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## The Impact of Animal Agriculture on the Environment and Climate Change in India: A Focus on Methane

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**HUMANE SOCIETY  
INTERNATIONAL**

## HSI Fact Sheet

### **The Impact of Animal Agriculture on the Environment and Climate Change in India: A Focus on Methane**

Animal agriculture inefficiently consumes natural resources,<sup>1</sup> contributes to deforestation,<sup>2</sup> and produces immense quantities of animal waste, threatening water and air quality<sup>3</sup> and contributing to climate change.<sup>4</sup> The Food and Agriculture Organization (FAO) of the United Nations estimated in 2006 that animal agriculture was responsible for 18% of global, anthropogenic, or human-induced, greenhouse gas emissions<sup>5</sup> and was “by far the single largest anthropogenic user of land.”<sup>6</sup> Climate change poses significant challenges to India’s agricultural sector, which is already facing increased competition for land and water.<sup>7</sup>

#### **Farm Animal Production and Intensification in India**

According to the Food and Agriculture Organization (FAO) of the United Nations, approximately 67.5 billion land animals were raised globally for human consumption in 2008.<sup>8</sup> India has the largest national herd of cattle and buffalo in the world, with over 170 million cattle and over 100 million buffalo.<sup>9</sup> Over 38 million buffalo and 38 million cattle were used to produce milk in India in 2008.<sup>10</sup> India is also one of the top five egg<sup>11</sup> and chicken meat<sup>12</sup> producers in the world. The nation’s 230 million egg-laying hens produce approximately 55.6 billion eggs per year.<sup>13</sup>

Global consumption of meat and milk has been growing since 1980, especially in developing countries. In India, between 1980 and 2005, per capita egg consumption more than doubled, while meat consumption grew 38% and milk consumption grew 69%.<sup>14</sup>

A growing number of farm animals are raised in industrial farm animal production (IFAP) facilities, where thousands or tens of thousands of animals are confined and concentrated, along with their waste, on the land.<sup>15</sup> According to the FAO, industrial systems now produce approximately two-thirds of the world’s poultry meat and eggs, and more than half of all pork.<sup>16</sup> In fact, “[i]n recent years industrial livestock production has grown at twice the rate of more traditional mixed farming systems and at more than six times the rate of production based on grazing.”<sup>17</sup> IFAP facilities (also called “factory farms”), compromise animal welfare,<sup>18</sup> degrade the environment,<sup>19</sup> and threaten public health,<sup>20,21,22,23</sup> and rural livelihoods.<sup>24</sup>

Nearly 80% of laying hen housing systems in India confine hens in cages.<sup>25</sup> Hens in battery cages spend their lives confined in tiny wire enclosures, where they are unable to engage in most of their natural behavior, such as nesting, perching, dustbathing, flying short distances, or even freely stretching their wings without touching other hens or the cage walls. Operations with 10,000 to 50,000 hens crowded together are common in India.<sup>26</sup> India also housed over 700 million broiler chickens in 2008.<sup>27</sup> A spokesperson for the Poultry Federation of India reportedly stated that India’s broiler chicken industry was comparable to that of developed countries,<sup>28</sup> which suggests that broiler chickens in India experience the crowded confinement,<sup>29</sup> and stressful handling<sup>30</sup> common in the U.S. chicken industry.

The dairy industry in India is also changing. The FAO predicts that, in India, “increase in demand for dairy products will put increasing pressure on dairy production systems; traditional breeds and feeding practices are likely to give way to higher-yielding breeds, associated intensification of production systems, increased disease risks, pollution and animal health issues, and a greater reliance on [feed] concentrates.”<sup>31</sup>

Unfortunately, industrialized animal agriculture is rapidly spreading globally, including in developing countries.<sup>32,33</sup> The Pew Commission on Industrial Farm Animal Production warned that the known environmental and public health costs of IFAP “may be exacerbated by institutional weaknesses and governance problems common in developing countries.”<sup>34</sup>

## **The Environmental Threat of Animal Agriculture**

In 2006, the FAO published “Livestock’s Long Shadow: Environmental Issues and Options,” its landmark report assessing the impacts of animal agriculture. The FAO concluded that “[t]he livestock sector emerges as one of the top two or three most significant contributors to the most serious environmental problems, at every scale from local to global.”<sup>35</sup> It is concerning, then, that global meat and milk production are expected to approximately double between 2000 and 2050.<sup>36</sup>

