

Gen Z farmers in Indonesia – is net-zero farming attractive for rural youth?

This article summarises findings from a recent study examining the feasibility and youth perceptions of net-zero farming in Indonesia. The research, conducted by an interdisciplinary team of young professionals* from Benin, Germany, India and Indonesia explores innovative low-emission agricultural practices that offer income opportunities for rural youth. The study provides insights into the technical, economic and social dimensions of transitioning to net-zero farming.

By Silke Stöber and Margitta Minah

Indonesia's backbone is its youth, with more than half of its population of 283.5 million under the age of 35 years. Generation Z, a demographic powerhouse of 80 million young people born between 1997 and 2012, is entering the workforce. As digital natives, they are well informed about global trends. Their influence on the country's culture and economy is strong, as they are highly engaged on platforms such as Instagram, TikTok and YouTube for self-expression and activism. The 2021 Indonesia Youth Survey shows that more than 81 per cent are convinced that "we must protect and preserve the environment, even if it slows economic growth". This is a clear statement, given that their top concern, after corruption, is the health of the planet, namely environmental degradation, pollution and climate change.

This gives rise to the hope that Gen Z will get involved in the food and agriculture sector and help transform it into a sustainable green sector. However, the reality is that in 2023, only 22 per cent of the country's agricultural workforce comprised millennial farmers, and this proportion was declining. Retaining the younger generation in food production and agriculture is a major concern for the Indonesian government as it seeks to reduce rising food imports, including rice and vegetables. But young people face many obstacles to starting a farming business. Farming is not profitable enough, farmland is becoming scarce, and the sector has a bad reputation in society. As a result, rural youth are migrating from farms and villages in search of a better life through office or service jobs in urban dwellings.

To learn more about the feasibility and opportunities for youth in net-zero agriculture, the Centre for Rural Development (SLE) conducted a Joint International Research Project (JIRP) study in Indonesia from June to December 2024. This study is part of the three-year Rural Youth Climate Action Movement in Indonesia (RYCAM) project funded by the International Climate Initiative of the German Ministry for Economic Affairs and Climate



Opportunities for rural youth and young farmers to be part of net zero agriculture were the subject of participatory focus group discussions.

Photo: Rein Syauta/MPM

Action (BMWK). The study contributes to the project's objectives of promoting the attractiveness of a rural lifestyle among the young generation by demonstrating rural income and employment potential, climate and environmental protection, and linking rural and urban areas through markets and social media. The research team engaged with insiders and pioneers of net-zero farming, including young innovative farmers, and discussed solutions to reverse the trend.

Net-zero farming in Indonesia

Agriculture is not only a victim but also a driver of climate change, accounting for 12 per cent of global annual greenhouse gas (GHG) emissions. For Indonesia, ClimateWatch reports direct emissions from agriculture of 154 million metric tonnes of carbon dioxide equivalent (CO₂-eq), representing 10 per cent of the national GHG emissions in 2021. The Gov-

ernment of Indonesia's climate change strategy outlined in the Nationally Determined Contributions (NDC) foresees four entry points to lower emissions in agriculture: improving crop productivity and intensity, integrating farming and agroforestry, optimising unproductive land and reducing food loss and waste. Agriculture in Indonesia can lower the emissions particularly by avoiding emissions from burning or decomposing crop residues, reducing nitrous oxide emissions from soil fertilisers, lowering fossil fuel-based farm mechanisation and energy use, and cutting methane emissions from flooded rice fields.

Net-zero farming solutions in the country include reducing emissions and enhancing carbon sequestration. The key practices here are avoiding rice straw burning after harvest, using renewable energy like solar and wind for water pumps and other devices, and adopting climate-friendly soil fertility strategies such as composting or replacing synthetic nitrogen



A young farmer showing his first melon harvest. Rice and melon rotation is a new practice introduced by the Indonesian farmers' organisation Jamtani for its positive impact on agro-ecological pest and disease management and soil improvement.

Photo: JAMTANI



The very first solar panel in the district of Toraja, which is used to power an irrigation pump for an organic net zero vegetable garden.

Photo: Silke Stöber

fertilisers. Alternate wetting and drying reduces methane emissions in rice farming. On the path to net-zero, agroforestry and tree planting play a vital role. In tropical mixed agroforestry systems, a single tree can absorb 25 to 40 kg CO₂ equivalent per tree annually.

