Radio serial on climate change and global warming

Climate change is now a reality. The fact has been supported by a plethora of literature published in the last decade. Some of the observable effects on the environment are already visible. The scientific community across the globe is confident that global temperature will continue to rise in the future, mainly due to the emission of greenhouse gases produced as a result of anthropogenic activities. Intergovernmental Panel on Climate Change (IPCC) has predicted that increase in global mean temperature of less than 1–3°C above 1990 levels will produce beneficial impacts in some regions and harmful ones in others, but 'taken as a whole', 'the range of published evidence indicates that the net damage costs of climate change are likely to be significant and to increase over time'[1,2].

The international community has responded well to this threat which is posing a danger to the survival of humanity on earth. As a result of a series of negotiations and conventions, an intuitional framework has emerged to address the challenges of climate change. However, difference of opinion regarding its implementation persists between the developed and developing countries.

Recognizing a major threat because of projected changes in climate at the global level, India has engaged actively in international and regional fora. The country is providing leadership to other developing countries as well as espousing their cause at multinational negotiations, including the United Nations Framework Convention on Climate Change (UNFCCC), with the objective of establishing an effective, cooperative and equitable global approach to deal with the consequences of climate change.

India's National Action Plan on Climate Change (NAPCC) consists of eight national missions. They represent multipronged, long-term and integrated strategies for achieving key goals in the context of climate change. NAPCC hinges on the development and use of new and sustainable technologies.

Considering the current relevance of the theme which is aligned with the national agenda and the objectives of Vigyan Prasar (VP), an autonomous organization under the Department of Science and Technology (DST), Government of India, of science communication and popularization, VP and All India Radio (AIR), New Delhi, have developed a package of 52 episodes on the multidimensional aspects of climate change and global warming.

The 52-episode series is named 'Badalti Fizae' in Hindi and 'Whispers of Wind' in English. Promoting science and technology using the radio is one of the flagship programmes of VP.

The radio serial consisting of standalone thematic episodes will be broadcast nationally – in 19 Indian languages from 121 stations of AIR (14 FM and 107 MW stations) from 30 March 2019 onwards. The broadcast of the serial has begun in Hindi and English from 31 March 2019 and will continue till the middle of March 2020 (FM Gold 100.1 MHz at 2.30 pm in Hindi and Rajdhani Channel MW 666 kHz at 9.30 pm in English).

Each episode is of 27 min duration and will focus on a particular aspect related to climate change. The basic objective is to create awareness about the challenges of climate change and promote understanding of climate change science, adaptation, mitigation, energy efficiency and natural resources conservation. The episodes also include success stories as well as do's and don'ts to motivate people for local action.

The radio serial will further India's objective of engaging and ensuring participation of people in mitigation and

Box 1.

Objectives of the proposed radio serial

1. Create awareness about the challenges of climate change to engage and ensure participation of people in mitigation and adaptive measures to ensure the success of all eight national missions.
2. Highlight the scientific facets of climate change in a simple manner.
3. Optimize on the reach radio provides.
4. Bring several prominent subject experts, technologists and planners to speak about the depth and spread of implication of climate change, and the inevitable role we as common citizens have to play to achieve the intended goals.
5. VP will derive the best to play out of its experience through the radio by engagement with experts and dedicated listeners' groups, in addition to greater nationwide reach it can achieve, as in the past.

Proposed thrust areas for the serial episodes

1. Understanding the science of climate change and global warming.
2. The natural and anthropogenic factors responsible for climate change.
3. The impact of climate change.
4. Preparedness of the global community to address the challenges of climate change.
5. Norms, conventions and institutions to cope with climate change.
6. India and climate change.
7. Institutional framework in India.
8. Mitigation and adaptation.

Target groups

1. Citizens, civil society awareness facilitators and managers.

Special features of the radio serial

1. Fifty-two standalone thematic episodes produced.
2. Each episode of 27 min duration.
3. Docudrama/feature format.
4. Produced in 19 Indian languages simultaneously.
5. Broadcast from 124 stations of AIR simultaneously.
6. Audio programmes made available for sale after broadcast.

adaption measures to ensure the success of national missions. For interactivity and two-way communications, there will be 8–10 interactive episodes based on questions, queries and letters/e-mails of the listeners and answering the questions posed at the end of each episode. The selected listeners will be provided additional materials in the form of activity kits developed specially for the serial.

