in environmental degradation, so any transition to pasture- and forage-based feeding would have to be done very carefully, with attention to the problem of overgrazing and the rotation of grazing plots, etc. Attention to such issues would likely further reduce the overall number of animals raised for food. See McWilliams (2009), for discussion.

animal products would decrease significantly. Pasture and forage feeding would also eliminate some production-associated animal diseases related to feeding. This kind of animal agriculture would not necessitate the high line speeds and brutal working conditions characteristic of modern slaughterhouses, and improvements in slaughterhouse working conditions could also be expected. A greater knowledge of animal husbandry, and more individualized animal care, would also be required of farmers and stockmen, thus potentially increasing pay due to an increase in necessary skill.

The many types of adverse effects caused by IFAP shows that changes to the current agricultural paradigm could be justified by multiple value systems. Michael Appleby has argued that “sustainable agriculture is humane, humane agriculture is sustainable” since “procedures that increase the sustainability of agriculture often result in animals being treated more humanely” and vice versa (Appleby 2005). Hence persons with different motivations for seeking reform of IFAP and different value priorities nonetheless should, in principle, be able to agree on much.

The Rationale and Putative Benefits of IFAP

Given the significant adverse effects of IFAP, it is worth briefly considering its rationale and putative benefits. It should be stressed that many of the adverse effects discussed here were not and could not be known at the time that IFAP initially developed. It should also be stressed that the recognition of the moral significance of some of these adverse effects depended upon shifts in social morality over the course of the late twentieth century, namely the rise of the modern environmental and animal advocacy movements. These facts can help to make IFAP more ‘legible’ in terms of understanding how such a destructive system could have been developed by otherwise well-intentioned people.

Numerous histories of IFAP and industrial agriculture more generally have been published (e.g., Fitzgerald 2003; Jones 2003). These histories are a valuable resource in understanding how and why IFAP came to hold its current position of dominance, and while a detailed historical discussion is not possible, a few observations can be made.

First, while economic advantage is often cited as a driver of industrialization, the perceived benefits were often *anticipated* rather than demonstrated. Fitzgerald (2003) argues that at the end of the 1920s, it was still not clear that the emerging industrial mode of agricultural production emphasizing efficiency and scale was more profitable than the pre-industrial model. Still, industrialization continued to accelerate. Today, large agricultural corporations record significant profits (Barker 2007), but the situation for individual farmers is different. Agricultural economist John Ikerd writes “Over most of the past century, profits from farming have gone primarily to those who found ways to reduce costs first and expand production the fastest. However, each new round of cost cutting technology has resulted in increased production and lower prices, erasing initial profitability. Late adopters have been motivated by survival rather than profitability and chronically declining prices have forced the laggards out of business” (Ikerd 1996). The necessity for farmers to industrialize to keep up with their competitors (who could sell products at lower cost) helps to explain how the IFAP model became widespread despite not being demonstrably more profitable than the system it replaced.

Indeed, one can envision an alternative model of animal agricultural production where production is scaled back and overhead costs are higher, but profitability is equal to that of the industrialized model because commodity prices are not depressed by overproduction, and/or because added overhead costs are simply passed on to the consumer. To some extent we see this already with the recent rise of the ‘niche’ market for sustainable, pasture-based, and more humane animal agriculture, which has higher overhead costs and takes longer to bring animals to market, but which passes higher costs along to consumers willing to pay for improvements in animal welfare and sustainability, or perceived improvement in taste (Appleby 2004). While such production systems are at present discretionary, regulatory changes would have the effect of leveling the economic playing field.

Second, the industrialization of agriculture was driven not only by perceived economic advantage, but also by other factors. These factors include ideological commitments to mechanization, efficiency and ‘progress’ (all of which should be distinguished from profitability per se) (Fitzgerald 2003; Hardeman and Jochemsen 2012). In addition, the veterinary medical profession helped to drive the development of IFAP because this was a source of professional stability, income and prestige (Jones 2003).

Apart from its historical development and perceived advantages for farmers, IFAP offers a number of putative benefits to consumers and society at large. First, IFAP offers lower food costs to consumers. In 1929, the average consumer in the U.S. spent about 23 % of their disposable income on food, whereas this percentage is now under 10 % (USDA ERS 2011). Lower food costs are a benefit because persons can spend the difference on other goods, save or invest it, or purchase more food for a given amount of money. As concerns the latter point, per capita consumption of meat and poultry has grown significantly in recent decades, from about 150 pounds in 1950 to about 250 pounds at present (Daniel et al. 2011). However, the lower register prices made possible by IFAP are to some extent illusory. Lower food costs at the register are made possible by significant federal subsidies of cereal crops, which go into animal feed, and also direct subsidies of animal agriculture, totaling more than \$246 billion between 1995 and 2009 (PCRM n.d.). These subsidies are in turn are paid for by citizens’ tax dollars. The exact effect of these subsidies on retail meat, egg and milk prices is hard to discern, but were they eliminated such prices would surely increase.

Furthermore, even if we assume that overall prices for animal products are lower in an IFAP model even after taking subsidies into account, as discussed above the increased consumption of animal products facilitated by such price shifts has led to a number of public health problems—hence lower prices may not represent a net benefit. There is no dietary requirement for animal products of any kind, and hence no nutritional argument for IFAP. Finally, U.S. consumers pay historically low food costs, and for most persons some increase in food costs would not impose economic hardship.

One might argue that animal products provide culinary pleasure, but this is hardly a compelling argument for IFAP, since animal products can also be provided by non-industrialized systems of animal agriculture, and since plant-based diets can also provide culinary pleasure. The lower price point (putatively) made possible by IFAP enables the consumption of greater amounts of animal products for a given

price than in extensive models of animal agriculture, but it is hard to seriously argue that this difference is a morally significant benefit when the average American already consumes an excess of such products for a historically low fraction of their disposable income.

At least anecdotally, one often encounters the argument that IFAP is necessary because without it, low-income persons experiencing food insecurity will not be able to afford food. While agricultural subsidies artificially depress food prices, in this case we are essentially dealing with redistribution: tax dollars paid by more affluent citizens help to lower register prices for citizens who pay lesser or no taxes. While food insecurity is a significant problem in the U.S. and worldwide, it should be noted that though animal products from non-industrial systems are more expensive at the register than animal products from IFAP systems, plant-based diets are not necessarily more expensive than omnivorous diets at the categorical level. For example, one recent study found that vegetarians spent on average only \$1 per week more than omnivores (Hyder et al. 2009). Hence eliminating IFAP would not necessarily increase overall food prices unless we stipulate that the diet must contain animal products, but there seems to be little positive ethical argument for such a stipulation. (Widespread availability of nutritious plant-based foods is clearly an issue, but this is a transitional issue, and not an issue-in-principle that would determine what kind of food system we move towards.) Furthermore, given the significant adverse effects of IFAP, it is dubious that the most ethically defensible option is to maintain this system just to provide the cheapest possible food to low-income persons. In addition to fighting poverty directly, a better solution would be to transition to a less harmful agricultural system and to use food aid to help persons who are food insecure. The large amount of federal subsidies presently going to agriculture could even be redirected to such food aid. Alternatively, federal subsidies, which at present are primarily directed to cereal crops and animal agriculture (PCRM n.d.), could be redirected to fruits and vegetables, thus increasing their affordability for low-income persons.

