Multiple benefits of molasses nutrient blocks for cattle

Helping the fight against climate change

In Southeast Asia, with its burgeoning economies, smallholder livestock production is in a promising transition stage, yet overall remains inefficient. Dr Peter Windsor, Professor Emeritus at the Sydney School of Veterinary Science at the University of Sydney, Australia, and a team of researchers in Laos, have adapted the humble feed block into an effective multi-intervention livestock development strategy that could also play a crucial role in climate change management.

According to the McKinsey Global Institute, the population growth rate in South-East Asia, in every age group, is higher than the global average. Two-thirds of consumption growth to 2030 will come from increased per capita spending; the remaining one-third will be from population growth. This is placing severe pressure on the region's farmers to boost food production, especially in sectors such as beef and dairy, where there has been increased demand thanks to the region's burgeoning economies. Smallholder cattle farmers, however, are battling several constraints in meeting this demand – the inability to boost yields in the face of ongoing risks of transboundary diseases and endemic parasites, and increasing global concern around bovine greenhouse gas emissions.

Dr Peter Windsor is a Professor Emeritus at the Sydney School of Veterinary Science at the University of Sydney with a particular interest in the health and welfare of production animals in Southeast Asia. He runs the consultancy Production Animal Welfare and Health Services, which conducts livestock development projects on biosecurity, foot-and-mouth disease, and veterinary education for improved global food and fibre security. Southeast Asia is a prime area for such research. It has relatively buoyant urban-based economies, creating increasing demand for animal-sourced foods, including from regional smallholder livestock production that is in a promising transition stage yet remains inefficient.

Windsor is a passionate proponent of a web of solutions to help the region's livestock farmers improve production systems and to become more efficient, market-orientated and better regulated. He knows that although smallholder livestock farmers in the region face similar diseases and parasites as livestock farmers in many developed countries worldwide, including foot-and-mouth disease, their farming methods differ markedly from those in developed countries such as the UK and require different solutions. For example, the efficacious use of well-established oral treatments for parasitic worms is challenging in countries where smallholder farmers have limited resources and no animal handling equipment, yet believe in the benefits of free grazing. Windsor and his team have come up with a simple and, it seems, tasty solution: a special kind of feed block.

Newly constructed molasses block factory, near Luang Prabang, Laos.

It would be tempting to wholly embrace such an easily manageable solution, but boosting cattle production comes with consequences.

THE MOLASSES FEED BLOCK

The use of feed blocks as a supplement to livestock grazing was first recorded in the 1930s. Simple to store, transport and use, feed blocks proved effective for a slow, sustained release of nutrients where grazing wasn't sufficient. Early feed blocks contained various salts and urea, a nitrogen-based additive that optimises ruminant digestion, thereby helping promote daily weight gain and milk production. Later blocks used molasses, which cattle find particularly tasty. Recent improvements in agricultural technology have enabled marked improvements in the feed block manufacturing process, particularly in tropical environments. Now, providing access for cattle and buffalo farmers in developing countries to these high-quality blocks could hold the key to providing community benefits from more efficient and sustainable meat and dairy production and creates opportunities to reduce global greenhouse gas emissions.

In Laos, the team studied the effectiveness of molasses nutrient blocks.

Working with smallholder cattle and buffalo farmers in Laos, Windsor and his collaborators have studied the effectiveness of molasses nutrient blocks (MNBs) for providing both essential nutrients and delivering parasitic treatments to control pathogenic worms. These parasites are ubiquitous to most ruminant farming systems and can kill livestock or hinder their weight gain, compromising production efficiency. They can usually be controlled through strict regimes of oral treatment. In Southeast Asia, however, parasite control is frequently poorly managed and inefficient, particularly the parasitic worms *Toxocara vitulorum* in young calves and *Fasciola gigantica* in growing and older cattle and buffalo.

From 2017 to 2020, Windsor and his collaborators conducted a series of trials over 12-week periods using 20kg molasses nutrient blocks. These were either standard nutrient blocks, formulated with urea, or medicated with the anthelmintics fenbendazole to control *T. vitulorum* or triclabendazole to treat *F. gigantica*. Compared to baseline data from various longitudinal studies and results from farms using control blocks and no supplementation, MNBs encouraged significant daily weight gains and milk production. The average daily weight gain was highest in young calves, probably from enhanced lactation yields in their mothers. Furthermore, cattle using the anthelmintic-medicated MNBs showed a marked reduction in parasitic infestation, again, especially among calves. Notably, the MNBs were very popular with the smallholder cattle and buffalo farmers, who readily saw improved body condition and behaviour in the treated animals, and that MNBs were simple to use and a welcome source of nutrition, especially during dry months when forage yields were low.

USING EMISSION-CONTROL BLOCKS

The global livestock sector is increasingly recognised as a significant contributor to climate change through greenhouse gas emissions (GHGe), mainly methane (CH_4) and nitrous oxide (NO_2). In smallholder ruminant livestock systems, more than 80% of GHGe is CH_4. It's estimated that livestock

Encouraging the livestock sector to implement practices that reduce greenhouse gases while improving productivity is important and includes use of molasses blocks and feeding forages. Here Lao farmers are observed by Mr Charles Olsson of Four Seasons Co.

