

# research evidence for policy



Using composted human excreta to fertilize a rice field.  
Photo: Nguyen Viet Hung

## The Vietnamese double-vault composting latrine: Fertilizer source or health risk?



Case studies featured here were conducted in: Vietnam

### Policy message

- Double-vault composting latrines are widely used in Vietnam. They are a valuable source of fertilizer, but they also pose a health risk. Faeces must be adequately composted to kill pathogens before they can be used safely as compost.
- Not all farmers are aware of the risks of using insufficiently composted waste. Health messages should emphasize the value of compost made from human waste, and the need to manage it properly to avoid health risks.
- Health messages for farmers, traders, and consumers should stress the importance of making safe compost, the use of protective clothing, hand-washing after handling waste, and the need to wash and cook food thoroughly.

- Human excreta are rich in plant nutrients, so many farmers in Vietnam use them to fertilize their crops and in raising fish. But they also contain dangerous pathogens: bacteria, viruses, protozoa, and the eggs of intestinal parasites. Exposure can pose a health risk to farmers, their families, as well as consumers.
- Urine is generally free of pathogens, so can be diluted and used as fertilizer directly. But the faeces have to be composted to kill the pathogens. Around one-fifth of households in Vietnam use a double-vault latrine that collects the faeces and allows them to decompose before spreading the resulting compost on their gardens and fields.
- What are the benefits and risks of doing this? This issue of *evidence for policy* draws on research in Nghe An, Ha Nam, and Nam Dinh in northern Vietnam to answer this question.

### The Vietnamese double-vault latrine

- The double-vault composting latrine has two holes for defecation, with a 0.3 m<sup>3</sup> vault under each. After using the latrine, the person sprinkles some ash on top of the faeces, then closes the hole with a lid. When the first vault is full, the hole is sealed and the faeces are allowed to compost for several months. The vault is then emptied and the contents, now dry and odour-free, are used as a phosphorus-rich fertilizer. Meanwhile, the second vault is used for defecation.
- The latrine design separates the urine (which is rich in nitrogen) from the faeces. The urine flows into a bucket, which can be removed every now and then, and the contents diluted for use as fertilizer.

This type of latrine has been popular among Vietnamese farmers since the 1950s because it converts smelly, unhealthy waste into valuable fertilizer. In 2005, the Ministry of Health's Decision 08/2005/QD-BYT on "Hygienic Standards for Latrines" listed it as one of four approved types of latrines for household use (the others were the ventilated improved pit latrine, pour flush-water sealed latrine, and septic tanks). About one-fifth of all households in Vietnam, or around 20 million people, use such a latrine. Most use the latrine contents as fertilizer on their fields.

### Economic benefits

For a family, the economic benefits of using human excreta as fertilizer are obvious. An average family of five people produces about 500 kg of

## Featured case studies

### How are latrines used?

A study in Ha Nam and Nam Dinh provinces, both in the Red River Delta of northern Vietnam, found that 97% of households who owned a double-vault composting latrine used it regularly and kept it in a good condition. An overwhelming majority (91%) said they were happy with the latrine. More than 90% used the excreta as fertilizer; 94% composted the excreta before use. The majority (63%) said they immediately applied the waste as fertilizer after emptying the vault. The rest allowed it to compost further before using it. Most (61%) said they applied the urine on leafy crops and trees near the latrine.

### How long must the waste be composted?

According to the Ministry of Health, at least six months' composting is needed to destroy pathogens. But many farmers, especially those in areas with three cropping seasons a year, use the compost before this because they need to fertilize their fields ready for the next crop. A study in Nghe An province found that 74% of the farmers apply compost every four months. Research in Nghe An found that composting for three to four months under conditions of high pH and temperature and low moisture resulted in a safe compost ready for application in the fields. Some 63% of the households regularly added lime to the composting waste, so optimizing lime use would require a minimal change in behaviour.

### How to reduce health risks?

Research in two communities in Ha Nam province found that diarrhoea and infections with protozoans and helminths (intestinal worms) are common in communities where people use human excreta for crop and fish production. However, adequate treatment of the excreta before using it as fertilizer cut diarrhoea episodes by more than half. Risks can also be reduced by using protective measures when composting and during fieldwork.

compost a year, with a phosphorus content of 0.7%, or about 3.5 kg of phosphorus in all. That is equivalent to 17.5 kg of chemical fertilizer containing 20% phosphorus. For the poorest 20% of farmers, this free fertilizer is equivalent to 15% of their annual income.

If we multiply the value of fertilizer by the number of households that use a double-vault latrine, we find that Vietnam saves around \$83 million a year from not having to buy imported phosphorus fertilizer.

### Ecological benefits

Vietnam is one of the world's heaviest users of artificial fertilizer (40 kg/ha), using more than twice as much per hectare as Switzerland (19 kg/ha). The country's farmers apply about 2.4 million tons a year. But around half of this is wasted: a lot of the nitrogen is released into the atmosphere or is leached into the groundwater (and can contaminate drinking water); much of the phosphorus is not available to crops.

Urine and compost made from faeces do not suffer from these problems. Urine can be diluted for use as a fertilizer (applying it undiluted can "burn" the crops). Using compost results in less nutrient loss and environmental pollution. The compost releases nutrients slowly, in a form that plants can use. Unlike artificial fertilizers, compost increases the organic matter content of the soil, improving the soil structure and promoting soil life.

