tions due to growing deficit in rainfall, conventional rice cultivation must be lowered in the Indo-Gangetic Plains and greatly expanded in the northwestern peninsular or central–western region of India, wherein a highly significant rise in rainfall is predicted/occurring. To keep the western parts of the Indo-Gangetic Plains as a major food grain-producing region, despite the adverse effects of climate change, is the major challenge for future agricultural research.

The Indo-Gangetic Plains can continue to be the major producer of food crops, despite lesser availability of irrigation water, provided new varieties are cultivated in location-wise, judiciously selected cultivation schedules. Traditionally, there are three cropping seasons in the area: *rabi* or winter season from October/November to March/April; *zaid* or summer season from March/April to June/July; *kharif* or rainy season from July/August to October/November. The following cropping schedules could be practised with the use of suitable varieties for high yields in the era of climate change: potato/rape/mustard – wheat/chickpea/lentil (in *rabi*) – moong-bean/soybean (in *zaid*) – aerobic rice/pigeonpea/soybean/urad-bean/cotton (in *kharif*). For higher profits to farmers, the essential oil crop menthol mint and medicinal crop, Artemisia could substitute for mungbean/soybean/cotton in *zaid* season, as suitable varieties of these crops are already available. Sugarcane, a water-intensive crop, should be continued to be cultivated in the Himalayan *tarai*/foothill region for strategic reasons. Also, mustard may be grown in the area with irrigation for high yields, again for augmenting liquid biofuel supply.

Mustard crop could be taken twice in *rabi* season, if suitable short duration and early maturing varieties become available. Cotton crop gives lint as well as oil and it could be a grown in wider areas during *kharif* season. Potato should assume the role of a staple food. India will need to produce 120 million tonnes (mt) of wheat, 25 mt of pulses and 100 mt of oil seeds (50 mt for biofuel purposes) by 2025 (refs 4 and 5). The Indo-Gangetic Plains should become a major supply region for these commodities in the changed climate situation.

Crop breeding programmes to develop temperature- and drought-tolerant high-yielding cultivars of the identified crops should be initiated urgently, so that the desired kinds of varieties are available when climate change effects are experienced consistently. The genetic resources, especially land races from areas where past climates mimicked the projected future climates for agriculturally prime areas in India, could serve as the starting genotypes for building the genes for tolerance, maturity and yield features. Considerable progress has been made in the genetic dissection of flowering time[6,7], inflorescence architecture[8], temperature[9,10] and drought tolerance[11,12] in certain model plant systems and by comparative genomics in crop plants. A combination of conventional, molecular marker directed, mutational and transgenic-breeding approaches will be required to evolve the desired kinds of crop cultivars. Crop-based coordinated programmes need to be launched to develop early-maturing, high-yielding and temperature- and drought-tolerant varieties as early as possible. Recently, the Indian Agricultural Research Institute, New Delhi has released an early-maturing wheat variety suitable for late planting. It appears that desired kinds of genotypes can also be selected in some of the ongoing breeding programmes. There will be need for identification of areas where the climate change conditions already exist or are mimicked (for example, Rajasthan–Madhya Pradesh–Uttar Pradesh border areas for the Indo-Gangetic Plains) and/or setting up of suitable environmental chambers for the purposes of screening large segregating populations to make selections. The climate change needs to be converted from a difficulty into an opportunity.

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Counterfeit drugs: problem of developing and developed countries

There has been an alarming increase in counterfeit drugs, which now represent 10% of the global market for medicines[1]. In some countries the counterfeiting of drugs is endemic, with some patients having a better probability of getting a fake medicine than a real one.

WHO has defined a counterfeit drug as follows: 'À counterfeit medicine is one which is deliberately and fraudulently mislabelled with respect to identity and/or source. Counterfeiting can apply to both branded and generic products and counterfeit products may include products with the correct ingredients or with the wrong ingredients, without active ingredients, with insufficient active ingredients or with fake packaging.' Counterfeit medicine was first mentioned as à problem at the WHO Conference of Experts on Rational Drug Use in Nairobi, Kenya in 1985. Since then, WHO has received many reports from developing and developed countries.