Windsor and his team have shown just how effective feed blocks can be as a multi-intervention livestock development strategy.

release the equivalent of 7.1 gigatonnes of CO_2 every year. However, the Paris Agreement clearly states that addressing climate change cannot be at the expense of food production and security. Therefore, the livestock sector is facing increasing pressure to implement farm-management practices that reduce GHGe without reducing livestock production, especially in developing countries where ready access to animal-sourced foods has been challenging.

Strategies to reduce emissions exist but most of them, including the use of chemical inhibitors, dietary lipids, and selective breeding programmes, are being tested for use in large-scale livestock farming in developed countries. Smallholder farmers in places like Laos need another approach and, once again, promise resides in the humble but upgraded molasses nutrient block.

Working with 60 smallholder farmers and two agricultural training institutions and using specially formulated emissions control blocks (EMBs) containing a mix of molasses, urea, canola meal, salt and various

A buffalo eating a molasses nutrient block, Laos.

macronutrients and micro minerals, Windsor and his team managed to achieve a net reduction of the equivalent of almost half a tonne of CO_2-equivalent per 20kg EMB. That's a notable 'return'. Standard MNBs also proved effective at reducing GHGe. Over a 220-day feeding period, the MNBs demonstrated a conservative net reduction of the equivalent of 350kg of CO_2-equivalent. Windsor acknowledges that, while such reductions in GHGe may be considered 'moderate', MNBs when upgraded to EMBs, are a remarkable example of the combination of proven health and nutritional benefits at a relatively minimal cost that are of benefit to the environmental sustainability of food production.

A MULTI-INTERVENTION LIVESTOCK DEVELOPMENT STRATEGY

Windsor and his team have shown just how effective feed blocks can be as a multi-intervention livestock development strategy. Not only can they provide supplementary nutrition for free-grazing livestock on smallholder farms at the mercy of increasingly severe seasonal shifts due to impacts of climate change, and deliver critical anti-parasitic medication, but they are also helpful as a methane-abatement measure.

Importantly, this research has ramifications well beyond Laos. Almost two-thirds of the world's cattle are in developing or low-income, food-deficit countries. Because of inadequate livestock development systems providing low feed quality in such countries, these animals contribute to a higher methane intensity level than those on high-quality feed and consistent nutrition in high-tech feedlots and dairy operations in developed countries. Significantly reducing livestock GHGe per unit of meat or milk produced will therefore require interventions that help farmers in developing countries. Such interventions must be cost-effective and straightforward to use, requiring minimal extra management, and they should respect the methods and cultures of smallholder farmers.

The simple molasses nutrition block ticks all these boxes. As Windsor and his team have shown, it can not only boost livestock production in developing countries, but the improved performance increases farmer interest in accessing disease-prevention strategies such as vaccination for infectious diseases, and their awareness of the importance of improved biosecurity. These initiatives don't just contribute to poverty reduction – they may also play a crucial role in addressing climate change management.

Behind the Research

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Research Objectives

Peter Windsor and colleagues are researching the challenges of increasing productivity and disease control for smallholder farmers in Southeast Asia and beyond.

Detail

Bio

Peter Windsor is Professor Emeritus at The University of Sydney. He runs the consultancy Production Animal Welfare and Health Services, conducting livestock development projects, mainly in Southeast Asia, working on biosecurity, foot-and-mouth disease, one health, ecosystem sustainability, and veterinary education for improved global food and fibre security.

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Collaborators

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Competing interests

The author declares no conflict of interest, although advises that ongoing technical advice is provided to Four Seasons Pty Ltd, AgCoTech Global and the research project funding agency (DFAT) that has supported the published research studies. These agencies do not provide direct funding to the author and have had no role in the design of the studies, in the collection, analysis and interpretation of data, or in the writing of and decision to publish the work.

References

Windsor, PA, Hill, J, (2022) Provision of high-quality molasses blocks to improve productivity and address greenhouse gas emissions from smallholder cattle and buffalo: Studies from Lao PDR. *Animals*, 12, 3319. doi.org/10.3390/ani12233319

Personal Response

What are your next steps in developing your research and getting molasses nutrient blocks into widespread use?

" The research has been a successful example of a public–private partnership that contributes to Sustainable Development Goals (SDGs). A new company, AgCoTech, has been created and an MNB/EMB factory built in Laos, for both manufacture and distribution of the blocks to smallholder farming communities. The AgCoTech's Block™ improves cattle welfare and productivity and reduces methane intensity and emissions. This generates AgCoTech-verified carbon/SDG offsets, and the environmental and social goals of various companies can be met by purchasing AgCoTech's verified carbon/SDG offsets. The income generated by the offsets allows the Block™ to be delivered for free to farmers in need in Laos and potentially across the world, generating huge social and environmental impact benefits. "