The focus of the study was to develop metrics for greenhouse gas emissions from agricultural activities through case studies. The team investigated net-zero potentials in rice, chilli, melon and shallot production in two project regions of Indonesia, namely in Pangandaran (West Java) and Toraja (South Sulawesi). The emission calculations were fully aligned with the International Panel on Climate Change (IPCC) guidelines and referenced to the Cool Farm Tool (CFT) 2.0 of the Cool Farm Alliance and the FAO's Ex-Ante Carbon-balance Tool for value chains (EX-ACT VC). Through detailed

and long in-depth interviews with farmers, the research team analysed the entire rice production system in the two project regions, including input supply, soil preparation, irrigation, soil fertility management, machinery use and post-harvest residue management. The Figures highlight the case study findings. They show that Toraja, which is lacking alternate wetting and drying practices in rice, combined with hilly terrain requiring more machinery, has higher greenhouse gas emissions per kilogram of rice compared to the Pangandaran region. Overall, organic farming methods exhibited lower emissions than conventional practices, underscoring their environmental benefits.

The vegetable case studies (see lower Figure) reveal that organic practices generally emit fewer greenhouse gases than conventional methods. However, one notable exception is

the conventional chili farms in Toraja, where yields are nearly five times higher than those of organic chili farms. This significantly lowers greenhouse gas emissions per kilogram of product, demonstrating that sustainable intensification can also occur in conventional farming when the input-output ratio is optimised.

Perceptions of net-zero farming

Perceptions of net-zero farming were gathered from rural youth, agricultural students, and both organic and conventional farmers. Co-research methods to actively engage participants were used to explore and design effective net-zero practices. In a design-thinking exercise, young people envisioned their future farm, and with selected farmers, the "business model canvas" was tested to develop their

The project and its partners

The Rural Youth Climate Action Movement in Indonesia (RYCAM) addresses the urgent challenges faced in the country to reorganise the agricultural sector in such a way that it is both climate-friendly and offers young farmers an opportunity to earn a living. The project is active in four work packages. Work package one comprises a school competition on sustainable food production and climate-friendly agriculture on five islands (Bali, Sulawesi, Java, Kalimantan and Sumatra). Work package two investigates the feasibility of net-zero farming, and takes a closer look at the contribution mar-

gins of rice and vegetable production under organic and conventional agriculture. Work package three organises climate field schools with young farmers in Java and Sulawesi and enables young farmers to take part in a competition on net-zero farming. Twenty-four groups of young farmers will be selected, who will then be supported for a year and can implement their projects. Rycam is to end with a youth camp and a resolution for net-zero farming.

The Indonesian farmer association Jaringan Masyarakat Tani Indonesia (JAMTANI) and the Yayasan Motivator Pembangunan Masyarakat (MPM), a community development

training centre of the Church of Toraja, are the main implementing partners. Both NGOs successfully promote agroecological practices, climate change adaptation and disaster risk reduction among smallholder farmers in Indonesia, and are cofounders of the NGO network of the Indonesian Climate Change Alliance.

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net-zero business models. These individual plans were presented, defended and discussed with peers. Here, the following driving forces and hindering factors were revealed:

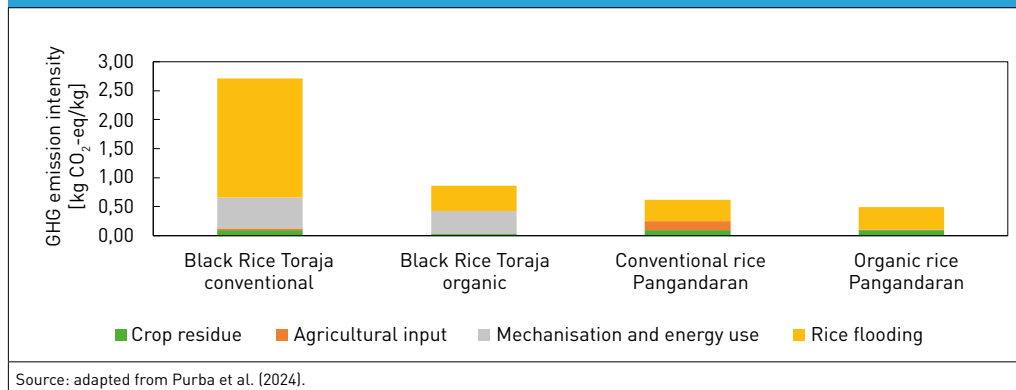
- The term “net-zero” was unfamiliar to most participants, who primarily associated net-zero with organic agriculture. Farmers viewed reducing chemical inputs as a key strategy for lowering agricultural emissions.
- One major motivation to pursue organic farming is its health benefit, along with a better taste and better quality of vegetables (e.g. longer shelf life). While the majority of farmers in the region farm conventionally, conventional farmers admitted that they were using organic strategies in their home gardens for their own consumption.
- Given the high costs for chemical inputs, farmers appreciate the cost reduction by using their own organic materials for compost and biopesticides.
- There is generally a strong intrinsic motivation to make a positive impact on the environment among farmers and rural youth. This is in line with the findings of the youth survey.
- The downside is the high labour requirement for compost production and other organic soil strategies. Marketing, price and market information and connecting to consumers who are willing to pay premium prices remains a further challenge.

