Mission-oriented higher education institution: some concerns

Grover[1] articulates the motivation for setting up a higher education institution (HEI) by a mission-oriented agency, and provides the example of the Department of Atomic Energy (DAE) that has implemented the integration of a university (Homi Bhabha National Institute) with a workplace. He provides an interesting account of the evolution of a dedicated university under the control of the Atomic Energy Establishment.

He argues that the interdisciplinary nature of nuclear does not lend itself to a silo-based approach, and that the specializations needed by DAE to meet its missions are unique and such resources do not exist in the university system. This may appear like a pragmatic solution to support the mission needs of DAE. However, an alternative option would have been to support strong centres of education and research in specialized nuclear research in universities, IITs, IISc, etc. to create a strong, vibrant constituency of academics and researchers with new ideas, new approaches and innovation. Some of these could be channelized and directed towards DAE goals. The resource personnel at DAE could be involved as co-guides, adjunct faculty, etc. DAE would then have the best of both worlds, have directed research yet have opportunities to integrate blue-sky research and benefit from cutting-edge research in seemingly unrelated areas. This will also enhance the engagement of faculty members on nuclear-related problems. The openness of a university provides an ideal environment for growth and evolution of new ideas. A HEI with focus on a restricted set of deliverables is likely to have a more restrictive culture and relatively less learning opportunities.

Since it is more than a decade after the establishment of HBNI, it would be worthwhile to understand its impact in terms of capacity building (employment opportunities and careers of its postgraduates), and to review the research linkages and synergies established with mainstream educational and research organizations in the country. DAE has been dependent on its workforce from its own training school, https://www.barc-onlineexam.in/science/info-training-schemes.html. It recruits graduates, trains them and absorbs them as officers. Lateral entry opportunities are limited. Has this changed with HBNI?

Several countries in the world have a different model with the nuclear establishment supporting and mentoring the growth of academic and research programmes in national universities[2–4]. In the US, there are more than 35 universities running successful nuclear engineering programmes[4] and there are several US university nuclear research reactors supported by the United States Department of Energy. In India too, there have been a few nuclear energy programmes (IIT Kanpur, IIT Bombay, Jadavpur University, etc.), but they are sub-critical.

In the context of the challenges of climate change and the supply variability of renewables, there is potential for nuclear energy to provide a greater share of the energy supply mix in the country, especially as we target a zero-carbon future. This is a challenge and an opportunity for the nuclear community. Integration of DAE's roadmap with supporting vibrant academic and research programmes on nuclear energy in good universities across the country is likely to help change the perception and reality of nuclear energy in the country. It may be worthwhile to rethink and revisit the structure of the new 'utilitarian' university model proposed.

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2. National Research Council, *US Nuclear Engineering Education: Status and Prospects*, The National Academies Press, Washington DC, USA, 1990; https://doi.org/10.17226/1696 (last accessed on 25 January 2020).
3. IAEA, Nuclear Engineering Education: A competence based approach to Curricula Development, International Atomic Energy Agency, Vienna, Austria, July 2014.; https://www.pub.iaea.org/MTCD/publications/PDF/Pub1626web-52229977.pdf
4. *Nuclear Science and Engineering Education Sourcebook 2018*, American Nuclear Society; https://neup.inl.gov/SiteAssets/FY2018_Documents/Nuclear.S_E.Education.Sourcebook.2018.pdf (last accessed on 28 January 2020).

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Researchable issues in livestock and fodder sector under COVID-19 pandemic and beyond

The livestock sector is crucial for the Indian economy with 27% contribution in the total value of output in agriculture and allied sector and 4.4% in total GDP at current prices. India ranks first in livestock population (536 million in 2019), milk production (187.7 million tonnes (mt) in 2018–19) and consumption[1]. The country earns over Rs 30,000 crores annually from the export of animal products, which includes major products like buffalo meat (Rs 25,168.31 crores) and dairy products[2]. This sector contributes not only to income, employment, food and nutritional security, but also provides the best insurance against any natural calamities[3]. The present COVID-19 pandemic has adversely affected the fodder and livestock sector, especially the input–output supply chain and thus, undermined the livelihood of millions of livestock keepers. This necessitated us to draw suitable short- and long-term strategies for sustaining fodder supply for managing livestock productivity during pandemics and beyond. We should also redesign our research priorities for the

above sector in light of such pandemics and other natural calamities like floods, droughts, etc. with an out-of-the-box thinking approach.

