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## **Livestock manure management and use by smallholder farmers An assessment in Battambang province in Cambodia**

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### **Abstract**

In Cambodia, soil depletion presents a serious threat for the agricultural production. Livestock manure can contribute with its organic content to a better soil fertility. However, not much is known about the manure management practices in Cambodia. Therefore the aim of the study is to generate basic knowledge about the farmers practices regarding farmyard manure management, including collection, storage and processing practices and the final use of the manure. Focus is laid on the management of cattle and chicken manure. In addition, some information was collected regarding pig manure. To gather data, a survey involving 68 semi-structured household interviews and seven key informant interviews were conducted. The target households and key informants were selected in six different villages in two communes in the district of Rottanak Mondol in Battambang province, located in the north-western part of Cambodia. To select the interviewed households, a non-random purposive multistage sampling was applied. The study was imbedded in a project about conservation agriculture, which is implemented by the Swiss NGO Swisscontact in cooperation with the National University of Battambang (NUBB). The main results show that the majority of the respondents collects the cattle and chicken manure and stores it on simple heaps. The manure is stored on natural floor and not protected from weathering. Generally, the manure is not processed, only a small number of farmers did burn the manure and very few sold the manure to traders or cash crop producers. Around 70 % of the interviewed households apply the cattle manure on their own crops (mainly rice and cassava). For chicken manure it was 83 % of the chicken keeping households and chicken manure was used mainly in the home garden. Main reasons for not using the manure are time consuming and hard work needed to collect, transport and apply the manure compared to the easy application of chemical fertiliser. Secondly, some respondents were complaining about more weeds growing in the field after applying manure.

Especially storage and processing practices have potential for improvement. By for example protecting the storage sites from weathering with a simple roof the loss of nutrients could be reduced. Furthermore, composting of manure would diminish its volume and make the transport and application easier. By improving the present practices some of the problems mentioned by the respondents as reasons for not applying manure on their crops would already be solved.

**Keywords:** Cambodia, cattle manure, chicken manure, livestock waste management, soil fertility, Southeast Asia

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## Introduction

Cambodia is a country with sandy soils, typical of the Southeast Asian region with humid and sub-humid climates. These are low in nutrients and have a bad buffering capacity. Soil depletion presents a serious threat for the agricultural production in Cambodia. The incorporation of organic matter is needed to restore the soils (Devendra and Thomas 2002). One material entailing organic matter is animal manure. When it is used as fertilizer, the manure can reduce the need for synthetic fertiliser, and contribute to a better soil fertility (Devendra and Thomas 2002; Malomo et al. 2018). The improvement of livestock manure management practices goes in line with the growing livestock sector in Asian countries (Van der Meer et al. 2008). To reach a sustainable intensification of the beef production, it makes sense to elaborate and promote good manure management practices, to enhance environmental preservation, but also to pursue an efficient use of all animal products to increase the cattle raisers' profitability. The aim of the present study was to generate basic knowledge about the farmers practices regarding farmyard manure management in the Battambang province, Northern west of Cambodia, including collection, storage and processing practices and the final use of the manure. The research investigated mainly in the management of cattle and chicken manure. In addition, some information was collected regarding pig manure. Furthermore, the structure of animal manure trade in the study area was assessed. This study was conducted in the framework of the ISA project (Innovation for Sustainable Agriculture), a project on conservation agriculture, implemented by the Swiss NGO Swisscontact, in cooperation with the National University of Battambang (NUBB).

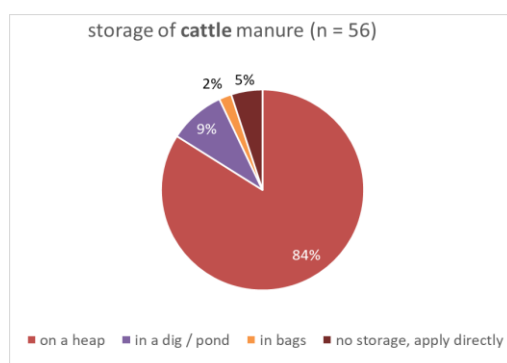
## Material and Methods

A survey involving 68 semi-structured household interviews and seven key informant interviews was conducted. The target households and key informants were selected in six villages in two communes in the district of Rottanak Mondol in Battambang province. To select the interviewed households, a non-random purposive multistage sampling was applied.

## Results and Discussion

### *Collection and storage*

The study results show that cattle manure is collected by 89 % of the interviewed households and 11 % do never collect the manure. Chicken manure is not collected by 22 % of the respondents. And four of five pig raisers collect the pig manure by hosing the pens every day and flushing the



pig manure into a small slurry lagoon. The chicken and cattle manure is stored on simple heaps by the majority of the households (Figure 1). Chicken manure is more commonly applied directly after collection or stored in bags. The chicken and cattle manure is stored on average between eight and nine months, whereas 60 – 70 % of the households store the cattle and chicken manure for up to one year. As depicted in Figure 2 and 3, the storage sites are characterized by natural floors and have no protection against weathering.