Another putative benefit of IFAP is greater food production. Proponents of IFAP often speak about ‘feeding the world’ through increased production efficiency (e.g., Place and Mitloehner 2010; NIAA 2013), but this argument relies on equivocation. ‘Feeding the world’ often means *meeting consumer demand for animal products* (ibid), but there is a difference between providing for consumer demand and providing the most possible food. As already discussed, a plant-based agricultural system provides much more food than any animal-agricultural system. As concerns animal agriculture, it is possible that IFAP systems allow for greater total production of animal products, but the moral significance of this is dubious in light of the fact that there is no nutritional need for such products and that total food abundance would be highest with plant-based agriculture. Even assuming some level of per capita dietary consumption of animal products, there is no nutritional or moral need to maximize such consumption, and if there is no need to maximize consumption of animal products then there is no need to maximize production of animal products.

Yet another argument touts the efficiency benefits of industrialization, asserting that because industrialization allows for greater efficiency in production, fewer persons are needed in the agricultural sector, freeing them up to pursue alternative activities, which then allows for further economic specialization that positively contributes to the general

welfare. This is a complex argument that will mostly be ignored here, since the putative benefit is not specific to industrial *animal* agriculture—an industrial plant-based agricultural system would also provide a similar benefit. Furthermore, since the percentage of the U.S. population working in agriculture is currently less than 2 %, changes to the agricultural system that required more labor input would not be likely to have significant effects on other labor sectors unless the size of the agricultural workforce increased quite dramatically.

Finally, there is a (perhaps disingenuous) argument sometimes encountered that intensive confinement systems actually *improve* animal welfare as compared to alternatives, or at least that intensive confinement systems are not any worse than alternative systems (see, e.g., AVMA 2005; McGlone 2006). The motivation for such arguments is often that indoor confinement enables farmers to control temperature, lighting, feeding, fighting and parasites more easily than if animals were outside. But this argument conflates indoor confinement with *intensive* indoor confinement, and also with indoor/outdoor housing systems that offer the best of both worlds. One need not confine animals intensively, or totally confine them indoors, to obtain the benefits of controlled feeding or shelter from the elements. This argument ignores the fact that in intensive confinement systems, animals are usually housed on uncomfortable surfaces, and in environments that are poorly ventilated and devoid of enrichment. It also ignores the many other detrimental effects that IFAP systems have on animals, from production-associated diseases to processing procedures to slaughter and transport for slaughter. And even if indoor confinement helps with parasite control as compared to indoor-outdoor housing systems, the overall significance of this animal welfare benefit is dubious. Even in extensive farming environments, management strategies can be implemented to adequately control parasites, and the benefit to an animal's welfare of a somewhat reduced chance of parasite infection, as possibly seen in intensive settings, would not seem to outweigh the significant welfare costs associated with such confinement.⁹

⁹ One study Gebreyes et al (2008), discussed by McWilliams (2009), noted a higher seroprevalence of antibodies to *Toxoplasma gondii*, *Salmonella* and *Trichonella spiralis* amongst free-range pigs as compared to conventionally raised pigs. Based on these findings, McWilliams approvingly quotes rancher and blogger Sara Davis, who writes “It is important to remember that many production practices that come under fire, such as indoor rearing and antibiotics, were put into place to increase food safety and/or animal welfare in response to increasingly intensive animal production. Merely removing these practices without addressing the reasons they were implemented in the first place does not necessarily bring about the benefits to humans or animals envisioned by consumers who purchase based on a ‘free-range’ label” (as quoted in McWilliams 2009, p. 152). Davis is correct to draw attention to the fact that the need for antimicrobials is in part due to the increased animal stocking density characteristic of IFAP, and that without addressing stocking density or overall animal husbandry, removing antimicrobials from production may improve one problem (antimicrobial resistance) at the expense of others (animal health and welfare, food safety). In addition, this example underscores the importance of careful dissection of a scientific study's findings and methodology. The results themselves are not overwhelming in their magnitude. In all cases free-range pigs had greater rates of seropositivity, but these were 6.8 versus 1.1 % for *Toxoplasma*, and 0.34 versus 0.0 % for *Trichinella*. In these two cases overall infection rates for either group were not high, and the *Trichinella* result did not achieve statistical significance (p value 0.2). In the case of *Salmonella*, both groups had high rates of infection, with free-range pigs at 54 % and conventional pigs at 39 %. However, three groups of pigs were tested for *Salmonella*. One group contained only five individuals, with 100 % (5/5) of free-range pigs testing positive—this was likely an anomaly that artificially inflated infection rates. In the second group, the difference was smaller (61 % for free-range versus

Assertions that highly intensive confinement systems (e.g., gestation crates) are no more detrimental to an animal's welfare than alternative systems usually rest upon a number of additional problematic arguments or framing assumptions. These include problematic definitions of animal welfare focusing only on physical characteristics (e.g., injury rates) and not mental well-being (see, e.g., McGlone 2006), problematic assumptions about the relevance of physiologic 'stress' measures to welfare (see, e.g., AVMA 2005, discussion of "physiology" as compared to Rushen 1991; and Weaver and Morris 2004), and leading comparisons of housing systems that omit non-traditional, but more animal-welfare friendly, housing systems (again see AVMA 2005).

To briefly conclude, we do not find the often-touted benefits of IFAP to be reasonable in light of alternative modes of agriculture, and, independent of alternatives, we feel it is clear that the putative benefits of IFAP do not stand up to scrutiny.

Existing Critiques of IFAP

Moral critiques of IFAP and/or animal agriculture in general have been made from a variety of normative theoretical perspectives, including utilitarianism (e.g., Singer 1980, 1993, 2002; Singer and Mason 2006), rights theory (e.g., Regan 2001, 1983/2004; Pluhar 1995), coherentism/common morality (e.g., Rollin 1995; DeGrazia 1996), and a feminist ethic of care (e.g., Donovan 1990/2007). To date, many if not most developed philosophical critiques of IFAP have focused on human obligations to animals and the ways in which IFAP violates these obligations. However, many of these critiques, as well as non-philosophical reports on IFAP (e.g., Pew 2008a, b, c, d, e, f, g), also emphasize the negative environmental and human health impacts of IFAP without necessarily locating these impacts within a specific moral framework, theory, or argument.

