

If only the weeds would keep their genes to themselves

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Family can be a blessing and a curse, and never more so than in the case of crop plants and their wild relatives. These wild and weedy relatives harbor unique and beneficial genes that may no longer be found in their cultivated siblings, but they also harbor genetic traits that farmers have intentionally selected against in their domesticated brethren. The close genetic relationships between some crop species and their wild relatives allow them to readily hybridize, sharing both the beneficial and problematic genes with each other.

The ecological and economic impacts of gene flow between crops and their weedy relatives are significant. Weedy relatives may acquire beneficial genes from cultivated cousins, potentially increasing their invasive ability. Farmers may find that their crop yields decrease or crops may be more difficult to harvest if they hybridize with a weedy relative. These are only a few consequences of the gene flow that occurs all the time between crops and wild relatives.

A recent article in the October issue of the [American Journal of Botany](#) by Dr. Adeline Barnaud and colleagues explores the role of gene flow between cultivated sorghum and its weedy relatives in a village in northern Cameroon. Sorghum is a staple food crop that is essential to food security in semi-arid regions of Asia and Africa.

Barnaud and her colleagues used a multidisciplinary approach involving biologists and social scientists in addressing questions of gene flow among the species and how farmers' practices affect this gene flow. The

farmers in northern Cameroon distinguish a variety of types of sorghum—ranging from weedy to cultivated with intermediates in between—but whether there is any genetic basis to these types was a question the researchers addressed. "Farmers have quite accurate perceptions about the genetic nature of their sorghum plants, accurately distinguishing not only domesticated landraces from the others, but also among three classes of introgressed individuals, and classing all four along a continuum that corresponds well to genetic patterns," Barnaud said. "Their practices are fairly effective in limiting gene flow."

The researchers found that farmers actively eradicate weedy types from their fields because their presence lowers yields. However, several of the farmers' practices unintentionally favor gene flow. Although farmers actively select against the weedy types, some are maintained to enhance diversity and lower risks of crop failure due to environmental changes, such as with annual rainfall. Also, despite a desire to remove the weedy sorghums, as any farmer or home gardener knows, it is often difficult to identify weeds when the plants are young, and, even if they are properly identified, it may be difficult to fully remove the weeds. As a result, some seeds from the weedy individuals are able to survive in the field and persist year after year.

Dr. Barnaud and her colleagues discovered that when harvesting seed for the following year, farmers in this village may not select seed from the middle of the fields where plants are less likely to have been pollinated by weedy types. In addition, the presence of intermediate weedy types may facilitate gene flow between the weediest type and the cultivated type due to their intermediate flowering time and the farmers' mode of management.

A multidisciplinary approach is truly necessary when addressing this type of question. "Biologists and social scientists need to work together more often, using their complementary methods to answer shared questions

about human-plant interactions," Barnaud said. "Few studies offer really hard, detailed data on how farmers' practices shape patterns in the genetic diversity of their crops. We showed the primary role that [farmers](#) continue to play as drivers of crop evolution, in this case by limiting gene flow from wild to crop.

"Such connections between farmers' knowledge and practices and the dynamics of diversity need to be better understood, and taken into account when management plans are being defined."

More information: <http://www.amjbot.org/cgi/content/full/96/10/1869>

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