Counterfeit medicine is the brainchild of criminals who want to make huge profits at the expense of innocent people.

Consumers who use medicines inappropriately and create demand for such drugs are also to be blamed. For example, the misuse of creams containing steroids for skin bleaching and body-building medicines has generated a market for counterfeit steroid-containing medicines. Often, these medicines are distributed through unauthorized channels or illicit markets.

Counterfeit drugs that have been discovered have rarely been efficacious and in most of the reported cases, they are not equivalent in safety, efficacy and quality to their genuine counterparts. They are not within the control of the Drug Regulatory Authority (DRA) of the country concerned. Hence, if needed, an effective product recall would not be possible. Treatment with ineffective counterfeit drugs such as antibiotics can lead to the surfacing of resistant organisms and may have a deleterious effect on a wide section of the population. In severe cases, counterfeit drugs may even cause death.

As a result of such damaging effects, counterfeit drugs may erode public confidence in healthcare systems, healthcare professionals, suppliers and sellers of genuine drugs, the pharmaceutical industry and national DRAs. Incorrect labelling as to the source can also be detrimental to the reputation and financial standing of the original and/or current manufacturer whose name has been falsely used.

Counterfeiting medicines in all forms continues to represent an understandable concern for regulators, law enforcement authorities, and healthcare professionals. Lack of suitable legislations and regulations has encouraged counterfeiters to continue their practices. Various countries where the severity of counterfeiting is more, should harmonize stringent legislations and regulations. Insufficient resources for drug regulation activities and absence of appropriate training of DRAs' personnel may also manifest as inefficiency and incompetence of national DRAs. The consequence of this will be increased infiltration of counterfeit medicines into national distribution channels.

There is no simple solution or remedy that can be applied to get rid of counterfeit medicines nor can the problem be solved by an individual company or government. The problem has reached global dimension and needs a global approach. Development of a system which helps in reporting counterfeit drugs, implementation of anti-counterfeiting technologies, enforcement of stringent, proven anti-counterfeiting laws and regulations, and severe penalties on convicted offenders will help combating counterfeit drugs.

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NEWS

Quark–gluon plasma: fifteen years of Indian effort

The Quark–Gluon Plasma (QGP), that enigmatic new state of matter almost 20 times denser than normal nuclear matter, supposedly existing in the early universe a few microseconds after the big bang and predicted to be formed in the laboratory in ultra-relativistic heavy nuclear collisions as a consequence of de-confinement phase transition, has been at the centre of intense experimental study in the accelerator facilities at the CERN laboratory, Geneva, Switzerland and at the Brookhaven National Laboratory (BNL), New York, USA over the last two decades[1,2]. Quantum chromo-dynamics (QCD), the current theory of strong interactions, predicts that at sufficiently high energy density and temperature, achievable in high-energy heavy nuclear collisions, hadronic matter may undergo phase transition and an extended volume of interacting quarks, anti-quarks and gluons, referred to as QGP, can be realized as a transient state. This state will have collective properties different from that of hot hadronic matter and these differences form the basis for experimental signatures in the search for QGP.

About a decade and a half ago, a major initiative in the experimental study of QGP was taken up by scientists from the Variable Energy Cyclotron Centre (VECC), Kolkata, who knitted an Indian collaboration with the Institute of Physics, Bhubaneswar and the university groups from Chandigarh, Jaipur and Jammu, with the aim to study photon production in nuclear collisions. Photons are produced in the whole of the phase space in all stages in the evolution of the system created in nuclear collisions and carry information about the history of evolution as they do not interact strongly with the system and have large mean free path. Theoretical study of photon production, as one of the signatures of QGP formation, has been carried out by several Indian groups since a long time[3].

The Indian team set its sight on the forward region in nuclear collisions. This region, with high particle density, is particularly difficult for the study of photons because traditional equipment, the electromagnetic calorimeters, cannot be used due to large overlap of showers. There had been no measurement of photons in this part of the phase space earlier. Using the concept of a preshower detector, where shower formation is controlled by using a thinner converter and the transverse size of shower restricted to minimize overlap, one can measure the spatial distribution of photons produced in nuclear collisions. High particle density requires high granularity of the detector to keep occupancy to a reasonably low value.