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Mapping UNSW Impact
Global Development

Primary SDG	**12: RESPONISBLE PRODUCTION AND CONSUMPTION**
Broad theme	Preserving fruit and vegetables in Indonesia
Research	Using Chitosan to naturally preserve farming produce for longer, delivering better quality produce and empowering farmers
Impact area	Indonesia
Faculty	Science
School/Institute	Chemistry
Academics	Dr Alexander Soeriyadi, Dr Edgar Wong
Project partners	Universitas Gadjah Mada
	UNSW-Indonesia Seed Fund of $10,000; runs out December 2017
	Salim Agro Indonesia
Related SDGs	1: No poverty
	3: Good health and wellbeing

Elevator pitch

UNSW research has found a way for farmers to better preserve their produce using chitosan, a 100% biodegradable solution made from crustacean waste, enabling the farmer to deliver higher quality produce to the supply chain and increase their income.

The Challenge: How to create better quality produce in Indonesia and help smallholder farmers

Indonesia is made up of over 18,000 islands with fragmented infrastructure, making it difficult to efficiently transport fresh produce to consumers. Many smallholder farmers are poor and cannot afford to buy and run chilling (refrigeration) equipment, with crops ageing before they enter the supply chain. A complex and protracted supply chain adds to the loss of around 28% of fruit and vegetables produced. To mitigate this loss, farmers rely on preservatives such as chlorine and formaldehyde, but both are poisonous.

Chitosan is a biodegradable alternative made up of entirely of crustacean waste. Around 60,000 tonnes of crustacean waste are generated annually Indonesia. Waste shells are typically dumped in landfill or the sea. Shells are cheap (around $150 per tonne) and they contain 20–40% protein, 20–50% calcium carbonate and 15–40% chitin. The chitin, the second most abundant natural biopolymer on earth after cellulose, can be transformed into chitosan.

UNSW's solution: Get farmers to use Chitosan to better preserve food and increase their income

At a UNSW roadshow in Indonesia, Alex spoke with researchers from Universitas Gadjah Mada (UGM) and together they realised Chitosan could be a solution to preserve food at the farmer's end of the food supply chain.

In laboratory tests, the team turned Chitosan powder into a solution that can be applied onto produce, conserving it in a film-like substance. Tests show the solution extends the life of fish to 12 days, compared to around 6 days using artificial preservatives and 0.6 days for fish without preservatives. With better preserved fruit and vegetables, farmers can demand higher prices from the supply chain.

Having proven the viability of the solution in the lab, Alex and his team will perform a controlled test at UGM's experimental farm site between January-August 2018. If that is successful, they will then undertake field trials with chilli and tomato farmers in Central Java, and fish farmers in Gunung Kidul, Yogyakarta between September 2018 and August 2019. Workshops will be provided for farmers by UGM and Salim Agro.

The Impact: Empowering poor farmers in a complex food supply chain

A chitosan spray could significantly impact Indonesia's food supply chain. Farmers could use it to increase the quality of produce they inject into the supply chain. This would empower the farmer to demand more for the better quality produce it is delivering. But how much more? Increasing farmer income is a key motivation of the project and the reason for partnering with Salim Agro. Alex and his team expect to learn more in planned field trials with farmers.

Their solution is also an effective use of crustacean waste. If successful, their chitosan solution will create a new industry for shellfish waste collection and transportation, increasing the income of crustacean farmers and providing work and income for small operators involved in the supply chain.

If the trials go according to plan, the team will approach Salim Agrochemical, where Alex's father works. Salim Agro is a leading agrochemical company in Indonesia and has access to vast distribution networks. Alex and his team could quickly gain access to this network, particularly farmers, to start selling and distributing their chitosan spray.

Researcher

Alex Soeriyadi is an early career scientist who has received an ARC PhD scholarship, a NHMRC Early Career Fellowship and a Humboldt Fellowship. He was born and grew up in Indonesia before leaving for Australia at the age of 17. He always wondered why fruit and vegetables in Australia are superior in quality to Indonesia's. Alex is convinced he has found a way for his country to enjoy better quality produce that also increases the income of disadvantaged farmers.

Ben Falkenmire 18.09.17