Peter Singer provided one of the first and most famous critiques of IFAP in his book *Animal Liberation* (Singer 1975/2002). Though Singer is a utilitarian, the argument that he presents in this work is based more on the common morality than on explicit utilitarian calculations (see Llorente 2009). Singer argues for a principle of equal moral consideration of interests (EC), which requires that we recognize a similar presumption against causing a certain amount of animal suffering as we would a like amount of human suffering. He arrives at this conclusion based on the rejection of species or mental capacity as relevant criteria for morally 'discounting' sentient animals' interests. As concerns farm animals, he devotes a chapter to arguing for the conclusion that, in modern IFAP systems, "these animals live miserable lives from birth to slaughter" (Singer 1975/2002, p. 97). Given an implicit presumption of nonmaleficence against humans, this empirical conclusion, coupled with a principle of equal moral consideration, secures the moral conclusion that IFAP is indefensible. In multiple works, DeGrazia (1996, 2002) extends Singer's common-morality approach. DeGrazia, too, argues for a principle of equal moral consideration of interests, building upon

Footnote 9 continued

52 % for conventional), and in the third group, conventionally raised pigs actually had a *higher* rate of *Salmonella* infection (37 versus 28 %).

the arguments Singer presents, but overall presenting a more philosophically developed and rigorous defense of equal moral consideration. Like Singer, DeGrazia argues that IFAP causes tremendous animal suffering, that sentient animals and humans possess a relevantly similar interest in not suffering, and that our common morality strongly endorses a principle of nonmaleficence, thus yielding the conclusion that IFAP is morally indefensible. However, DeGrazia strengthens this nonmaleficence-based case against IFAP as compared to Singer by explicitly arguing that confinement and death, and not just suffering, are harms to animals. Finally, Rollin (1995) has articulated an emerging social ethic for the treatment of farm animals, which requires that farm animals' species-typical preferences, or *teloi*, be respected. Respecting farm animals' *teloi* requires amendment of many current practices in IFAP.

While multiple philosophers have presented compelling cases for a principle of EC (DeGrazia 1996; Regan 1983/2004; Pluhar 1995; Sapontzis 1987; Rowlands 2002, 2009), many persons will still not accept this view, and furthermore the philosophical case for EC is not indisputable. Therefore it is significant that a rejection of IFAP on animal welfare grounds need not rest upon this principle. Elsewhere, DeGrazia (2004, 2009) and Garner (2005) have argued that we only need acknowledge that animals have nontrivial moral status in order to reject IFAP, not that we need acknowledge EC or even unequal but substantial moral consideration; Rollin's (1995) view is also consistent with this judgment. This conclusion is based on a specification of nonmaleficence so as to be consistent with even the weak anticruelty ethic currently predominant in Western society, thus holding that 'we should not cause massive, nonconsensual harm to animals for unimportant human purposes.' Not only can it be argued that the consumption of animal products per se is an unimportant human interest, given that plant foods can provide adequate nutrition and also be palate-pleasing, but in addition the rejection of IFAP-derived animal products (on the argument presently considered) does not rule out the consumption of animal products from non-industrialized agricultural systems. Here the human interest at stake is perhaps a modest additional cost for such products, and perhaps also some minor inconvenience in having to locate animal products from ethically defensible sources and/or to abstain from eating animal products when non-IFAP-derived products are not available. This seems to be an even less significant interest than the interest at stake in avoiding animal products entirely.

A number of moral theorists have explicitly defended the rights of animals. Of course, to say that animals have rights is not to say which rights they have. It is conceptually possible to acknowledge very limited animal rights in a way that is consistent with the prevailing (or emerging) social ethic (e.g., the right to be spared pain and suffering in the service of trivial human goals), but as discussed above even these minimal rights seem sufficient to reject the defensibility of IFAP. Some philosophers, such as Regan (1983/2004), Pluhar (1995), and Rowlands (2002, 2009) have argued for more robust animal rights, based on inherent value (Regan), a principle of rational altruism (Pluhar) or an amended version of Rawlsian contractarianism (Rowlands), coupled with (what is in effect) a principle of EC covering all animals with desires or a welfare, which certainly includes farm

animals.¹⁰ These rights typically include strong negative rights against the imposition of harm and the restriction of liberty, and so would rule out most (perhaps all) animal agriculture, and not just IFAP. While rights views and coherentist/common morality views may sometimes part ways in normative justification (e.g., as concerns the sacrifice of one individual to prevent the death of many), as concerns IFAP these two approaches look very similar when based on a principle of EC.

In addition to moral critiques of IFAP based on animal rights, such a critique might also be made based on *human* rights. Brei (2012) argues that we have obligations to protect and preserve the natural environment based on a human right to health, since human health critically depends on the natural environment. Brei notes that “if human activities—those leading to soil erosion, water and air pollution, for example—thwart the environment’s ability to provide us with these goods, those activities should be regarded as rights violations.” Though he does not pursue the argument in detail, Brei specifically indicates that industrial animal agriculture would violate such human rights in virtue of its contributions to antimicrobial resistance, soil erosion and pollution (Brei 2012, p. 13).

Utilitarian critiques of IFAP have also been published (e.g., Singer 1980, 1993). These critiques typically emphasize that the harm perpetrated upon animals in IFAP systems greatly outweighs any benefit to humans such systems provide, including the benefits of employment and the pleasurable taste of animal flesh. These critiques often compare the human interest in eating animal products with the human interest in eating plant products, noting that plant-based foods can be both tasty and nutritious, and that any loss in utility incurred by depriving people of desired animal foods would be relatively small and greatly outweighed by the ending of animal suffering. However, if the question at hand is the moral defensibility of IFAP as compared also to non-industrial animal agriculture, then again the significance of the human interest being sacrificed is even lesser. Some utilitarian critiques of IFAP draw a distinction between the morality of perpetuating IFAP systems and the morality of eating animal products resulting from such systems, holding that while IFAP itself is morally indefensible, it is not wrong for persons to consume the products of IFAP (see, e.g., Frey 1983). Such arguments typically rest on a claim of *causal impotence*, which holds that consumers’ purchasing or consumption decisions have no causal effect on the production of animal products; that production and consumption are essentially causally decoupled from each other (see also Harris and Galvin 2012). Numerous commentators have argued against this causal impotence claim (e.g., Garrett 2007; Almassi 2011), but for present purposes such arguments are not particularly important, since the question under consideration is whether IFAP is defensible at the systemic level.

