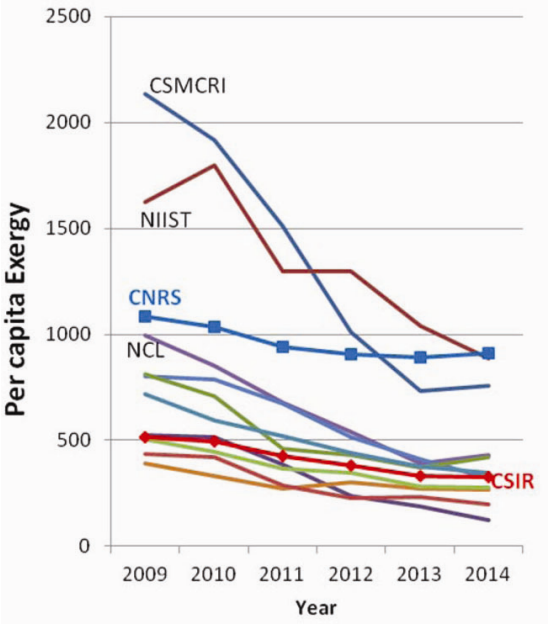

Figure 1. The ten laboratories of CSIR that show relative progress.

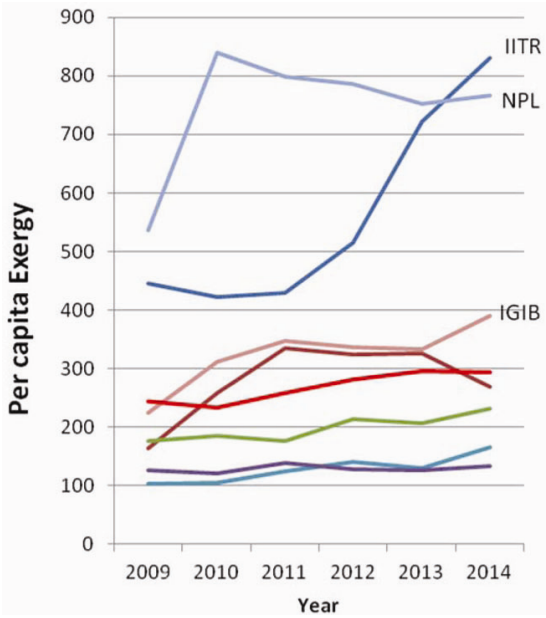

Figure 2. The eight laboratories of CSIR that are in relative decline.

same time CNRS has declined to only 83.67% of its 2009 value in 2014. Note that these relative declines have to be rationalized in terms of the very high standards set by the Broad Institute of MIT and Harvard which occupied the top rank with an Excellence Rate score of 100 in 2009 and from 2012 to 2014, and the Whitehead Institute for Biomedical Research which was credited with the 100 score in 2010 and 2011. The SLOPE function available in Excel is used to compute the progress or decline of the various institutions and this is shown in the last column in Table 1. Ten of the CSIR institutions are in decline while eight show steady or good progress. Figure 1 displays the trajectories of the two groups with the prominent laboratories labelled. We see that the premier Chemistry-based laboratories are in rapid decline. The Biology laboratories are registering relatively good progress (Figure 2). For good measure, the results for CSIR and CNRS as a whole are also included as a benchmark.

1. http://www.scimagoir.com/; accessed between 15 and 24 August 2014.

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Human–animal conflicts

At the outset, *Current Science* must be lauded for publishing papers linking science and society. And in these days of human–animal conflicts, publication of reports on dog–human relationship is timely[1,2].

This author's association with about a dozen breeds of pet dogs and over several hundred free-ranging native dogs started over 60 years ago first in Bangalore (where he was born and brought up until about 12 years of age) and then in New Delhi for substantial part of his life, and now in Chennai since 1999. In all these places, this author has always had pet dogs at home and also cared for scores of free-ranging native dogs. His understanding of their behaviour based on years of observations at home and outside is that dogs inherently are neither 'submissive' nor 'aggressive', but just adaptive to suit the circumstances. Often dogs which wag their tails and 'beg' for food or crave for love and attention can also become aggressive under provocation. At home, this author's pet Deutschund 'Pinky' would jump on his bed at midnight and push him to the other side so that she could be right under the fan. If chided, she would either bark and exercise her authority or jump out of the bed and sulk. These different behaviourial patterns probably reflect her moods similar to those of humans.

There is a strong hierarchy among a group of free-ranging dogs, a tradition preserved from their progenitors, the wolves. The domestic dogs originated from European wolves that interacted with human hunter-gatherers between 18,000 and 32,000 years ago. That was quite a long time before humans made the transition from hunting and gathering to cultivation of crops and domestication of farm animals. Hence, the humans today should not forget the long-standing evolutionary binding.

