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## Module II— Diminishing the Ecological Footprint

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### Q&A

MODERATOR: VERNON G. THOMAS

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*Uko Zylstra (Calvin College, Grand Rapids, MI):* A couple of the speakers made mention of the fact that we need to reduce the human population—I do agree with that—but I want to raise a point that was not mentioned. In the 1970s, George Borstrom, then at Michigan State University, analyzed human population equivalents with regard to animals. And the animal to human population equivalence, as I recall, was about 14 to 15 billion. That's a pretty large number of human population equivalents. Why isn't that in your analysis and your attempt to deal with some of the problems with regard to ecological footprints? Animals have large ecological footprints. It's not in the equation that I saw this morning. Any explanation? And to what extent should we incorporate that? In other words, Borstrom dealt with domestic, not wild, animals, and that's a pretty large impact. How does that relate to our own dietary system, *etc.*, our whole food system?

*William Rees:* A couple of points: obviously animals do have a large footprint, but in our analysis, for example, much of it is attributable to the human footprint because domestic animals are simply a way-station for energy and material flows from the ecosystem into humans. That massive population of animals is a supportive network for the human system. There is no question that if we eliminate the animals we could sustain a larger population of humans. Something like half the grain grown in North America is fed to animals. If we moved toward a more vegetable- and fruit-based diet and eliminated the animal intermediaries you could sustain a larger human population. But it doesn't get at the fundamental problem, which is the constant pushing upward of human population numbers. And as wealth increases, the quantity of animals and animal protein in our diet increases

space. It goes right back to some of the things that Dave said. People want those higher dietary standards. China is becoming a huge meat-eating country. If you simply extrapolate—one of their specific objectives is to attain the same levels of meat consumption as the West—you'd have to have the entire planet covered in grazing lands just to sustain that demand of the Chinese. So there is inherent conflict here and I think you are right in pointing out that these animals in fact have a huge footprint; but it's really part of the human footprint.

*Klaus Ammann:* A study was done in the 1970s by an interdisciplinary group at the University of Stuttgart and Berkeley on how much space does humanity need, if it could be organized in an ideal way with agriculture, with vacation space, with everything involved. Their result was the size of the island of Taiwan. So I don't want to comment further on that but I would just like to say there is some hope still. With respect to our behavior and our organization we can do much better and the potential is gigantic.

*David Lavigne:* One reason why it wasn't in my talk was largely the time constraint, but I think you've probably seen a paper by Palmer, who calculated the agricultural footprint of the United States, and the largest component of that was beef. And I think he recommended that the United States could reduce its agricultural footprint by consuming far less beef than currently. And the other reason I left it out was I assumed most people here would be from the plant biotech field so I didn't want to take a shot at beef.

*Rees:* If I may just add something: you could contain the whole of humanity on a place like Taiwan but if you put it in the context of the second law of thermodynamics about half of the rest of the planet would be directed towards sustaining the consumptive activities going on in that little space. You can read all kinds of crazy notions about the whole of the human population, if condensed, would occupy less than a cubic kilometer. It's irrelevant when you'd need the productive capacity of half of the rest of the planet to sustain the consumptive activities of that relatively small mass of humans.

*Ammann:* You don't even know the study and you ridicule it. They did the study by using all the parameters including food production and were baffled themselves that it was this size, not more. Not a few cubic meters—about the size of the island of Taiwan. Let's think about this. It should not be dismissed out of hand.