Somewhat surprisingly, utilitarian critiques of IFAP including all of its environmental, occupational, community and public health impacts are difficult to locate in the academic literature. However, if a sound utilitarian case against IFAP

¹⁰ These writers do not necessarily use the language of “moral considerability,” but they argue that sentient animals’ interests should not be morally discounted as compared to humans’ interests, which (apart from some rather obscure philosophical nuances) amounts to the same thing.

can be made based on animal welfare concerns alone (as we believe it can be), then the addition of concerns about its effects on the environment, occupational and rural community health, antimicrobial resistance, public health nutrition and the risk of zoonotic disease would just strengthen the case that much more. For persons disputing the utilitarian case against IFAP based on animal welfare, the addition of these other concerns should clinch the argument—even without precise quantification, it seems beyond reasonable doubt that the full range of adverse effects outweighs the benefits of IFAP, and furthermore that alternative agricultural systems not exerting such adverse effects would be preferable alternatives.

There is some debate about whether utilitarianism necessarily leads to vegetarianism. Early on, Singer argued for this conclusion (Singer 1980), but later reversed his position by arguing that animal agriculture would maximize goodness if animals led happy lives, were killed painlessly, and were replaced by additional animals leading equally happy lives (the “replacement argument”), who were then killed painlessly, and so on (Singer 1993). Roger Crisp has also made a similar argument (Crisp 1988). Other writers have disputed this argument on the grounds that eating meat (or milk and eggs) from humanely raised animals will be substantially more expensive than a vegetarian diet, and that the difference in cost between the two diets would produce more overall utility if used to aid other humans (Llorente 2004). One recent commentary (Garrett 2007) argues that a utilitarian case for individual vegetarianism can be based on the positive health benefits of a vegetarian diet. Still other writers have pointed out that the replacement argument can only apply on a ‘total population’ version of utilitarianism and not a ‘prior existence’ version of utilitarianism, and furthermore that we have reason to favor the prior existence view, thus making the replacement argument moot (Sapontzis 1987). Finally, though we will not pursue the argument in detail, the broad range of adverse effects discussed here, when fully built into a utilitarian critique of IFAP, would seem to indicate not only that IFAP is morally indefensible, but that utilitarians should be vegetarians. This is because the range of adverse effects discussed here would be best mitigated through a transition to plant-based agriculture, and the disutility of this transition would only be the minor one of the loss of animal products in the diet. Furthermore the transition to vegetarianism need not rest on voluntary personal choice, but rather can be legislated at the production end, thus circumventing the question of causal impotence.¹¹

A number of feminist and virtue theorists have argued for either moral vegetarianism or a non-industrialized animal agriculture that provides for better animal welfare than IFAP. Though there is diversity within these traditions, feminist approaches typically emphasize the cultivation of sympathy and compassion, and virtue-based (aretaic) approaches emphasize the choices that would be made by a

¹¹ Some writers, such as Frey (1983), have emphasized the loss of employment that would occur with a transition to vegetarianism. While we will not discuss such arguments in detail, we believe that they are overstated. Some proposed losses, such as employment in restaurants or retailers, seem dubious—such businesses would simply replace animal foods with non-animal foods. Other businesses, such as renderers, would indeed cease to exist, but there would be a very large expansion of businesses related to the production of plant-based foods. Therefore we do not believe this ‘argument from economic loss’ to be persuasive.

person with the appropriate character and motives. Hence both approaches focus on psychological aspects of the agent, and there is overlap between the two since compassion might be included in the list of virtues.

There is a long history of association between feminism and concern for animals, going back to ‘first-wave’ feminism in the late 1700 s. Many early feminists were also animal advocates, and historically most animal advocates have been women (Gaard 2002). Part of the reason for this association is the perceived structural similarity between the oppression of women and the oppression of animals, particularly as relates to patriarchal systems of thought (Gaard 2002). Not all scholars in feminist ethics address human relationships with animals, and amongst those that do, some have forcefully rejected both vegetarianism and equal moral consideration for animals (see Gaard 2002; Gruen 2007). However, amongst contemporary feminist scholars who do write about animal ethics, quite a few—perhaps even most—have endorsed vegetarian commitments (Gaard 2002; see also Donovan and Adams 2007), on simultaneous grounds of opposing oppression and cultivating sympathy. Some feminist scholars have gone so far as to argue that feminists *necessarily* should be vegetarians—that is, that one cannot truly be a feminist and continue to eat meat (e.g., Donovan 1990/2007). Though some feminist scholars writing about animal ethics reject vegetarianism, they typically also condemn IFAP (e.g., George 1994). Furthermore, some prominent feminist critiques of vegetarianism (e.g., by George) have sustained significant criticism (see Gruen 2007, especially n. 2).

Stephen Clark, a virtue theorist, emphasizes that living a “pure” life requires that “we must strip off our aggression” and see the inherent value in all living things, a mindset that in his view entails vegetarianism (Clark 2004). Ray Anthony has proposed an “environmental virtue ethic of care” encompassing the virtues of attentiveness, responsibility, competence and responsiveness. Anthony specifically posits this virtue ethic as an antidote to the present IFAP system, of which he is critical (Anthony 2012), though he does endorse animal agriculture more generally. Paul Thompson has also recently articulated a defense of sustainable agriculture—which contains a critique of industrial agriculture—based on the argument that local, sustainable agriculture represents a way of life that is best suited to the cultivation of human virtue (Thompson 2010).

Finally, critiques of IFAP from an environmental perspective have been made, based on its adverse environmental effects and lack of sustainability. Many such critiques do not evaluate IFAP’s adverse environmental effects from the perspective of a particular normative theory, but instead appeal to the reader’s likely conclusion that an agricultural system exerting such effects is bad and should be changed (Singer and Mason 2006; Pew 2008a, c; Foer 2009). In addition to locating such adverse effects within a rights-based or utilitarian framework, as discussed above, one might also mount a critique of IFAP based on the intrinsic value of nature or the environment, an approach often described as ‘biocentric’ or ‘ecocentric.’ To a large extent, such critiques are nascent—that is, emerging—rather than well established. Writing in 1995, Paul Thompson noted that while much discussion of agriculture’s adverse effects on the environment had already taken place from an atheoretical perspective, there was virtually no discussion of agriculture within academic

environmental ethics. He attributed this to a dogma within environmental ethics that viewed ecocentrism as entailing a commitment to unspoiled nature—and agriculture by definition disrupts nature (Thompson 1995). Ben Minteer has reiterated this same argument as recently as 2008, writing that “to the degree that agricultural and other productive landscapes are seen as diminished by human influence, the wilderness values of many nonanthropocentrists [read: ecocentrists] can thus also carry anti-agrarian—as well as anti urban/suburban sentiments” (Minteer 2008, p. 344). Both Minteer and Thompson see environmental ethics as engaging with agriculture, and indeed emerging philosophical explications of sustainability take up this charge. Since agriculture is a precondition of civilization and thus ineliminable from it, even an ecocentric viewpoint favoring unspoiled nature might lead us to choose the agricultural system imposing the ‘least harm’ upon nature—and IFAP is not this system. Alternatively, conceptions of ‘sustainability’ might be elaborated that recognize agriculture as a good in itself, but direct us to choose agricultural systems in which man and (modified) nature interact in a harmonious way conducive to the simultaneous minimization of negative environmental impacts, the maximization of sustained agricultural yield, and the development of individual and community virtue that proponents of agrarianism argue is best served by this way of life (see Thompson 1995, 2010; Minteer 2008 for discussion).

