Agricultural intensification not a 'blueprint' for sustainable development

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New research suggests that the combined social and ecological results of increased agricultural intensification in low and middle-income countries are not as positive as expected.

The study, led by researchers from the University of East Anglia (UEA) and University of Copenhagen, is the first to bring together current knowledge on how agricultural intensification affects both the environment and human wellbeing in these countries.

Sustainable intensification of agriculture is seen by many in science and policy as a flagship strategy for helping to meet global social and ecological commitments—such as ending hunger and protecting biodiversity—as laid out in the UN Sustainable Development Goals (SDGs) and Paris climate agreement.

However, there is limited evidence on the conditions that support positive social and ecological outcomes. In an attempt to address this knowledge gap, the researchers from UEA and Copenhagen, working with colleagues in Scotland, France and Spain, conducted a review of 53 existing studies into the human wellbeing and ecosystem service outcomes of agricultural intensification.

Overall, they find that agricultural intensification—broadly defined as activities intended to increase either the productivity or profitability of a given tract of agricultural land—rarely leads to simultaneous positive results for ecosystem services and human wellbeing.

Publishing their findings in *Nature Sustainability*, the authors argue that intensification cannot be considered as a simple "blueprint" for achieving positive social-ecological outcomes. While there is considerable hope and expectation that agricultural intensification can contribute to sustainable development, they find that only a minority of existing studies present evidence for this and that even these infrequent 'win-win' cases tend to lack evidence of effects on key regulating or supporting ecosystem services, such as moderating river flow or cycling soil nutrients.

Principal investigator for UEA Adrian Martin, professor of environment and development, said: "We have scant evidence to back up the weight of expectation that we currently see attached to agricultural intensification. By contrast, we find that negative outcomes are still common.

"Few of the cases we examined provide evidence that agricultural intensification is contributing simultaneously to SDGs such as ending hunger and achieving sustainable use of terrestrial ecosystems.

"If we are to achieve sustainable intensification of agricultural land, we clearly need new approaches. This must involve putting what we already know into practice but also working to fill some considerable knowledge gaps."

The researchers also found that it is important to look at how intensification is introduced, for example whether it is initiated by farmers or forced upon them. Change is often induced or imposed for more vulnerable population groups who often lack sufficient money or security of land tenure to make these changes work. Smallholders in the cases studied often struggle to move from subsistence to commercial farming and the challenges involved are not currently well reflected in many intensification strategies.

Co-author Dr. Laura Vang Rasmussen, from the University of Copenhagen, said: "Although agricultural intensification is often considered the backbone of food security, the reality is that intensification is often undermining conditions that may be critical for the support of long-term and stable food production, including biodiversity, soil formation and water regulation."

Another important finding is that the distribution of wellbeing impacts is uneven, generally favouring better off individuals at the expense of

poorer ones. For example, a study in Bangladesh showed how rapid uptake of saltwater shrimp production is enabling investors and large landowners to get higher profits while poorer people are left with the environmental consequences that affect their lives and livelihoods long term.

The authors find that the infrequent 'win-win' outcomes occur mostly in situations where intensification involves increased use of inputs such as fertilizers, irrigation, seeds, and labour.

Prof Martin added: "These are important lessons that policymakers and practitioners can respond to in terms of moderating their expectations of agricultural intensification outcomes and striving for improved and alternative practices.

"Future research efforts need to consider how biodiversity and ecosystem services other than food production, particularly regulating and cultural services, as well as wellbeing aspects other than income, can be incorporated into assessments of social-ecological outcomes of agricultural intensification."

More information: Laura Vang Rasmussen et al. Social-ecological outcomes of agricultural intensification, *Nature Sustainability* (2018). DOI: 10.1038/s41893-018-0070-8

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