

Science for Environment Policy

'Alternative agriculture': key to preserving food security and biodiversity?

The goals of providing sufficient quantities of food to support the world's growing population, whilst simultaneously protecting its biodiversity, may seem incompatible. However, a recent review of the literature has highlighted how 'alternative' agricultural practices can offer a realistic solution to the problems of achieving both food security and biodiversity conservation.

Agriculture represents one of the biggest challenges to protecting biodiversity.

Industrialised, high-input, high-yielding practices dominate global agricultural land use, while less than 2% of agricultural land is under 'alternative' agriculture. Industrialised methods concentrate on a narrow range of crops, whilst relying on the use of synthetic fertilisers and pesticides. The 2% of global agricultural land use devoted to alternative agriculture ranges from traditional indigenous practices to processes involving 'sustainable', 'organic' and 'low-input' methods. Previous research has suggested that alternative agriculture can increase biodiversity, with an average of 30% more species and 50% more individuals around farmed areas than in conventional agriculture. Approaches to protecting biodiversity include avoiding soil compaction via low till or no till practices and reducing heavy machinery use, and planting traditional, diverse, locally adapted crop varieties. These actions tend to promote lower incidence of crop pests and pathogens and reduce the need for synthetic inputs, such as pesticides and fertilisers.

Some have argued that the only means to feed a human population of 9-10 billion will be to expand agricultural land use and intensify production, and that only conventional agriculture can produce enough food to feed the world. However, emerging evidence suggests alternative agricultural methods could also provide enough food on a global basis to sustain the world population.

A study examining 293 examples comparing alternative and conventional agriculture concluded that in principle, intensification to increase yields and feed a population of 10 billion people could be achieved with either alternative or conventional methods, without using more land. Small farms in developing nations generally produce higher output levels per unit area than larger farms because of multiple cropping, more efficient use of irrigation, higher labour quality, and lower reliance on agrochemicals. There is also less variation in yields from year-to-year in alternative agriculture because it uses a more diverse range of crops. Total energy output/input ratios from alternative systems may range from 11:1 (corn) to 1:20 (beef), while modern/conventional systems may see ratios from 2.5:1 (corn) to 1:40 (beef).

Integrated plant nutrient systems, which aim to improve soil's fertility while reducing environmental degradation, can provide 10-30% greater efficiency in fertiliser use, whilst no-till/conservation agriculture can avoid the problems of degradation seen in conventional soil tillage, reduce the need for herbicides and raise yields by 20-50%. Plant protection based on integrated pest management can help decrease overdependence on pesticides, improve production and reduce costs.

Evidence from case studies in Cuba and Brazil illustrate how greater *regional* food security can be achieved by adopting alternative agricultural practices. In Cuba, significant land reform has been carried out by breaking large, conventional state farms into cooperatively owned organic operations, creating new organic farms, and fostering urban and peri-urban agriculture. Some farms have up to 180 species under cultivation and integrated polycultures are the norm. The city of Belo Horizonte in Brazil has created a Secretariat of Municipal (food) Supply (SMAB), which encourages alternative agriculture through the support of farmers' markets. The SMAB has overseen a reduction in infant mortality and malnutrition by at least 50% since its inception.



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Contact:
m.jahi.chappell@wsu.edu

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