

'Systems thinking' can be used to solve complex food contamination problems

Systems thinking" can help deliver a framework to simulate solutions to pressing food concerns, like the presence of aflatoxins in groundnuts in Africa.



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So said Dr Willeke de Bruin, a postdoctoral fellow at the Centre of Excellence in Food Security and Agricultural Transformation in Africa programme, University of Pretoria. "Why is it that in this day and age, we still have websites reporting on food contamination outbreaks? Why do we even need to hold conferences relating to food safety matters?"

This was the question posed by De Bruin during the 2nd International Conference for Food Safety and Security recently held in Pretoria.

The challenge, she suggested, is that some problems are stubbornly resistant to change. "Yet, if we want to provide people with enough food that is safe to consume, we need to find solutions to these sometimes old-age problems."

De Bruin's specific area of interest is the contamination of groundnuts with aflatoxins. Groundnut is a staple food and means of income in many African countries. Aflatoxin is a dangerous compound that can cause acute poisoning, often leading to death within a week to those who consume contaminated peanuts. Chronic exposure to lower dosages can also ultimately lead to liver cancer and stunted growth in children and animals.

Different countries have set different limits for aflatoxins in groundnuts, varying from four parts per billion to twenty parts per billion. The strictest limits are in place for imports into the European Union.

"However, peanuts in Malawi, for instance, can contain 7, 700 parts per billion. To get an understanding of how this is possible, it is necessary to stand back for a moment and look at general smallholder production practices in countries such as Malawi and Tanzania," said De Bruin.

She pointed out that there are many factors that can influence aflatoxin contamination, from the soil to watering, to harvesting and threshing, sorting, storing, transporting, trading and processing into peanut butter.

“ Regulations are often not effective if they are set by developed countries that do not comprehend the challenges that these countries face. The groundnut value chain is a nexus of global challenges, and you cannot solve this problem by looking at it from one perspective, such as by enforcing standards and regulations. ”

Instead, de Bruin proposes a different approach to predict and find ways to change the internal behaviour of such a system. This approach, termed "systems thinking" allows researchers to dissect complex food environments into several pieces. Systems thinking and modelling using system dynamic diagrams can illustrate the series of interconnected components, indicating how the value chain is influenced by all internal and external factors.

Changing internal behaviour

"In the system dynamics diagram of the groundnut value chain, it shows that there is a myriad of elements within the chain that are all interconnected and all influence each other. You will find that often, the least obvious component or factor, such as in this context access to extension services, is a major driver that influences the whole chain. You would not have been able to see this if you had not used a systems approach," said De Bruin.

She adds that the behaviour that this system generates through simulation modelling can be used to find the optimal intervention points to address the problems.

"Many challenges faced today are extremely complex, and cannot be looked at from one perspective only, but they can and should be approached by looking at the system within. When we look at the system within and have the courage to do so, we can restructure the system. By using systems thinking, we can solve complex problems."

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