Majumder *et al.*[1] have concluded that the solution to the dog–human conflicts is not culling, but efficient 'garbage management' and a 'positive attitude' towards dogs. While agreeing with the authors, it should be ensured that 'garbage management' does not, however,

result in a situation of 'no food, but starvation death'.

The free-ranging dogs require not only food, but also love and care. Along with a few other dog lovers, this author gets the free-ranging female dogs periodically spayed. The 'Blue-Cross' in Chennai is quite proactive in this regard. This approach helps in maintaining the population of free-ranging dogs within manageable numbers and budget for feeding, vaccination against rabies, etc. What is basically needed is a change in the human attitude towards not only free-ranging dogs, but also all other animals. It must also be noted that the ever-increasing human–animal conflicts are due to human encroachment into their habitat. Humans multiplying in numbers beyond the 'carrying capacity' of the planet and also adopting unsustainable lifestyle are responsible for 'habitat destruction' and species extinction.

Finally, we should understand that no other animal species has caused degradation of the environment, species extinction and exceeding the planetary boundaries with regard to climate change, nitrogen cycle, hydrological cycle, etc. as humans have. Learning from animals to live in harmony with nature can save the planet and humanity which are now at the cross-roads.

1. Majumder, S. S. *et al*., *Curr. Sci.*, 2014, **106**(6), 874–878.
2. Vanak, A. T. *et al*. and *response by* Bhadra, A., *Curr. Sci.*, 2014, **107**(3), 341–345.

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Food production to feed the growing population needs both water and energy

Water–energy nexus in relation to population is elegantly brought out in the editorial by Srinivasan[1]. The message that water is needed for energy production and energy in turn, is needed for providing water is loud and clear. As the population increases freshwater is rapidly becoming a limiting factor for human activities. I would like to further add the complexity of food production into the water–energy relationship. Food production which essentially involves conversion of solar energy into carbohydrates, proteins and lipids[2], consumed as food, by humans and animals, is intimately linked to the availability of water and energy. At the same time, though socially reprehensible in food-deficit countries, food can be converted into biofuels (energy).

The demand for food, water and energy increases with population growth and rising income. Though currently India is self-sufficient in cereal production and is an exporter of rice, pulses and oilseeds or edible oils are imported. At the same time, India accounts for one quarter of the world's hungry population. Global hunger index[3] shows that in 2010–12, 17.5% of the population in India was undernourished, 40.2% of children under the age of five were underweight in 2008–12 and under-five mortality rate was 6.1% in 2011.

In this context, it is pertinent to recall that export of rice and horticultural products, though good for the economy, amounts to export of virtual water as well as energy used for production. One kilogram of rice requires 3000–5000 litres of water for production. It is estimated that export of 10 million tonnes of rice amounts to the export of 30–50 billion cubic metre of water[4]. Both energy and water used for production are subsidized by the Government.

Increasing water, energy and food demands of the growing population, and their shortages call for inter-disciplinary science-based estimates of sustainable human population that the land area of the country can support. Earlier, I had called for carrying capacity (CC) estimates for the country based on food, water and energy[5]. Subsequently collective views of several crop and animal scientists were brought out as a Policy Paper[6] of the National Academy of Agricultural Sciences, and as a special section in *Current Science*[7].

Ecologists define sustainable CC of an ecosystem as the number of humans and animals that can be sustained based on primary productivity of plants, with the available resources without damaging the resource base. Since crop productivity (food production from unit area) is highly dependent on inputs of water and energy, it is pertinent to estimate the numbers that can be sustained with the available resources of water and energy. There are increasing demands for energy and water resources from other sectors.

CC is not a fixed number and essentially depends on acceptable environmental impact. The latter is the product of population number, consumption levels, the technology used as given by the IPAT[8] equation. All manmade items – elevators, buses, trains, aircraft, roads, bridges, etc. are designed for a specified CC. The consequences of exceeding the CC are disastrous – elevators do not move, aircraft fail to take off, bridges collapse, people fall off from trains and buses and movement of vehicles slows down on roads. Presently, we live in ecosystems subject to large human interventions and hence, it is relevant to know the numbers and consumption levels that can be sustained based on land area, food, water and energy available and that could be made available within acceptable environmental impact. Exceeding the sustainable levels would lead to disasters and even collapse. Of course, technological innovations and reduced consumption can enhance CC. In the past, adoption of new farming technologies, the so-called Green Revolution, has made it possible to essentially feed the present population of 1.2 billion compared to 340 million at the time of independence in 1947. An anonymous referee had suggested that the concept of 'ecological footprints' (EF) is more relevant for food production systems as land for growing crops is becoming a shrinking resource. The green revolution technology with increased use of chemical fertilizers, pesticides and water has high EF and hence is considered unsustainable. Reduction in EF of food production has been recommended for global sustainability[9]. EF inversely correlate to CC.