

Prof. Dr. P C Kesavan Ph. D; FNA; FNASc; FAAS; F Inst P  
Formerly Director, Biosciences Group, Bhabha Atomic Research Centre, Trombay  
Professor & Dean, School of Life Science, Jawaharlal Nehru University, New Delhi  
Associate Professor, School of Life Sciences, Jawaharlal Nehru University, New Delhi  
Assistant Professor First at the University of Calgary Alberta and then at the Dalhousie University Halifax, N. S. Canada  
Department of Atomic Energy - Homi Bhabha Chair, and  
Currently Distinguished Fellow, M. S. Swaminathan Research Foundation, Chennai

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**Dr. Panjab Singh**

President

National Academy of Agricultural Sciences

NASC Complex, Dev Prakash Sastry Marg

New Delhi - 110 012

Tel.: [011-25846051-52](tel:011-25846051-52)

Fax: [011-25846054](tel:011-25846054)

Email: [naas@vsnl.com](mailto:naas@vsnl.com)

Dear Dr. Panjab Singh

I respond with the following points with regard to the Resolution on the Commercialisation of GM Mustard by the National Academy of Agricultural Sciences (NAAS).

The Resolution starts with the statement that the NAAS presently comprises nearly 625 Fellows. It is noted that the Resolution was adopted at the Annual General Body Meeting of the Academy held on June 5, 2017. There are two pertinent points: the first is that I was not informed of this important Resolution that was planned by NAAS and presumably the other Members were not informed either and second, how many Fellows happened to attend this meeting and were a party to the resolution? I would appreciate your reply to these two points.

This is an important resolution and I believe that the views of individual Fellows should have been first ascertained. Very clearly, all of the 625 Fellows would not be a party to this Resolution. In the meanwhile, the NAAS has written to the Prime Minister and we are therefore, confronted with a fait accompli. I have several reasons that demand that I counter both the Resolution and THE LETTER, based on hard science and attendant socio-economic issues connected with GMOs, our history in Bt cotton and its performance and now, HT mustard in particular. A proper appreciation of these matters is pivotal for the well-being of our resource-poor, small and marginal farmers who comprise the bulk of our farming communities, as you have also alluded to.

My response must logically start with Bt cotton. It is very clear, based on the data of 14 years of Bt cotton, that this first GMO in India may not be considered anywhere near a sustainable success-story. The fact is that this is even the admission of the Central Government in the Delhi High Court in 2015-16. Let me make it absolutely clear. A rigorous and objective

scientific evaluation of Bt cotton during its 14 years as a commercial crop in India is absolutely critical. Fortunately, such authoritative analyses has already been done by Dr Keshav Kranthi, ex Director CICR (CAB document, 'Best Global Practises' of April 2017), based on hard official statistics, accompanied by expert scientific analyses of the Indian cotton 'story' by an internationally acknowledged entomologist. I am therefore, somewhat surprised that the failure of Bt cotton to perform in yield and sustainability is being *converted* somehow, into a myth of its great success. This is how you express it and it has dangerous consequences for Indian agriculture and our Country. How has this '*conversion*' happened? It doesn't stop there. It is being promoted as the successful model to be emulated to expand our GMO base in Indian agriculture. Hybrid Mustard DMH 11 is the current example of that conclusion to be followed by other GMO food crops.

For example, your letter to the Prime Minister is full of errors and wrong claims based on such errors. Why is this? The data is the same, yet in the hands of such of our colleagues who with you have signed-on to this letter, the data is misconstrued to convey the very opposite meaning to the leader of our Nation. Of course, these kinds of letters usually provide little data. Our leaders understandably accept the authority of our scientific institutions, that they are being given the best possible advice based on rigorous scientific evaluation. That is the trust. So let me fill the data gaps to prove that Bt cotton is a laggard and unsustainable crop. I specifically counter the following assertion you make:

*"India herself has benefited from (Bt cotton) becoming a world leader in cotton production and export" ---. "chemical pesticide use in cotton has declined ---- and PRODUCTIVITY and PRODUCTION have doubled---*"

