

Biosafety in agriculture: is it justified to compare directly with natural habitats ?

The more subtle truths behind LaReesa's statement: "A fundamental, and unresolved, issue for answering these questions is what data most effectively can be used to assess environmental impacts." need investigation. For a deeper understanding, we must delve into the distinctions between natural and agricultural habitats, the first of which is that agriculture is a human invention, with its purpose founded in serving human needs.

- There is a widespread trend, even among learned ecologists, to treat agricultural systems the same way as natural ecosystems when planning, modelling or interpreting ecological field experiments. Although some of the same methods can be applied by comparing natural and agricultural sites, data interpretation must take care of some fundamental differences:
- Dramatically and artificially reduced biodiversity in agricultural sites (Altieri, 1991; Hutton & Giller, 2003; McLaughlin & Mineau, 1995; Pyke & Archer, 1991)
- Crops and many weeds are the result of man ingenuity.: Most agricultural weeds are not "wild species". derived from millennia of selective adaptation. A good example is the widespread weed *Galeopsis tetrahit* see (Ammann et al., 2000a; Müntzing, 1930)
- Soils are often subjected to heavy tilling, significantly affecting soil microbial life Crop rotation is important in controlling levels of pests, but there is no close counterpart to this activity in nature.
- Commonly accepted inputs, such as fertilizers, herbicides, and other pesticides, effect environmental disturbance, which never occur at this level in natural habitats.

For these reasons it is not appropriate to apply the same ecosystem and biodiversity standards for comparison to both cases, although it is always important to compare them with the same scientific methods. Importantly, the risk conclusions are in many cases very different. Whereas a disturbance factor in the case of a natural system as alpine grassland can well affect the species composition over decades (Hegg et al., 1992), while agricultural environments are subjected to regular disturbances causing transient impacts that are measure primarily in terms of yields of output. We have to realize that there is no automatic symmetry in conclusions regarding the same phenomenon for both types of sites. Instead of applying the same interpretation standards, we should also differentiate in risk assessment.

Agricultural systems are highly artificial and certainly show a much higher dynamics through manifold farmer activities such as tilling, sowing monocultures, harvesting, crop rotation, to name the ones having the most dramatic impact on biodiversity.. This is why reports such as the one of Ecostrat, commissioned by Greenpeace (Hilbeck et al., 2000) are factually correct, but written as if standards of natural habitats could be taken as the scale on how safety standards should be applied to the new crops. For instance, the sequence and pace of disturbance and crop regime make the types of long-term assessments requested by Ecostrat near impossible to control experimentally and yield useful information for regulators. This does not mean that academics do not play an important role in examining basic ecological questions and expanding knowledge. It merely means that, in cases like agriculture, it would be imprudent to wait for these types of long-term experiments before launching any new, potentially beneficial technology such as GM. It is also interesting that, in the hindsight it is now clear that the trends have been interpreted correctly. (National-Research-Council, 1989; Sears et al., 2001).

There are more reasons to pay more respect to agricultural dynamics and related long-term experience. There is a plethora of gene flow studies published to date, and it is very likely that more will be coming (Eastham & Sweet, 2002). As a botanist, I am compelled to remind the scientific community of the experience and hybridization data to be found in plant collections such as herbaria (Ammann et al., 2000b). An equally valuable source of practical information comes from the long term experience of seed producers, who have a strong economic interest to keep the seed lines genetically well defined for agricultural purposes. (OECD, 2003).

Finally, the challenge for regulators is to make decisions on real products in real environments within a realistic timeframe. They must include in their evaluation experience from agriculture based on traditional methods and crops. It is important to give thorough consideration to baseline comparisons between the traditional and GM crops and agricultural methods of all kinds. (Babendreier et al., 2003)

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