# LINKING AGRICULTURE AND ENERGY IN CAMBODIA

*This series of case studies is part of a project to emphasise the energy-agriculture nexus in smallholder and small-scale commercial farming.*

## SMALL-SCALE COMMERCIAL PIG FARMER

**Province**: Takeo

## Farmer's ID card

**Name:** Mrs. Sok Nai
**Total land owned:** 0.3 ha
**Pigs house size:** 3x15m
**Access to grid electricity:** since 2016
**Main source of income:** pig farming
**Production capacity:** 6-8 piglets (360-480 kg) per cycle
**Production cycles per year:** 2 cycles
**Duration of each cycle:** 4 months

Mrs. Sok Nai, supported by her husband, is a small holder livestock farmer whose production mainly entails pigs, and plans to expand her activities to chicks and ducks. At the moment, her husband's activity as tuktuk driver provides the biggest income, but their main farm-related income is pig farming.

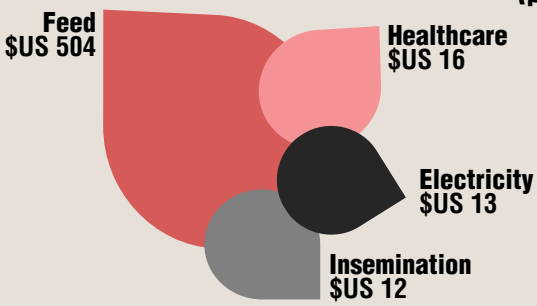
## Context

Farmers raise pigs throughout Cambodia. The highest number of pigs farmers is found in Takeo, Kampong Speu, Prey Veng and Svay Rieng provinces (the latter fueled by Vietnam exports). Pig farmers usually spend a lot in rice bran purchased from local rice millers, as it constitutes the major part of their pigs' diet. The number and profitability of pigs raised are therefore based on the quantity, quality and price of rice bran in the area, although animal medicines are also highly expensive.

## Earnings & expenses

Mrs. Sok Nai can produce 360 to 480 kg of pig meat by cycle. Sold alive at $US 2/kg, she earns $US 720 to $US 960 in annual revenue. After deduction of the feed, electricity, insemination and healthcare (including vaccines) costs, she can earn up to $US 414 as net profit for each production cycle ($US 829 per year).

### Mrs. Nai's expenses splitting (per cycle)



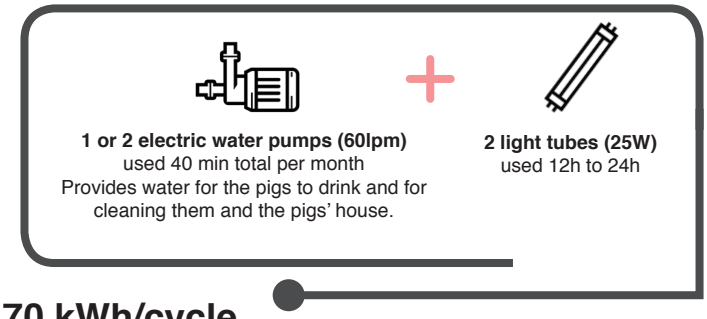

Total cost of **$US 545***

The biggest expense for Mrs. Sok Nai is, like for most pig farmers, the feed given to the pigs and sow, which accounts for 92% of her expenditures. She will spend more than $US 500 to feed her pigs per production cycle. She is sometimes able to feed them with vegetables she gets for free (*e.g.* morning glory) but their main diet is based on rice bran and commercial pellets, which she buys and is very expensive. Healthcare, electricity and sow insemination costs contribute just 8% of her total expenditures. She also uses an electric water pump, but even after 16 years of daily usage, the pump has never required substantial repair.