There is little that is factual in these claims. On the contrary, the YIELD (kg lint/Ha) of Hybrid Bt cotton has been stagnating since 2007 despite the substantial expansion in Bt cotton area (at the expense of oilseeds and lentil crops in Gujarat and elsewhere, a point recognised by the PSC of 2012) and despite the increase in application of fertilisers, insecticides and irrigation (Gujarat). Higher acreage under Bt cotton is the reason for higher production/tonnages. But YIELD as you well know, is the real measure of productivity; and that plateaued 10 years ago and has now dropped below 500 kg/Ha in the last 3 years. Yet, you speak of a doubling of productivity and have given our PM a significantly wrong message in such a key narrative. When Bt cotton was officially introduced in 2002, its *raison d'être* was that it would free farmers from dreaded pesticide spraying, which had become a nightmare for our cotton farmers. Massive insecticide overuse in cotton was creating very serious problems indeed. Our resource-poor farmers took the twin promise claimed for Bt cotton, swallowed the bait of 'no insecticides and high yield'. These are the facts (official data).

**Area & Yield:** After 2006 when Bt area more than doubled to 95% (from 37%), yields stagnated. By 2015-16, yield had dropped to near pre-Bt cotton era levels (2004-5) of approx. 470 kg lint/ha (DES-CAB).

## BT COTTON: PRODUCTION AND PRODUCTIVITY 2013-2015

YEAR	PRODUCTION Lakh Bales DES	PRODUCTIVITY Kg Lint/Ha	
		DES	CAB
2013	359	510	566
2014	348	462	511
2015	305	437	484

Source: G of I: DES (Department of economic & statistics), MoA and CAB (Cotton Advisory Board) --  
Min of Textiles

### Other Sustainability Indicators

**Insecticide:** Insecticide use doubled after 2006. Expenditure increased 2.3 fold from Rs 1240/ha to 2799 (2006-2016) respectively.

**Fertiliser Use: Tonnage &/Hectare: 2006-'13:** 1.7-fold increase: from 131 kg/ha to 224 kg/ha. Total tonnage more than doubled; 2.2-fold, from 1.2 metric tonnes to 2.68 metric tonnes (2006- 2013)

**Fertiliser cost: 2006-'13:** increased 3.3 fold from Rs. 2397/ha to Rs 8246/ha

**Cost of Production: 2006-2013:** Increased 2.7 fold as a result of increased cost of inputs, from Rs. 26,414/ha to Rs 72,434 in 2013.

**Average Area each year:** 11.0 million hectares.

**Source:** Compilation of official data by KK (CICR)

These data conclusively prove the unsustainability of Bt cotton. In the recent issue of Current Science, there is a Commentary entitled 'An area-wide approach to pink bollworm management on Bt cotton in India – a dire necessity with community participation' (*Curr. Sci.* Vol **112**, 25 May 2017) by Mohan, Komarlingam S. This article makes a desperate appeal for IPM to rescue Bollgard II from its imminent collapse. But it is already too late. The question is, how, despite these facts, has Bt cotton been consistently interpreted and described as a resounding success. Your letter continues with this charade and to the Prime Minister of our Country? The further question is whether it was not known, and if not why,

to our policy makers that pesticide producing crops would induce 'selection pressure' and consequent development of resistance in crops. This is not unexpected based on principles of mutations and natural selection especially under 'induced' selection pressure. The Central Government in the Delhi High Court described it as "*a natural phenomenon*". Indeed, this is a pretty good conclusion!