Defenses of IFAP

Just as striking as the many possible philosophical routes by which one might criticize IFAP is the lack of defenses offered for it. In fact, it is nearly impossible to locate defenses of IFAP in the academic literature. Of course, there is a long debate in the philosophical literature about the moral obligatoriness (or lack thereof) of vegetarianism, but concluding against vegetarianism is not tantamount to defending IFAP. In fact, philosophers who argue against the obligatoriness of vegetarianism often also argue against IFAP (see Frey 1983; Leahy 1993). Similarly, arguing in favor of industrial agriculture generally is not tantamount to defending IFAP specifically. For example, in *Just Food* James McWilliams argues that local, organic agriculture is not always best, and that we should at times embrace certain aspects of the industrial agricultural model, such as judicious pesticide and fertilizer use (McWilliams 2009). However, McWilliams also argues that we should drastically reduce meat consumption in a way that would make IFAP unnecessary (he has also since become an animal rights activist and moral vegetarian).

One of the few, albeit brief, defenses of IFAP that can be located in the academic literature is offered by Smith (2010). Smith’s argument draws heavily from Cohen (2001), who argues that animals do not have rights, but that humans have significant obligations to treat animals humanely; Cohen does not apply his arguments to agriculture, but Smith does. However, neither author has much to say about the specific content of our obligations to animals, and it is arguable that ‘humane’ treatment is inconsistent with IFAP. (Cohen’s argument is also vulnerable to a number of other criticisms; see Regan 2001 and Nobis 2004 for discussion.) Furthermore, Smith’s defense of IFAP specifically—as opposed to animal

agriculture more broadly—is that it supplies cheap food to poor persons, but this argument has already been examined and rejected. Moreover, though Smith defends human exceptionalism, his argument in favor of IFAP ignores the other costs that it imposes on present and future *humans*. Place and Mitloehner (2010) also defend industrial animal agriculture for reasons of food abundance, writing “The world population is expected to grow from 6.8 billion persons in 2009 to 9.1 billion in 2050. With no prospects to significantly increase the amount of arable agricultural land, food production must intensify to ensure an affordable, abundant food supply.” This argument ignores the fact that present global food insecurity might be due to distribution and not overall scarcity, and furthermore that IFAP is not the best way to produce the most overall food when total production becomes an issue. The authors acknowledge some of the environmental problems caused by IFAP, but also problematically place faith in the ability of further intensification to solve these problems.

Outside of the academic literature, commentators in animal agriculture or veterinary medicine sometimes mount informal defenses of IFAP, but for a variety of reasons the arguments they typically make are highly problematic. Some such ‘defenses’ are really calls to action, rather than responses to specific criticisms of IFAP. For example, a recent article in the farm magazine *Top Producer* notes that animal agricultural producers need to “become strong advocates for agriculture in the face of ongoing attacks from the Humane Society of the United States, the Environmental Defense Fund and others,” and that such producers need to educate the public to counter “misconceptions,” “myths” and “misinformation” about agriculture (Bernick 2010). However, the article does not elaborate on the nature of these misconceptions, myths and misinformation.

When agricultural or veterinary actors do offer specific defenses of IFAP, these defenses are often selective in the issues they address and tend to make problematic claims concerning the issues that are addressed. These groups often ignore or downplay some of IFAP’s costs, such as its contributions to environmental pollution or global climate change. They often emphasize that IFAP provides a safe, abundant, and inexpensive food supply (AVMA 2008; Animal Agriculture Alliance n.d.), but these claims have already been addressed and shown to be problematic. Furthermore, we lack a compelling reason to think that alternative agricultural systems will produce an unsafe or less safe food supply (Pew 2008a, b, c, d, e, f, g; Foer 2009). Additional dubious claims made in the service of defending IFAP include the claim that we lack sufficient evidence to causally link antimicrobial use in agriculture to antimicrobial resistance in human populations, or the claim that intensive confinement is not detrimental to animals’ welfare as compared to alternative housing systems (American Veterinary Medical Association 2005, 2009). Finally, these groups often make *ad hominem* attacks against their opponents, such as dismissing calls for more space for farm animals as “arbitrary and emotion-based” (AVMA 2008). They may also fail to respond on-point to criticisms, for example by arguing that farm-animal housing is “species-appropriate” when responding to the criticism that farm animals are not provided enough space to move around (Animal Agriculture Alliance). These tactics raise concerns about bias and credibility.

A Common-Morality Critique of IFAP

The preceding section shows that critiques of IFAP have been mounted from a variety of theoretical perspectives. In this section, we briefly sketch a common-morality critique that is both comprehensive and, in our view, based on relatively uncontroversial moral assumptions. What most distinguishes ‘common morality’ approaches to ethics from classical ethical theories is that the former do not seek a unified foundation for ethics, but rather begin from certain ‘mid-level’ principles that are broadly shared. More specifically, we follow DeGrazia (2003) in defining ‘common morality’ as “the set of moral beliefs that probably would be widely shared among morally serious people who give initial credence to considered judgments...and expand their moral thinking in conformity with the criteria for evaluating moral theories—e.g., consistency and argumentative support” (pp. 222–223). The main advantage of a common-morality approach is that it eschews highly controversial arguments about the metaphysical foundations of ethics, and instead begins from moral principles and beliefs that most people share, and which are also shared by most ethical theories. Applying DeGrazia’s definition to IFAP, we can see that what matters is not whether most people are initially disposed to judge IFAP indefensible, but rather whether a well-informed person would judge IFAP indefensible if appropriately applying their core beliefs about what ethical principles we should espouse, what kind of people we should be, and what kind of argumentative standards apply to ethics.