**The initial investment for the purchase of the first sow and pigs are not included in the calculations, nor is her one-time water pump purchase or its maintenance costs. Only regular expenses are included.*

# Zoom in:
# Mrs. Nai's Energy Profile

*During a pig production cycle (4 months), Mrs. Sok Nai uses one or two electric water pumps - depending on the season - and two light tubes. Pig production is difficult but does not require high energy consumption, only 70 kWh per cycle, corresponding to an estimated cost of $US 13.*




**70 kWh/cycle**
electricity cost per cycle: $US 13

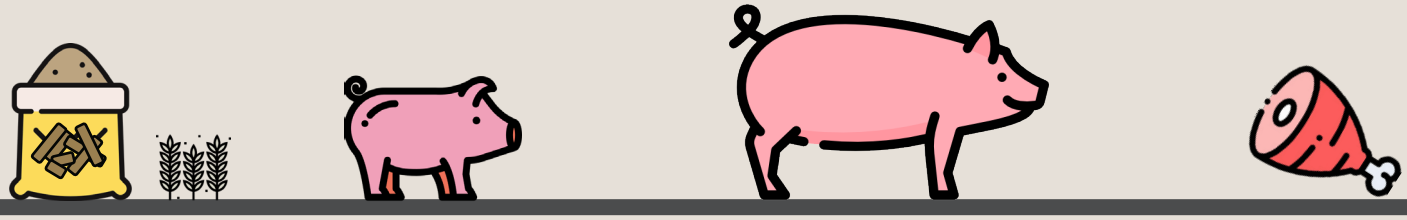
*Throughout the value chain, renewable energy technologies can help reduce pig feed cost, limit food losses and the fuel consumption of small commercial farmers.*

*"I am interested in clean energy but we don't have the finance. My husband bought a solar panel after hearing a radio add but he is using it on the tuktuk and I consider it too expensive for the household and the farm"*

**Mrs. Sok Nai**

## Opportunities for energy savings within the full value chain

**Mrs. Sok Nai's potential for action**



### Food production: Rice bran and pellet

The potential for renewable energy and energy efficiency in pig feed manufacturing is tremendous, both for pelleted food and by-products from rice production such as rice bran. For example, pelletising food is a complex process which studies evidenced to be **highly energy-consuming** (9 to 24 kWh/t) **due to the heat treatment and pelleting process**. **Energy efficiency measures could save up to 20% of energy**[1]. Solar-powered rice mills can also reduce the feed costs for farmers like Mrs. Sok Nai.

### Solar Water Pump

Pig production requires substantial clean water for drinking consumption and cleaning. A growing pig needs to drink 5-10L/day, a pregnant sow needs more than the double. It represents about 3,650L/year for a sow (10L/day on average). Solar water pump systems coupled with water tanks could reduce the dependence on fuels and reduce operating costs over the long run. **After five years, the cost of installing and running a diesel pump is more expensive than using a solar pump**.

### Biogas & biodigester

Pig production can be coupled with methane capture and anaerobic composting. On-site treatment of farm waste using **a biogas system present a low cost electrification potential. It can reduce enteric emissions and expenditures on cooking and lighting fuels.** Smallholder commercial farmers like Mrs. Sok Nai might not have enough manure to put in the system (at least 20L/day is needed) but the creation of cooperatives with small-scale farmers using a biodigester could bring subtantial savings on fertilisers.

### Meat conservation

The Cambodian diet is expected to become more meat-based, increasing from 15 kg per year and per person today to 42 kg by 2050[2]. Solar-powered DC efficient refrigerators for meat storage and transportation could be promoted to guarantee meat supply from rural areas to food processing plants and abattoirs and finally reach end customer. **Refrigerated storage reduces food loss, maintains food freshness, retains high food quality and limits bacterial proliferation.** The biggest challenge remains the necessity to build a full cold chain.

[1] Guerin O. and Menno T., 2013, Data Analyses of energy use in 3 feed factories. Retrieved from Zetadec: website: http://www.zetadec.com/?Articles.
[2] Rosegrant M. et al., 2014, Food Security. Retrieved from http://www.ifpri.org/publication/alternative-futures-world-cereal-and-meat-consumption-0

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