The situation is if anything, worse with Herbicide Tolerant crops. Based on official US data of 25 years of commercialisation in that country, HT crops are proven to be an unsustainable technology in their large-acreage 'Industrialised agriculture'. Glyphosate (glufosinate as well in Canada with HT rape) have led to resistance and the emergence of 'superweeds' requiring increasingly higher applications of herbicide spraying. Instead of a scientific response to weed management, the response is more of the same toxic medicine, moving to a treadmill of even more toxic herbicides. Glyphosate is toxic to mammals and is also tumorigenic. The International Agency for Research on Cancer (IARC) classified Glyphosate as a "*probable human carcinogen*" although the industry is seeking desperately to discredit the IARC conclusion. Glufosinate (involved in hybrid mustard DMH11) is a neurotoxin and presently banned in the European Union. HT crops and therefore DMH 11 quite simply, may not be released in India with our small-holder farming. There will be serious harm on multiple fronts – havoc. The issue of irremediable contamination of our mustard germplasm is a real concern that is central to HT Mustard. India has great genetic diversity in *Brassica species*, with over 9700 accessions in our gene banks. The case of mustard is not less than brinjal in which India has the greatest genetic diversity worldwide of 2500 varieties including wild varieties. We must learn lessons from both the US and also Argentina. The latter records a dramatic increase in birth defects and cancers following exposure to glyphosate. We must act with prudence and foresight in our Country where agriculture is our backbone with 65% of our population rural-based and largely economically distressed. The TEC report also makes the case with other countries, which similarly have crops of genetic diversity/origin, that GMOs in such crops in India, like mustard, rice and brinjal must be banned, the principle of which is recognised and supported by the CBD to which India is a signatory.

The statement in the Resolution and THE LETTER "whereas In field trials, DMH-11 has out-yielded the national and zonal checks by 20 to 30% -----" is not supported by the data, and requires clarification.

I provide the facts based on official documents. In 2006, there was one open field trial of DMH 11 conducted in ten locations supervised by the Directorate of Rape-Seed Mustard Research (DRMR). This test was a bench mark. It involved (i) supervision by the DRMR and (ii) an appropriate Non-GMO Comparator namely DMH-1. You must know that DMH 1 out-yielded the GMO DMH-11? Kranti the National Check (variety) also out-yielded HT DMH-11, or in some locations the yield difference between DMH-11 and Kranti was not significant.

The 'mandated comparator' for DMH-11 is the nearest isogenic lines, ie the **Non-GMO cross or hybrid of its parental lines**. Hybrid must be compared with Hybrid is the agronomic logic and rule for field trials. Therefore, there should also have been other valid Comparators, other superior yielding Non-GMO hybrids. Yield data comparison between DMH 11 and one or both of its parents is absurd and unacceptable from a genetic standpoint. The subsequent BRL trials had no valid comparators at all and no hybrid as an entry. Strangely, it also had as entries the GMO version of the parents of DMH 11. I can guess why?

These matters among others are pretty well unbelievable. These are grave regulatory exclusions and false entries that must void these trials. Yet, they were not only accepted, but justified for commercial approval based on a false claim of superior yield performance of Hybrid DMH 11 over National & Zonal Checks (NC & ZC) by an average of 25%?

Therefore, it is reasonable to ask you to explain this statement. Furthermore, Varuna (one parent of DMH 11) was dropped as the NC in 2008. I am constrained to say that the claim of superior yield appears to be a deliberately misleading statement. With NON-GMO hybrid DMH-1 out-yielding (GMO) DMH-11, the large question, because of its implications, is: how was DMH 11 approved for the subsequent BRL trials?

As a Member of the original FIVE MEMBER TEC (appointed by the Honourable Supreme Court of India), which had both Government and Petitioners' nominees, I stand by our unanimous report submitted in 2012. The TEC-5-Member Committee had considered health, environmental and socio-economic dimensions relevant to India, and recommended, "*That every GMO must prove in the FIRST INSTANCE THAT IT IS NEEDED, satisfying all the relevant criteria of yield/trait superiority, before being allowed to proceed to an evaluation of the GMO in a comprehensive and rigorous risk assessment protocol conducted by independent experts*". DMH-11 has failed to demonstrate yield superiority over Kranti and hybrid DMH 1 (Non-GMO) in the only *near-acceptable* field-trial conducted in 2006 under the supervision of the DRMR. It should have ended there. It didn't.

The subsequent BRL trials that were nevertheless conducted, failed regulatory approval criteria and were also outside of mandated design and control for any meaningful statistical result. Therefore, they are invalid. Despite this, DMH 11 has been approved for commercial release. And NAAS has endorsed, it has to be said, a dodgy process presented instead as regulatory rigour to the Prime Minister.