The core of this critique is a principle of nonmaleficence, which stipulates that we ought not to harm others. Nonmaleficence is a core moral principle that is recognized by virtually all normative ethical theories. As DeGrazia puts it, “A system of thought that did not embrace nonmaleficence would hardly be recognizable as a *moral* system” (DeGrazia 2004).¹² Of course, recognizing a strong version of nonmaleficence does not mean that harms to others are never justified. DeGrazia mounts a common-morality case against IFAP by specifying nonmaleficence in its least controversial form: “It is wrong to cause extensive unnecessary harm to others without their consent” (DeGrazia 2004). He then goes on to argue that IFAP does exactly this: it causes massive harm to animals (in the forms of suffering, confinement and death), this harm is (obviously) non-consensual, and the harm is unnecessary in the sense that alternatives to the products of IFAP are readily available. Importantly, though this

¹² Some theories of ethics, such as rational egoism, recognize a principle of nonmaleficence but make it conditional upon the fact that recognizing this principle serves our own interests in the long run. And while classical utilitarianism would seem to allow significant harms to individuals if such harms best maximize overall goodness, in practice many utilitarians seem to want to defend the compatibility between the theory and nonmaleficence (e.g., by advocating rule utilitarianism or an indirect argument against killing). These examples prompt two important observations. First, for many moral theorists, nonmaleficence is a moral ‘given,’ a datum that needs to be accounted for by their preferred theory. Hence the indirect and sometimes convoluted defenses of nonmaleficence by advocates of theories that would seem not to recognize a strong version of this principle. Second, to the extent that any theory is thought not to be compatible with nonmaleficence, we might simply reject the theory as implausible—here we would encounter a tension between (what is likely to be) our settled moral conviction and what a given theory prescribes, and we should only conclude in favor of the theory if (i) foundationalism can be defended, and (ii) this particular theory can be shown to be the correct one. Many people doubt that such a burden of proof could be met.

condemnation of IFAP would clearly follow from an equal moral consideration position, DeGrazia (2004, 2009) notes that this conclusion can be secured merely by acknowledging that animals have nontrivial moral status. We agree with DeGrazia's common-morality critique of IFAP, but note that such a critique could in fact be extended much further using relatively uncontroversial moral assumptions.

First, we can note that IFAP harms more than farm animals—it harms humans in rural communities and the public at large, as we have discussed in detail. Typically, the concept of 'harm' is understood as making an individual or group 'worse off' in one state of affairs as compared to another, and IFAP makes rural communities and the public worse off because of its adverse effects on the environment, the economic and social health of rural communities, the public health burden of chronic disease, food abundance, and the risk of infectious disease.

While a principle of nonmaleficence is an uncontroversial starting point, the concept of 'harm' does require some analysis beyond our intuition. Individuals or groups might be harmed because they are placed in a state that is intrinsically unpleasant—what is sometimes called “negative welfare” (see Holtug 2002)—for example by causing them pain, anxiety or distress. In other cases, individuals or groups are harmed not because they are placed in an intrinsically unpleasant state, but because their positive welfare is diminished as compared to some alternative state of affairs. One such state is what we might call an 'uncaused state,' which simply refers to how an individual or group would have fared were a particular adverse effect not imposed by IFAP. So, for example, we can say that IFAP's contributions to climate change, water depletion, antimicrobial resistance and waterway pollution (amongst other things) are harms in this sense because the diminutions of welfare in question would not have materialized were it not for the IFAP system; they were *caused* by the IFAP system.

Many of the harms associated with IFAP fall into the category of either 'negative welfare' harms or 'diminutions of welfare as compared to an uncaused state.' Such harms would include pain and distress caused to farm animals; pain and distress caused to farmers, slaughterhouse workers, and members of rural communities (e.g., through painful injuries; feelings of frustration, intimidation, distress and powerlessness; unpleasant noxious odors, etc.); environmental pollution and its associated health sequela; preventable disease from antimicrobial-resistant bacteria, zoonotic infectious agents and higher levels of pesticide use; preventable death directly attributable to IFAP (e.g., animal slaughter and human slaughterhouse accidents from unsafe working conditions); and perhaps also morbidity and mortality from chronic, nutrition-related diseases, since many of these are due to the consumption of levels of animal products only achievable through IFAP. This observation is important, since neither of these senses of 'harm' seems particularly controversial.

However, it might be noted that we have to have *some* sort of agricultural system, and therefore it is appropriate to ask whether IFAP leaves relevant stakeholders worse off than they would be under alternative forms of agriculture. We might call this the 'alternative system' baseline for harm. As already argued, many of the adverse effects of IFAP would be significantly mitigated were we to transition to a sustainable, pasture- and forage-based, animal-welfare friendly form of agriculture, and IFAP's adverse effects would be mitigated to an even greater extent were we to

transition to plant-based agriculture. Hence IFAP also imposes significant harm to humans as measured by this alternative system baseline. The alternative system baseline also seems to be the best way to make sense of some of the adverse effects IFAP imposes on farm and slaughterhouse workers and rural communities. For example, local investment of farm profits occurs to a much lesser extent in IFAP-associated communities as compared to rural communities characterized by local and smaller-scale ownership. This is a diminution of welfare, but not as compared to an uncaused state, since in the uncaused state there would be no financial investment at all. But the relevant comparison is not between some degree of local investment and nothing; rather, it is between the extent of local investment that we would see in alternative agricultural systems, given that some choice of agricultural system must be made.¹³

We can observe that some of IFAP's adverse effects are risks of harm—that is, *probabilities* of harm—rather than determinate harms; or that such adverse effects are a mixture of harm and risk. For example, the problem of antimicrobial resistance (AMR), to which IFAP contributes, already constitutes a significant harm to the public's health, but in addition the continued use of large amounts of antimicrobials in IFAP exerts an additional risk of further AMR and even the collapse of the modern healthcare system. Similarly, the threat of a pandemic influenza outbreak, which could be catastrophic, is at present a *risk*, albeit a significant risk, to which IFAP contributes. While risks are not determinate harms, we can nonetheless count them as unwanted, adverse effects, and at times significantly so.¹⁴ Two possible