Many people compare organic fertilizer with traditional Vietnamese medicine, which improves people's general health and cures minor diseases. They liken chemical fertilizer to Western medicine, which has a rapid effect on serious diseases but does not strengthen the body.

### Health benefits and risks

The health benefits of these latrines are clear: when used properly, they greatly reduce the risk of transmitting a whole range of diseases. But that does not mean they are risk-free. Human excreta contain many pathogens such as virus, bacteria, and eggs of parasites. Some people use partly composted or even fresh faeces as fertilizer. If the faeces are not composted adequately, these pathogens can survive and be spread on the soil, water and plants, where they may persist for many months.

If the latrines are not cleaned and the vaults are not closed tightly, flies can spread pathogens, and the latrines can become unsanitary (meaning people are unlikely to use them). People can become exposed to pathogens in various ways: directly after using the latrine, when handling and transporting faeces, when applying inadequately composted waste on the field, when working on fields that have been so fertilized, and when harvesting or consuming the fertilized crop. Both farmers and consumers are at risk, but do not seem to be aware of the risks of using human ex-



Compost product from a double-vault composting latrine ready to use.  
Photo: Nguyen Viet Hung



creta in food production. Farmers fail to recognize the health risks to themselves and to consumers, and they do not know how to reduce such risks. Consumers, traders, and other actors in the value chain also have limited information about the health risks and how to prevent them. The health authorities, on the other hand, try to promote hygiene but do not necessarily take the economic benefits of using human excreta into account.

### Minimizing health risks

Various approaches can reduce these risks:

#### Reducing exposure to excreta.

Ways to reduce direct and indirect contact with fresh and decomposing excreta include washing hands after defecation and handling excreta, using protective measures and equipment during handling and spreading fertilizer, and reducing the number of flies in the latrine (for example, by frequent cleaning and by making sure that the lids of the holes fit tightly).

**Ensuring the faeces are thoroughly composted.** Proper composting kills pathogens, making the compost safe to use as fertilizer. The latrine must be adequately constructed, maintained, and used to allow the material to compost over a sufficient period of time to kill the harmful microorganisms. The Ministry of Health recommends composting for six months, though research shows that shorter periods may also be effective (see Featured case studies). For thorough composting to occur, the faeces must be dry enough (which means preventing urine from getting in the vault, and using only a little washing water). Adding ash or lime reduces the moisture levels (and therefore the smell), and creates alkaline conditions. That kills helminth eggs and reduces the amount of time needed for composting.

**Avoiding infection.** People assume that if the excreta are dry and odour-free, they are safe to handle (which is not necessarily true). Few farmers wear gloves, boots, and face masks when working with human excreta: they say such items are uncomfortable and hinder their work. They know that working with excreta can lead to diarrhoea, but they get little advice on how to avoid such risks. Campaigns

should promote convenient, cheap, protective measures, along with hand washing to prevent infection.

**Awareness and regulation.** Producers, traders and the authorities should be aware of the dangers of contamination of vegetables and fish. Consumers should be made more aware of

the importance of safe food and ways to disinfect food through washing and cooking. Product quality should be monitored and product certification schemes should be implemented. Products should be sampled regularly and tested in the laboratory. Unsafe products must be publicized in the media.

### Featured case studies (continued)

#### How to reduce health risks?

Research in two communities in Ha Nam province found that diarrhoea and infections with protozoans and helminths (intestinal worms) are common in communities where people use human excreta for crop and fish production. However, adequate treatment of the excreta before using it as fertilizer cut diarrhoea episodes by more than half. Risks can also be reduced by using protective measures when composting and during fieldwork.

### Definitions

#### Pathogens in human excreta

These include bacteria (*E. coli* and *V. cholerae*), viruses (*hepatitis A*, *rotavirus*), helminths (roundworm, hookworm), and protozoa (*Cyclospora*, *Cryptosporidium*, *Entamoeba histolytica* and *Giardia*). They can be eliminated by composting that is long and hot enough.



A Vietnamese double-vault composting latrine. Photo: Nguyen Viet Hung



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### Policy implications of NCCR North-South research

- Human excreta are a valuable source of crop nutrients, but they must be handled properly to eliminate the serious risk of spreading diseases. Faeces must be composted properly before they are used as organic fertilizer.
- Guidelines for using latrines and applying compost should be revised. With suitable conditions and the addition of lime to kill helminth eggs, faeces can safely be used after four months of composting.
- Information activities are needed to change farmers' unsafe behaviours (such as not using protective clothing) and to promote hygiene practices by both farmers and consumers (such as washing hands and cooking food well).
- The hygiene message needs to be promoted differently. Health authorities should come up with messages that balance the farmers' need for inexpensive fertilizer with the public health requirement for safe products and working environment. Double-vault latrines should be promoted as an affordable way to convert waste into safe fertilizer.
- More research is needed to assess the risks of latrines and compost use for particular groups such as farmers, consumers, and children. Such research would enable interventions to be focused better.

### Further reading

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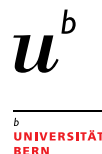
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