For rural youth in particular, the lack of social recognition of farming and the role of parents in discouraging children from taking up farming are major barriers to becoming farmers. In contrast, young pioneer farmers reported that they wanted to serve as role models for other young people and demonstrate the viability of farming as a business. They are highly motivated to promote their regions and produce local food, and there are also benefits in having control over one’s livelihood and a self-managed occupation. However, many of the young agro-pioneers would like to work in a stronger group or network of young farmers in order to receive support from their peers.

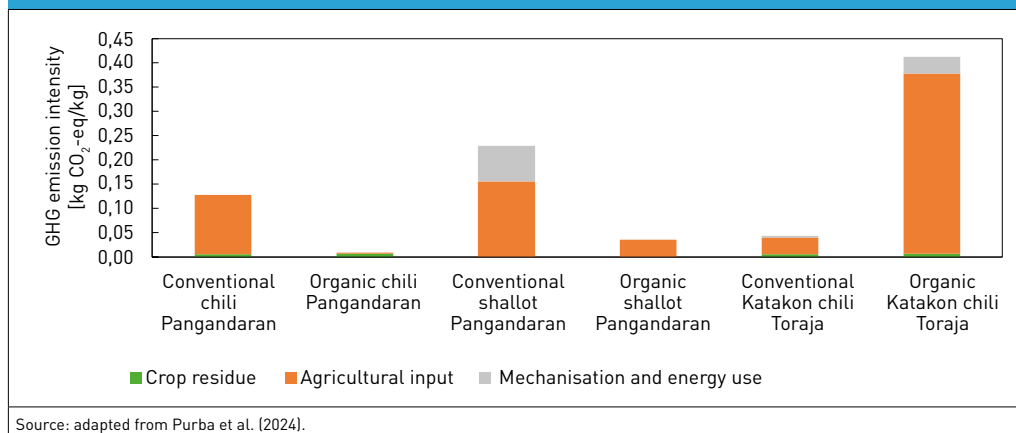
How profitable is net zero farming?

“To make farming profitable, you really need a lot of knowledge,” said one farmer, and this is particularly true in the case of organic farming. The research team spent a long time calculating the costs and income streams of the case study farmers. As farmers do not tend to keep records, data on yields, costs and input quantities were based on the farmers’ memories. All the case

Greenhouse gas emission intensity for rice



Greenhouse gas emission intensity for vegetables



studies show that both organic rice and organic vegetable production are profitable. However, organic farming in these areas is not always more profitable than conventional farming. Some organic farms are still very small and have not yet taken the step to scale up to a profitable business. They fear that the willingness to pay the premium prices for organic produce is not strong enough. This fear is confirmed by Indonesian consumer statistics, which show that 39 per cent of consumers are willing to pay a 25 per cent premium for organic products, but almost the same percentage (36 %) are willing to pay exactly the same price for organic and conventional products, leaving organic producers with high market uncertainties. A premium price for net-zero organic or for agroforestry practices could be also promoted by the government in order to bring the NDC to life.

Outlook

The project will expand its work on greenhouse gas emissions calculations and simulate policy options to compensate for the net-zero output of organic farmers. To generate more evidence based on farm records, the project partners Jamtani and MPM (see Box) are

to implement a Young Farmer Challenge in 2025. Through this challenge, young farmers or agro-entrepreneurs will be trained in a Climate Business Field School programme. In addition, young farmers are to be invited to submit project proposals for net-zero agriculture and will receive prize money to implement their net-zero agriculture projects. Their business plans and activities are to be promoted through social media.

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