¹³ This baseline for harm might be thought more morally controversial than the 'uncaused state' baseline, since the 'alternative system' baseline might be viewed as blurring the distinctions between acts versus omissions and positive versus negative obligations. For uncaused state harms, the act causes the harm and refraining from the act in question correlates to the unharmed state—hence this baseline preserves the distinction between acts and omissions, and also the distinction between positive and negative obligation, insofar as negative obligations correspond to non-interference and positive obligations correspond to actively providing benefits to others. However, with the 'alternative system' baseline, the comparative state of affairs that we are using to define the harm might be one where people are presumed or even required to act in some way, e.g., by giving someone a job with certain benefits and protections as opposed to an exploitative job. This might make the categorization of 'harm' as opposed to 'failure to benefit' seem to be merely a matter of convention, and thus open to rhetorical framing. While we acknowledge that such a comparative baseline might in some circumstances be philosophically controversial, as concerns IFAP we do not see this as being a significant issue, since some form of agriculture is necessary to civilization—the alternative state of affairs being used to define the harm is not optional in any nontrivial sense, as opposed to many acts of beneficence, which are. Hence the relevant moral goal is maintaining an agricultural system that can provide necessary food while leaving all affected parties in the best comparative position, i.e., best off or least worst off. Furthermore, with many acts of beneficence the agent has no causal role in bringing about the baseline state of affairs of the recipient of the benefit, whereas with agriculture our society bears collective agency and responsibility in bringing about such states of affairs. Finally, to the extent that some of IFAP's adverse effects can be viewed as failures to benefit, they might be failures to provide *due* benefit—i.e., benefits or protections to which persons are entitled, such as a job free from significant risk of injury or the ability to engage the free economic market. And the failure to provide due benefit or to safeguard certain moral rights can itself be viewed as a harm.

¹⁴ Perry (2007) has proposed that risks might set back our interests, albeit in a different way than do harms—for risks, we could say that they set back 'our interest in not increasing the probability that our interests be set back.' More generally, we can observe that we would (in most if not all circumstances) not consent, other things being equal, to the imposition of a probability of harm upon ourselves, especially a significant probability of harm—that is, risks are unwanted and must be justified in some way.

differences of moral relevance between risk and harm are that, first, we might discount extremely small risks, and second, we can usually avoid imposing harms while we can never totally avoid all risk. However, while these differences might at times influence the moral analysis of risk, they are not relevant to IFAP, which imposes significant risks that, by and large, *can* be avoided. Hence we can extend a principle of nonmaleficence to cover the risks of IFAP without any morally controversial moves.

In sum, IFAP imposes significant and unnecessary harm and risk on both animals and presently existing humans. These harms and risks are unnecessary both in the strict sense that they are avoidable, but also in the more important sense that they are the result of a system that provides only trivial benefit and to which viable alternatives exist. These harms and risks are also frequently nonconsensual—in most cases, no kind of consent whatsoever has been given by affected parties, and where some kind of consent has been given (e.g., as relates to employment at a slaughterhouse) it is not truly *free* because reasonable alternatives are not available to affected parties who bear the harm and risk. The one potential exception to this relates to the public health nutritional effects of eating diets high in animal products, since there appears to be at least tacit consent given by individual consumers. However, such harms are still significant and unnecessary. Furthermore, we can note that the adverse public health effects of chronic disease are never borne solely by the diseased individual, but are also borne by society at large, for example by increasing healthcare costs that are jointly shared. While consent *might* at times morally ‘nullify’ harm, the public health significance of chronic disease and the shared nature of its burden do not appear to make it a plausible candidate for such nullification. We should also actively question this notion of ‘consent,’ since consumer choices are often uninformed and are significantly structured by the food environment, for example as relates to convenience and habit. Hence we can say that *IFAP imposes extensive, unnecessary, nonconsensual harm on animals and presently existing humans*, thus strengthening DeGrazia’s (already persuasive) common-morality critique.¹⁵

¹⁵ Again we emphasize that our critique is made at the system-level. Some writers have asserted that even if factory farming is wrong, individual consumers have no moral responsibility to avoid its products because of an insufficient causal link between consumption and production (the “causal impotence” objection). Other writers have pointed out that farmers’ actions are constrained by the system, thus lessening the moral responsibility that farmers bear for the ills of factory farming (Hendrickson and James 2005). Both of these arguments might be wrong—that is, both individual consumers and individual producers might bear moral responsibility for IFAP—but we can circumvent both arguments by appealing to our *collective moral responsibility not to cause and enable harm* (see Mellema 2006; Smiley 2010). While individual moral responsibility is sometimes an important determination, we do not need to pin responsibility for IFAP’s harms on any specific individual or group in order to conclude that IFAP is morally wrong. What matters morally is that IFAP imposes significant and unnecessary harms that are known and can only be perpetuated because we, jointly, as a society, allow it to happen (see Mellema 2006; Smiley 2010). Furthermore, from the standpoint of either causality or moral responsibility, it might not make sense to individuate either consumption or production decisions. Some individual decisions (e.g., killing) are morally significant in light of the harm they cause, but some harms (e.g., climate change) result from aggregated, systemic action. Similarly, production and consumption are “two parts of the same wrong”; animals are killed *so that* they might be consumed, and the consumption of animals represents a *completion* of the initial act of their killing (see Zamir 2007, pp. 47–48).

We can go even further with a nonmaleficence-based critique by introducing two additional considerations into the analysis. First, to the extent that we have good reason to ascribe intrinsic value to nature—whether unspoiled nature, or sustainable ecosystems—we can say that IFAP harms nature, in addition to presently existing animals and humans. Whether nonsentient entities have intrinsic value is a philosophically controversial matter (see, e.g., DeGrazia 1996, pp. 226–231; Rolston 1989; Varner 1998 for discussion), but in this case the conclusion against IFAP does not hinge on ascribing value to nature—rather, such value, should we acknowledge it, only strengthens the conclusion against IFAP. Furthermore, while some philosophers have argued that one cannot consistently claim rights for animals and also intrinsically value nature, Jamieson (2003) has shown that both commitments can in fact be reconciled.

Second, IFAP harms not only presently existing humans and animals, but also future humans and animals. As long as IFAP systems persist, billions of animals will be brought into existence each year, only to suffer significant harm in exchange for a trivial benefit. Furthermore, IFAP's contributions to climate change, water and food scarcity, antimicrobial resistance, environmental pollution, and possibly zoonotic disease affect not only presently existing humans and wildlife, but future humans and wildlife as well. The philosophical literature on obligations to future persons often discusses a number of potential problems in ascribing such obligations, including discerning the number or preferences of future persons, discerning the exact effects of our actions, or knowing which specific persons in the future will be affected by our actions (Reichenbach 1992; Pasek 1992; Vanderhiden 2006). In our view most of these potential problems do not prevent us from extending a principle of nonmaleficence to future persons in the case of IFAP. We can rest reasonably assured that future persons will prefer not to inhabit a planet whose ecosystems are destroyed, where food and/or water are unavailable, where we have no effective antimicrobials, or where we face a significant threat of death from catastrophic outbreaks of infectious disease. And we can be reasonably assured that future persons will indeed exist, and that they will be adversely affected by the choices that we are making now—it seems unnecessary for us to say exactly who will be affected or the exact timeline according to which they will be affected.¹⁶ As