In a similar case in Australia/New Zealand for a lysine enriched corn LY038, the use of the wrong 'comparator' forced Monsanto to withdraw its dossier for regulatory approval under challenge by the EU. Should not the NAAS, if it is indeed committed to promoting good science in the interest of the health and environment of the people of India, have instead upheld this same principle for which we even have a regulatory precedence in the EU?

I do not wish to labour the experience with the Bt-brinjal biosafety dossier. International experts critiqued different aspects of the raw data; the molecular construct, the animal and rat studies and environmental impacts of Bt brinjal. Their critiques expose our deep incompetence. And they opened a 'can of worms'. In fact, the unanimous 5-Member TEC Report also dealt at length with the inadequacies of the Monsanto-Mahyco self-assessed

dossier including regulatory incompetence and even lack of basic understanding of a biosafety evaluation of genetically-engineered crops. Some of the data in the Bt-cotton dossier even established 'gender equality' in body weight and growth rates of male and female rats! - A 'new biology', no doubt!

If this was the case with Bt cotton, and the only case where we have a biosafety dossier (not- withstanding its lack of independence in a self-assessment by the Developers), then what might be the expectation from a still SECRET biosafety dossier of Mustard DMH 11, which has been with-held from the public domain and the critical gaze of any independent scientist anywhere who wishes to access it and assess it? This is particularly so in the context of a virtual regulatory vacuum in the field trials of DMH 11, which comprehensively failed to establish the first step of NEED. Therefore, based on this evidence, you will agree that it would not be exactly reasonable to thereafter, expect sound, rigorous and exemplary risk assessment protocols? The secrecy cannot be defended under any guise. Yet, the NAAS's impassioned plea to the Prime Minister to approve Ht mustard also gives a wink and a nod to the regulatory delinquency that denies transparency is in contempt of the Constitution, Democratic Polity and Supreme Court Orders. It reminds me of the smoking lobby which hid for 40 years, with regulatory connivance, the link with smoking and lung cancer. It is a similar case with glyphosate. There is serious scientific concern that glyphosate is an endocrine disruptor and that this has been known and covered-up by Monsanto for 30 years. I raise this point for the added reason that herbicides including glufosinate are toxic chemicals, and that no National Regulator anywhere tests for endocrine disruption. It is difficult given these facts, how NAAS can assign safety to DMH11 in a process of regulatory oversight that is described as sound and rigorous.

The obvious solution lies in setting -up an independent, rigorous and competent international committee of experts in GMO risk assessment and genetic toxicological evaluation of genetically engineered crops, which will also review the biosafety-dossier of mustard DMH 11. Yet, given the serious conflict of interest in our regulatory bodies and institutions, the GEAC cannot be that Body and must stand down to facilitate this solution. It is a long asked-for and required measure.

There is the further and important question of GMO hybrids. Engineering Bt into hybrid cotton is a failed experiment. Their socio-economic impacts have been exacerbated by the problems presented by the Bt technology. In combination, hybrid Bt cotton is unsustainable and created the 'killing fields' of vidarbha. In his analyses of Bt cotton, (CAB Report of April 2017) Kranti says:

*"We believe that hybrid cotton gives higher yields than pure-line varieties. The world thinks otherwise. **Result -the yields of 'rest of the world' are double that of India!!** --- All the differences in crop production practices of India with the rest of the world are related **to one major policy factor –Hybrid cotton**. India is now saturated with hybrid cotton. Rest of the world did not adopt the concept of hybrid cotton. However, it was only in India that there was a general belief that hybrid-cotton technology could lead India towards high yields---. **With the introduction of Bt-cotton only in hybrids**, the area under hybrid (Bt) cotton reached 95% by 2011----*

*“ As long as insecticides or Bt toxins were effective in controlling the pink bollworm, long duration hybrids delivered higher yields. However, with the bollworm resistance to insecticides and Bt toxins, hybrids became highly vulnerable to bollworms”.*

High-yielding Bt cotton is a myth promoted and sustained officially, including by the NASS, right up to the present. It was sought to repeat and extend the unsustainable Bt cotton model in a dangerous and unscientific ‘experiment’ in Bt brinjal, also in hybrids, and brinjal is a food crop. Fortunately, we were saved from the disaster that would have ensued in Bt brinjal if Regulatory approval had not be overturned.