**Figure 1** Storage of cattle manure by interviewed farmers in the research sites



**Figure 2** A framed manure heap  
(Photo by Keiser 2021)



**Figure 3** A simple manure heap  
(Photo by Keiser 2021)

### *Processing*

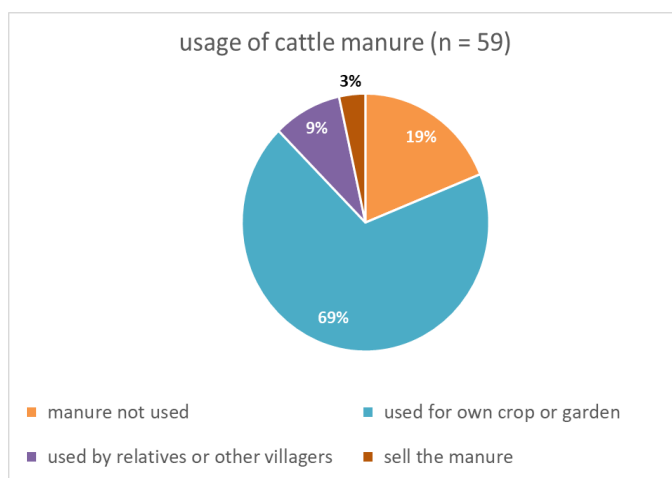
Most of the interviewed households do not process manure in any way (77% for cattle manure and 85 % for chicken manure). A small number of households burns the manure (11 % of cattle raising households and 7 % for chicken raising households).

This result is surprising as there is a National Biodigester Program promoting the installation of small biogas plants (Buysman and Mol 2013). For running a small-scale biogas plant, the manure of five to six cattle is needed (Buysman and Mol 2013). Fifty percent of respondents have six cattle or more and subsequently would have enough manure available to run a biodigester.

An additional approach could be the promotion of composting, that is also suitable for poorer families. Through composting, the volume of manure is reduced (Malomo et al. 2018) and this could make it easier to bring the manure or the compost to the field. Furthermore, composting would reduce the number of weed seeds, which can be transmitted to the field (Malomo et al. 2018).

The results indicated that households are not informed about the possible uses of manure. As mentioned by Blair and Blair (2014), the extension offices are poorly represented in Cambodia. This might be also an issue in the study sites.

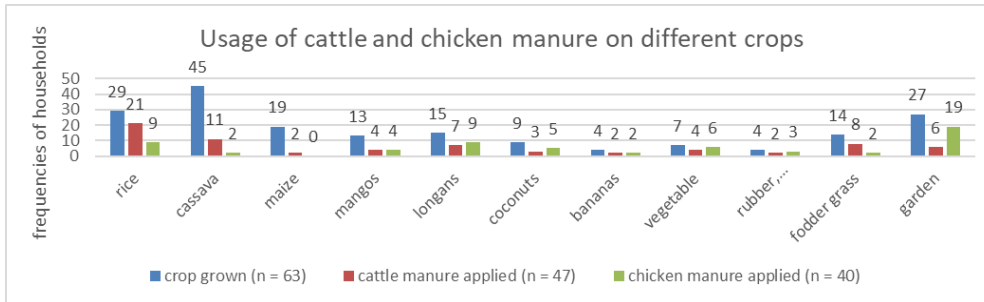
### *Usage*



**Figure 4** Usage of cattle manure

respondents, who mentioned to prefer using manure as fertilizer for household-consumption crops and chemical fertilizers for cash crops, which should bring high yields.

As shown in Figure 4, the majority of cattle raising households applies the cattle manure on their own crops or gardens. Chicken manure is used by 83 % of the households for their own crops or gardens. Cattle manure is more likely used for crops like rice and cassava, while chicken manure is preferred for use in the home garden and fruit plantations like longans (Figure 5). Garden crops and fruits are predominantly, and rice is partly used for household consumption. Figure 5 shows that cash crops like cassava and maize are not often fertilized with livestock manure. This observation was confirmed by a few



**Figure 5** Usage of cattle and chicken manure on different crops

Reasons behind the practices highlighted by the study were the following. Farmers using manure mentioned that they use it as they knew about the positive and long-term effect of manure on the soil fertility. Farmers not using the manure at all, stated the time consuming and hard work needed to collect, transport, and apply the manure compared to the easy application of chemical fertilizers as the main reasons. It needs to be mentioned here, that many respondents cultivate land far from their homes and do not have an accurate transport mean to bring the manure to the field. Secondly, some respondents complained about more weeds growing in the field after applying manure.

It can be discussed, whether it is good or not if respondents in this study use manure in priority for crops destined to household-consumption rather than for their cash crops. What ultimately matters is the fact that the nutrients are not lost. It seems that the interviewed farmers are aware of the value of manure, especially regarding soil fertility. The problem is rather related to the lack of manure. This is an argument to first promote and train farmers about better storage and processing practices before promoting the use of manure as fertilizer.

### ***Manure trade***

Regarding manure trade, the research showed that six out of 68 households sell manure and 59 % of the households not selling manure would have the possibility to do it. The few respondents, who sell manure reported, that no middlemen are integrated, the manure is sold directly from cattle raisers mostly to fruit producers.

### **Conclusions and Outlook**

Most of the interviewed households do collect and use cattle and chicken manure in Battambang Province. However, the majority of the surveyed farmers does not process the manure in any way. Additionally, the storage practices are weak and result in a big loss of nutrients. Accordingly, storage and processing practices have high potential for improvement. For example, protecting the storage sites from weathering with a simple roof can reduce the loss of nutrients. Furthermore, composting of manure would diminish its volume and make the transport and application easier. By improving the present practices some of the problems mentioned by the respondents as reasons for not applying manure on their crops would already be solved.

### **Recommendations:**

- To investigate on more practicable storage methods designed for smallholder farmers and preventing nutrient loss
- To investigate further on practicable processing methods designed for smallholder farmers, which aim for less nutrient loss, easier transport, and reduction of weed seeds transmitted by manure application
- To promote processing methods like composting and bio digestion more strongly
- To foster the establishment of more extension offices

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