# Outcome of the 1st International Biological Nitrification Inhibition (BNI) Workshop (2nd – 3rd March, 2015; JIRCAS, Tsukuba, Japan)

Suppressing soil nitrification and increasing NUE is critical to reversing the N-fertilizer overuse and minimizing its environmental impact. Global nitrogen (N) fertilizer consumption has increased >10-fold since 1960s, but food grain production has only tripled during this period, resulting in a decrease in nitrogen-use efficiency (NUE). Of the 150 million tons of N-fertilizer currently applied to agricultural systems globally, up to 70% is not recovered by the crop and often results in negative environmental impact through pathways such as nitrate-leaching and nitrous oxide emissions[1]. Nitrate is an important groundwater pollutant and nitrous oxide ($N_2O$) is a powerful greenhouse gas. Annual economic losses from lost N-fertilizer is estimated at 90 US$ billion. If this trend continues, annual N-fertilizer application will double by 2050 and global $N_2O$ emissions from agriculture will reach 19 million tons of N $y^{-1}$ by then[1].

Biological nitrification inhibition (BNI) is the ability of certain plants to suppress nitrifying activity by releasing nitrification inhibitors from root systems. This phenomenon has been observed in tropical grasses (*Brachiaria* spp.), food crops (sorghum) and wheat-wild relatives (*Leymus* spp.). JIRCAS has been working together with three CGIAR Centers (CIAT, CIMMYT and ICRISAT) to advance this research and to develop technological components for BNI, including genetic and agronomic aspects.

The International BNI Workshop held at JIRCAS during March 2-3, 2015 was attended by 40 researchers representing four CGIAR Centers (CIAT, CIMMYT, ICRISAT and ILRI) leading four CGIAR Research Programs [CRPs: Climate Change (CCAFS), Wheat (WHEAT), Dryland-Cereals, Livestock-Fish) and several Japanese organizations (National Agricultural Institutes, and universities).

The major conclusions from the workshop are:

- Reduced nitrification is essential to reduce $N_2O$ emissions and to improve NUE in agricultural systems. As part of a comprehensive approach incorporating genetic and agronomic management solutions, BNI-technology will reduce nitrogen losses, facilitate nitrogen retention and improve soil-health in next-generation

climate-smart production systems.

- Developing and deploying BNI-technology requires collaboration among Japanese institutions, CGIAR centers and institutions from developing countries.
- The four CRPs will include BNI research in their program plans (2017-2026) and seek donor support as part of developing and deploying climate-smart agricultural practices.
- JIRCAS, together with CGIAR partners, formed a Consortium on BNI Research for Sustainable Development, with JIRCAS in a convening and coordinating role.

*Links to JIRCAS, participating CGIAR Centers and CRPs in BNI Research Consortium*

http://www.jircas.affrc.go.jp/index.html
http://livestockfish.cgiar.org/
http://drylandcereals.cgiar.org/
http://wheat.org/
http://maize.org/
http://ccafs.cgiar.org/
http://ciat.cgiar.org/
http://www.cimmyt.org/en/
http://www.icrisat.org/

[1]Schlesinger W. 2009. On the fate of anthropogenic nitrogen. PNAS (USA) 106:203-208.