But now, despite the evidence to the contrary, we are having to contend with the new myth of mustard DMH 11, which is an HYBRID-MAKING technology and an HT Crop patterned on Canadian HT rape. The NASS agrees with the Regulators that this mustard is high yielding, enough to seriously dent our high import bill. Do I assume then like the Dossier that the arithmetic which proves such a feat, is a deep secret?

But the evidence fully debunks these claims. I also enclose a bar chart of production & yield data of the top rape-seed producing countries. It is clear that GMO HT rape is a comparative non-performer. Finally, this hybrid-making technology aims to convert India’s mustard agriculture to entirely HYBRID variants of DMH 11 and through DEREGUALTION. The NASS freely admits to this. Our inability to acknowledge and learn from history, condemns us to the same mistakes with increasingly severe consequences. It quite simply, is a false notion bereft of agri sense and science that we should even consider that India mustard agriculture should be converted to hybrid DMH 11 and its variants.

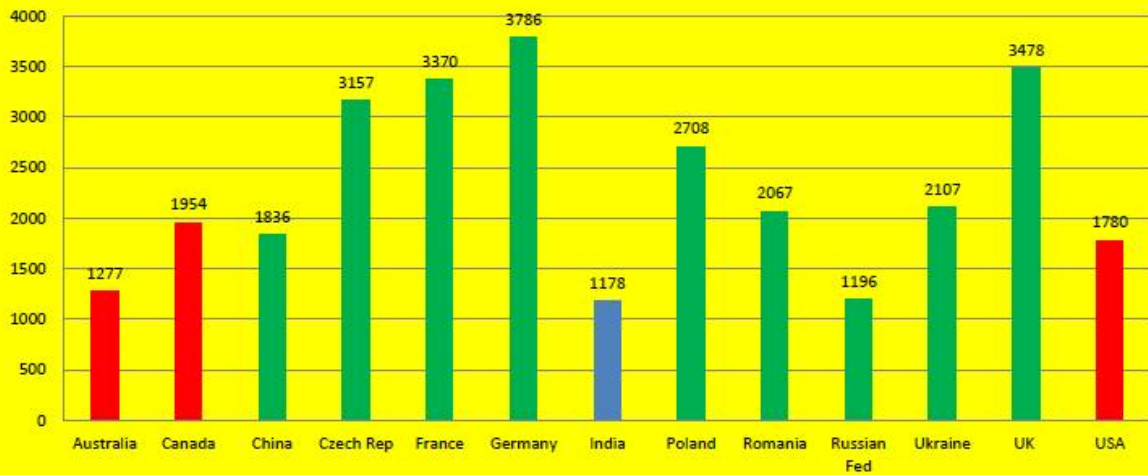
I believe that the resolution of the NAAS in its present form is neither scientifically valid, nor ethical, and therefore not maintainable. So, many of the Fellows knowing these data and scientific facts will reject the Resolution. I suggest that it is immediately withdrawn.

But the NAAS letter to our Prime Minister is an entirely different proposition. How do the Fellows undo the damage? It is deeply disturbing and shocking that Prime Minister Modi is being exhorted to add his weight to the approval of mustard DMH 11 based on false data, which he believes to be the truth.

With kind regards  
Sincerely

P.C. Kesavan

### Top Rapeseed Producing Countries of the World & Average Yields per Hectare (2010-14)



Red Colored countries have opted for GM; Top Yielders are non-GM.  
ISN'T IT COMMON SENSICAL WHAT INDIA SHOULD BE OPTING FOR?

Source: FAO Statistics: <http://fenix.fao.org/faostat/beta/en/#data/QC>