Prominent subject experts, technologists and planners will highlight the scientific facets of climate change in a simple manner in the interactive episodes of the series. The series in 19 languages will also promote appropriate mechanisms that India is developing to deal with the challenges of climate change on several fronts simultaneously.

The following thrust areas are covered in the series: (a) Understanding the science of climate change and global warming. (b) The natural and anthropogenic factors responsible for climate change. (c) The impact of climate change. (d) Preparedness of the global community to address the challenges of climate change. (e) Norms, conventions, and institutions to cope with climate change. (f) India and climate change. (g) Institutional framework in India. (h) Mitigation and adaptation.

In 2008, VP and AIR had signed a memorandum of agreement, under which radio serials are being produced and broadcast through AIR to enhance understanding of the approaches and outcome of science and technology. For the exact schedule of the broadcast day/time/frequency, etc., one may contact the nearby AIR station. Before launch of the serial, a press meet was also organized at the Constitutional Club, New Delhi on 29 March 2019.

1. IPCC, Summary for Policymakers. In *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (eds Stocker, T. F. *et al.*), Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2013.
2. IPCC, Summary for Policymakers. In *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (eds Solomon, S. *et al.*), Cambridge University Press, Cambridge, UK and New York, NY, USA, 2007, p. 17.

B. K. Tyagi, Vigyan Prasar, A-50, Institutional Area, Sector-62, Noida 201 309, India.
e-mail: tyagi.bk@gmail.com

How are storage organs of root and tuber crops made? Mobile RNAs and proteins hold the promise!

Storage tuber and root crops (such as potato, yam, sweet potato, cassava, carrot, radish, sugar beet, etc.) form a significant portion of the world's subsistence food supply. Although these storage crops are nutritionally rich and have diverse roles in medicinal and industrial applications, not much research has been conducted on them. The only exception being a tuber crop potato, where extensive literature is available, largely on molecular signals that control tuber development. Since storage root crops hold an immense promise for food security purposes, studying storage root development would enable us to understand several unanswered questions. For example, what are the factors (internal and environmental) that govern the formation of below-ground storage organs? What regulates the size of the storage organs? How is the dormancy of these crops controlled post-harvest? If we could identify crucial factors involved in storage organ development, we can design biotechnological strategies to improve the overall growth performance and enhance their yields.

In all of these crops, below-ground storage organs serve as a strong reservoir for starch and storage proteins that help plants to harness energy required during post-dormancy. Sugar molecules synthesized in leaves are transported through phloem sieve tubes that results in a massive accumulation of starch in below-ground storage organs. During the course of evolution, plants have adapted a long-distance transport mechanism through the phloem to communicate with their distant organs and regulate flowering[1,2], defence responses[3,4] and nutrient deficiencies[5,6]. Apart from sugars, many other signals, such as metabolites, hormones, proteins, lipids, small RNAs and full-length mRNAs are now known to ferry through the phloem sieve tubes as mobile molecules in response to various intrinsic and extrinsic signals[7].

In 2007, the discovery of a phloem mobile protein as the flowering signal in *Arabidopsis* and rice paved the way to identify mobile signals for tuber development in the storage crop potato. Flowering Locus T (FT) protein is synthesized in leaves and moves to the shoot tip through the phloem to initiate flowering under favourable conditions[8]. Interestingly, early experiments from 1980s revealed that flowering and tuberization pathways share common signals[9], where researchers observed that if any flowering tobacco plant (as scion) was grafted onto non-tuberizing potato (as stock), it induces tuberization (Figure 1 *a*). These experiments prompted other researchers to look for potential mobile signals involved in potato development. Mobile mRNA of a BEL1-like transcription factor, StBEL5, proved to be one of the major long-distance signals that moves from leaf to a below-ground modified stem (known as stolon) to induce tuber formation in potato[10]. Later, mRNAs of the two close homologous proteins of StBEL5 (*StBEL11* and *StBEL29*) and *Knotted1*-like class-I KNOX gene (*POTH1*) were also found to be phloem mobile signals associated with potato development. Other researchers established that over-expression of the rice FT ortholog in potato also induced both flowering and tuberization, even under unfavourable conditions. The potato FT protein ortholog StSP6A was identified as the mobile tuberization signal that moves as a protein from leaf to stolon to regulate tuber development[11]. Potato plants having high expression of either the mobile mRNA *StBEL5* (ref. 10) or StSP6A protein[11] showed increased tuber yield.

The field of mobile RNAs and proteins is expanding rapidly, as revealed by