## **Waste**

Traditional farming systems balance the number of animals with the crops’ ability to absorb the animals’ manure.<sup>37</sup> On factory farms, where thousands of animals are confined,<sup>38</sup> the amount of manure can overwhelm the ability of the surrounding land to absorb it.<sup>39</sup> When animal waste is over-applied to land and exceeds the capacity of soil and crops to assimilate its nutrients, it becomes a pollutant<sup>40</sup>—and can contaminate water supplies and emit harmful gases into the atmosphere.<sup>41</sup> According to the United States Department of Agriculture’s (USDA’s) Economic Research Service, in 1997, IFAP operations in the United States produced 1.12 million tonnes of spreadable nitrogen from manure; however, “cropland and permanent pasture controlled by operators of confined livestock and poultry operations is estimated to have assimilative capacity for only 38 percent of the calculated nitrogen available.”<sup>42</sup> Similar studies need to be conducted in India to determine the quantities of manure being produced by IFAP operations relative to the surrounding land’s ability to assimilate nutrients from the waste.

According to the USDA, the problem of excess nutrients is most pronounced in poultry production operations, which produce 52% of the excess phosphorous and 64% of the excess nitrogen created by farm animal waste in the United States.<sup>43</sup> Run-off from poultry operations into the Chesapeake Bay in the eastern United States has been blamed for outbreaks of *Pfiesteria piscicida* in the water, killing fish and causing skin irritation, short-term memory loss, and other cognitive problems in those exposed.<sup>44</sup> An editorial in an October 2007 edition of a prominent local newspaper commented, “For too long, the poultry industry in this state has wielded economic and political clout to escape responsibility for its primary role in the slow, steady poisoning of the Chesapeake Bay.”<sup>45</sup>

## **Resource Use**

Approximately 70% of the world’s agricultural lands are dedicated to raising animals for food, including grazing and feed production.<sup>46</sup> Raising farm animals for human consumption consumes exorbitant amounts of cereals. Over 97% of global soymeal produced is fed farm animals, and during the last four decades of the 20th century, over 60% of the corn and barley crops were also fed to these animals.<sup>47</sup> Yet, the conversion of grains to meat is a highly inefficient process. It takes approximately 7 kilograms of grain to produce one kilogram of beef in developed countries. The ratios for pig meat (1 kg meat/4 kg grain) and poultry meat (1 kg meat/2 kg grain)<sup>48</sup> similarly exemplify this inefficiency.

This inefficient use of resources can be seen in India. Approximately ten percent of India's coarse grain production goes to feed farmed animals,<sup>49</sup> and approximately 50% of all corn consumed is used as animal feed—most of which is for poultry.<sup>50</sup> For 2010-2011, 76% of Indian oil meal is anticipated to go to animal feed.<sup>51</sup> In addition to the inefficiency of converting grains to meat, using crops for poultry can negatively affect commodity prices. In 2008, it was reported that a shift to using rice for animal feed raised rice prices in the South,<sup>52</sup> where rice is a basic staple in people's diets.<sup>53</sup>

## **Greenhouse Gas Emissions (GHGs) and Climate Change**

According to a 2006 estimate by the FAO, globally, animal agriculture is responsible for 18% of anthropogenic GHGs.<sup>54</sup> Therefore, this sector offers a key opportunity for the immediate mitigation of anthropogenic climate impacts worldwide,<sup>55</sup> including in India,<sup>56</sup> which is the fifth largest GHG emitter in the world.<sup>57</sup>

Almost every part of the animal production chain pollutes the air or contributes to climate change.<sup>58</sup> The sector emits significant amounts of three of the most important GHGs: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O).<sup>59</sup> In fact, globally the farm animal sector accounts for:

- 9% of human-induced CO<sub>2</sub> emissions<sup>60</sup>
- 35–40% of human-induced CH<sub>4</sub> emissions,<sup>61</sup> which has 25 times the global warming potential (GWP), or power,<sup>62</sup> of CO<sub>2</sub> over 100 years,<sup>63</sup> and
- 65% of human-induced N<sub>2</sub>O emissions,<sup>64</sup> which has about 300 times the GWP of CO<sub>2</sub>.<sup>65</sup>