¹⁶ Some readers might think that we pass too quickly over the complications of intergenerational obligations. Admittedly we cannot address in detail each of the issues that would be relevant to this discussion. However, as concerns the central points we can say that it is irrelevant (in our view) to talk about the *rights* of future persons to exist, if indeed we can be confident that future persons will be brought into existence. At most, the right to exist correlates to any putative obligations we might have to bring people into existence, not to obligations that we have to them once they are in existence. Some writers have asserted that obligations to future generations cannot be founded upon considerations of justice, since the conditions of justice—relative equality in power—do not obtain, because future generations cannot harm us. In our view this is the wrong way to conceive of justice, since in our view the source of morality is not any kind of contract or decision founded upon self-interest. As for the requirement that obligations must be 'person-affecting' in any specific sense, this too seems problematic in our view. If indeed obligations require a referent—an 'obligation to' clause—this referent can simply be 'persons who will exist.' Similarly, the non-identity problem, which is premised upon the observation that different choices will result in different persons existing, thus preventing us from saying that people who would not have otherwise existed are harmed by such choices—this 'problem' might in some sense be overstated, at least in the context of IFAP. If we know that future persons will exist, and we know that

Reichenbach notes, “we can be most reasonably sure that there will be future persons who will make claims and who will have interests which can be affected by what we do now. Hence there are grounds for present obligations to preserve those rights which it is reasonable to anticipate that they will claim, even though there are no present claimants” (Reichenbach 1992, p. 214; see also Vanderheiden 2006). That we cannot say exactly *who* will exist does not change the fact that persons will most certainly exist and have their interests negatively affected by IFAP *as compared to what the world would be like otherwise*. Hence we can extend our conclusion to *IFAP imposes extensive, unnecessary, nonconsensual harm on presently existing and future humans and animals, and also potentially on the environment itself*.

Finally, while nonmaleficence might be the most basic moral principle, we can also appeal to beneficence and justice to critique IFAP, and again in relatively uncontroversial ways. Some of the adverse effects of IFAP, particularly those relating to the economic and social health of rural communities, might also be viewed as failures to benefit. For example, having a job is a net benefit if the only alternative is unemployment and an inability to secure basic goods. However, having a poorly paid job in difficult and unsafe conditions is less of a good than having a well-paid job in safe and pleasant conditions. The potential moral significance of this is that obligations to benefit are often thought to be less specific and less strict than obligations not to harm. However, there are certain positive rights or freedoms that we might justifiably think people are entitled to, including the right “to expect that when they go to work and do what they are told to do, that they will be able to leave the workplace at the end of the day with life and limb intact” (Human Rights Watch 2004, p. 25), as in the case of slaughterhouse workers. As concerns contract growers, we might reasonably acknowledge their right to conduct business on the open market, and thus to exercise some measure of control and autonomy over their business and the choices they make therein—none of this seems especially controversial. More generally, if we have any positive obligations to others, it would seem that we have such obligations when we can provide a significant benefit to others at little cost to ourselves, and where our own choices are (however indirectly) causally implicated in the conditions in which others find themselves—all of which are true as concerns IFAP.

Finally, conditions of justice also factor into the common morality critique of IFAP. We can observe that the benefits and burdens to humans of industrial animal agriculture are distributed highly unevenly, with the benefits accruing primarily to large corporations and consumers at the register, and the burdens being borne primarily by agricultural workers and rural communities, but also the population at large. On the face of it, this distribution appears to be unfair. Agricultural workers are generally paid very poorly, and rural communities are not compensated for the costs that they bear—hence the asymmetric distribution

Footnote 16 continued

our present choices will adversely affect the quality of life of whatever persons do exist, as compared to their quality of life if we act differently in the present, we are prevented from speaking of harm only if we know for certain that such persons would not have otherwise existed, or we use a two-state, temporal (diachronic) definition of harm—but neither of these conditions need apply.

of burdens is not compensated for by greater financial benefit to the adversely affected parties. In addition, we can draw on John Rawls' theory of justice to explain the wrongness of these arrangements (Rawls 1971). Rawls argues that just social arrangements do not require equality in resources between all parties, but they do require that inequalities work to the advantage of all parties as compared to a starting point at which all parties are equal in power and resources. Rawls' theory was an ideal theory of justice, aimed at describing what social institutions ought to look like starting from scratch, as it were. In practice, it can be difficult to figure out whether existing inequalities are just or unjust, but one test of injustice is whether the elimination of the inequality does not work to the disadvantage of all. If the elimination of the inequality would benefit one or more parties, as it clearly would in the case of industrial agriculture, then the arrangement cannot be just on Rawlsian terms, since the initial inequality did not work to the advantage of all.

Conclusion

In this article we have undertaken to provide a comprehensive critique of IFAP. After briefly defining IFAP's key characteristics, we discussed in detail its many adverse effects, including harms to animals, significant contributions to environmental pollution and climate change, the deterioration of the economic and social health of rural communities, the exacerbation of antimicrobial resistance, the threat of a global influenza pandemic, food and water scarcity, and significant contributions to the public health burden of obesity and chronic disease. In exchange for these significant adverse effects, IFAP's main benefit is a large supply of inexpensive animal products—a benefit of dubious importance, and perhaps an illusory benefit given agricultural subsidies and other externalized costs. Furthermore, these adverse effects would be significantly mitigated or even eliminated if we transitioned to plant-based agriculture or to smaller-scale, sustainable, pasture-based animal agriculture providing for better animal welfare.

Many critiques of IFAP have been offered from common-morality, rights-based, utilitarian, virtue-based, feminist and sustainability perspectives, and correspondingly very few defenses of IFAP appear to have been made. In addition to these critiques, we have offered a sketch of an extended common-morality critique of IFAP that addresses its many adverse effects using relatively uncontroversial moral principles and assumptions. What defenses of IFAP can be found are often vague, non-systematic, and premised on highly problematic arguments. Furthermore, defenses tend to be made by actors with significant conflicts of interest concerning this issue, raising concerns about credibility and bias.

The preceding discussion demonstrates not only that IFAP is morally indefensible, but furthermore that this conclusion is significantly overdetermined. The conclusion that IFAP is morally indefensible can be reached via multiple lines of argument touching upon multiple areas of concern. While criticism of IFAP is

nothing new, and significant political opposition to IFAP has even emerged in American society, it remains the dominant mode of agricultural production and is protected by powerful economic interests. Moving forward, it is essential that the broadest and most powerful case against IFAP be made, so that social actors with different concerns and moral views might recognize that they have common cause in seeking agricultural reform. We hope the present analysis provides one resource to help in this cause.

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