The livestock feed and product supply chain involves producers (farmers and feed industry), consumers, inputs, processing, value addition and storage, transportation and marketing. Some of the components of this demand-and-supply chain were adversely affected due to the COVID-19 pandemic-related lockdown restrictions. The livestock farmers are facing difficulty in selling milk due to such restrictions and closure of sweet shops, hotels and restaurants. The milk collection centres of organized cooperative dairies have either closed or reduced their intake. The milk-processing industries also halted processing due to labour shortage and disruptions in demand-and-supply chain. Milk is highly perishable and needs immediate disposal. This forced the farmers to make ghee (cream/butter) from milk, but this is less profitable than direct selling of milk. Ghee-making is also not possible for big dairy farmers with large production. Other dairy products like cheese/paneer, ice cream, curd, srikhand, etc. are also perishable, and not possible or difficult to prepare and dispose at farmer's level. Therefore, under such a condition, the research priorities before dairy scientists should be on dairy products which are easy to prepare and have a long shelf life, e.g. dry milk powder, ghee, etc. Dairy scientists should also focus on value addition for enhancing the keeping quality of the products. Poultry farmers and the meat sector were also severely affected as there were no takers for their produce. The poultry and egg prices drastically reduced and these farmers suffered huge losses. Poultry meat and egg-processing, and value addition should also be a priority research area as poultry has a shorter production cycle than the other meat-producing animals.

The input supply side of livestock farmers (dry and green fodder, concentrates, mineral mixtures, medicines, etc.) may also be affected to some extent by the current pandemic, but it can be managed. As of now, there will be ample supply of dry fodder as the country is expecting a record 106 mt of wheat production this year besides good harvest of other crops. The green fodder production is less likely to be affected due to COVID-19, because livestock farmers are generally less dependent on external inputs for green fodder production, except for some crops (e.g. berseem), where we largely depend on imported seeds. Similarly, organized big dairies, peri-urban dairies and dairies in milk-shed areas may face some difficulty in arranging fodder. The availability of other inputs like fertilizers may be an issue for some farmers.

Looking at the above input-side constraints and issues, scientists should set their research agenda on input management for uninterrupted livestock production under such pandemics and even beyond. More research programmes should focus on perennial forages like Bajra–Napier hybrid, guinea, setaria, fodder trees, etc. which are less affected by such biotic and abiotic calamities and are capable of supplying green fodder throughout the year. Further, our extension scientists should convince and/or encourage farmers to grow such perennial forages in some area on their farms, or at least on field boundaries and bunds. Research should also focus on forage conservation and value-addition techniques for excess green fodder as silage and dry fodder as feed blocks, bales and leaf meal for use during lean periods or times of crisis. Natural resource management scientists should develop integrated input management strategies, such as integrated nutrient management, integrated weed management, etc. if certain inputs (e.g. fertilizers, herbicides) are in short supply, and should also search for alternative inputs and input management strategies. Similarly, more research is needed on non-conventional and alternative feed resources like top feeds (tree leaves), sugarcane tops, banana leaves and stem, spineless fodder cactus, lathyrus, fodder sugarcane, moringa, fodder sugarbeet, azolla and hydroponic fodder production, for their utilization as fodder during pandemics and other natural calamities. The government should fund research programmes that aim towards rehabilitation and development of common property resources like village common pastures and grazing lands, wastelands, community forests, joint forest management, etc. for fodder resource development. The Government should also provide policy support to livestock keepers by establishing fodder banks in a cluster of villages or at least in each block. The supply of critical inputs like fertilizers and quality seeds should also be ensured during such natural crisis. The government should consider having a minimum buffer stock for seed and planting material for use during calamities. Dedicated green corridors for agricultural inputs and outputs, including livestock, may be opened in order to effectively avert a rural crisis if the COVID-19 situation worsens and lockdown continues in the country.

1. Department of Animal Husbandry and Dairying, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India (GoI), 2019; http://www.dahd.nic.in/about-us/divisions/statistics (accessed on 5 May 2020).
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3. Ghosh, P. K., Palsaniya, D. R. and Srinivasan, R., *Agric. Res. J.*, 2016, **53**(1), 1–12.

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