**CO<sub>2</sub>:** Carbon dioxide emissions from this sector are produced through nitrogen fertilizer production for feed, on-farm fossil fuel use, deforestation to make way for grazing and animal feed production, and pasture desertification,<sup>66</sup> which can result from overgrazing by farm animals.<sup>67</sup> An estimated 41 million tonnes of CO<sub>2</sub> are emitted from fertilizer production for feed crops each year.<sup>68</sup> Given the amounts of coarse grains and corn that are used to feed farm animals in India,<sup>69,70</sup> it is likely that significant CO<sub>2</sub> emissions result from raising animals for food.

**CH<sub>4</sub>:** Enteric fermentation and manure management are the key causes of animal agriculture's methane emissions.<sup>71</sup> Enteric fermentation is a microbial fermentation that takes place in the digestive systems of ruminant animals, such as cattle, sheep, and buffalo.<sup>72</sup> Enteric fermentation is responsible for 49% of India's methane emissions, 63% of its agricultural emissions, and 12% of total emissions.<sup>73</sup> Buffalo account for nearly two-thirds of methane emissions from enteric fermentation, and are the most significant methane source in India.<sup>74</sup> Per-head methane emissions (arising from enteric fermentation) from crossbred dairy cows are greater than emissions from indigenous cattle, and buffalo have the largest emission coefficients relative to all dairy cattle.<sup>75</sup> The population of crossbred, dairy-producing cattle in India increased between 2000 and 2005,<sup>76</sup> as there is a growing preference for high yield animals.<sup>77</sup> There was also a 9% increase in the buffalo population from 1997-2003.<sup>78</sup>

Manure is responsible for the remaining portion of global methane emissions from farm animals<sup>79</sup> and accounts for approximately 5% of animal agriculture's GHG emissions.<sup>80</sup>

**N<sub>2</sub>O:** The farm animal sector also is responsible for the majority of the world's human-induced nitrous oxide emissions.<sup>81</sup> Nitrous oxide emissions from animal agriculture originate primarily from manure, but also from fertilizer for feed crops,<sup>82</sup> and contribute approximately 31% of animal agriculture's GHG emissions.<sup>83</sup>

## **Conclusion**

Mitigating the animal agriculture sector's significant yet underappreciated role in climate change and environmental problems is vital for the health and sustainability of the planet, and its human and nonhuman

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inhabitants. As “the single largest anthropogenic user of land”<sup>84</sup> and responsible for an estimated 18% of human-induced GHG emissions,<sup>85</sup> the farm animal production sector must be held accountable for its many deleterious impacts, and society must achieve changes in animal agricultural practices worldwide.

Methane’s relatively short atmospheric lifetime compared to carbon dioxide ( $\approx 10$  years<sup>86,87,88</sup> vs.  $\approx 100+$  years<sup>89</sup>) means that reducing methane emissions would have a more immediate and significant impact on mitigating climate change than just reducing CO<sub>2</sub> emissions.<sup>90</sup> Thus, tremendous opportunity to effectively mitigate climate change in the near term lies in the dairy sector,<sup>91</sup> particularly in India which has the largest combined population of cattle and buffalo in the world<sup>92</sup> with nearly 40 million milk-producing buffalo and cattle, each.<sup>93</sup> GHG emissions from animal agriculture are fundamentally related to the size of farm animal populations.<sup>94</sup> Therefore, aggressive breeding programs to increase dairy animal populations in India are not advisable; breeding programs must be designed with the goal of reducing cattle and buffalo populations. This should not be done by increasing dairy animal productivity in ways that are negative for animal welfare.

Individually, incorporating environmentally sound and animal welfare-friendly practices into daily life, including a reduction in meat, milk, and egg consumption, can reduce our environmental impact. The production, processing, transport, and preparation of an Indian, non-vegetarian meal including mutton collectively emits nearly twice the GHGs as that of a vegetarian meal that excludes dairy products and eggs.<sup>95</sup>

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<sup>11</sup>Food and Agriculture Organization of the United Nations. FAO Statistical Database, FAOSTAT. <http://faostat.fao.org/site/567/default.aspx>. Accessed May 13, 2011.

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