# *Original Research Article*

## Assessing economical livelihood of small-scale city swine farmers using SemPLS: Special Case of Manokwari, West New Guinea Papua


Abstract

City swine farmers has been raising swine for generation in economical ways. The represented sixty city farmers selected as respondents gained from several sub districts. The SemPLS employed by using economical model. The principal findings are significant parameters and hypothesis proven in model designs are population swine affected cost swine and price of swine (p=0,000), price of swine induce sold swine (p=0.000) and sold swine determined income generation (p=0.000). Dropped variables after re-analyzed are X4: Cost breed, X7: cost housing, X8: Cost tools (loading factor under 0.5).



Keywords: city livestock farmers (clf), city swine farming (csf), SemPLS, West New Guinea Papua (WNGP), Manokwari



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## INTRODUCTION

City livestock production (CLP) become a trending livestock issue in developing sustainable farmer' development programs (Kruska et al. 2003; Oosting et al. 2017). This is fully taken into account when small-scale home livestock business operates in and around the crowded human population, such as in urban areas. This characteristic of livestock farming tend to play vital role in supporting livelihood of the poorer households (Kimbi et al. 2015). They are exist running their business production and tied with a number of constraints.

Pictures of home-livestock business in the third world are under developed performance. The production seen mostly in the way of extensification production systems. Lack of improvement, unrolled market systems, weak of policies supports, low market demands, and etc. are the shapes of under developed livestock performs (Mutibvu et al. 2012; Zebua and Siagian 2017; Ouma et al. 2013; Govoeyi et al. 2019; Uwizeye et al. 2019; Lassen et al. 2006).

Constraints faced by city swine farmers (CSF) are complex and multiplied effects. However, getting knowledge to solve that constraints need passion and critical construct of thinking. Why complex is due to interrelated factors and actors involvement. Why multiply is due to multiplayer effects (Iyai 2017). Economic effect such as income losses will bring loses in swine production and productivity (Terry and Khatri 2009; Muhanguzi et al. 2012).

Parameters assessed mostly on swine production are herding size, body weight, average daily gain, pig production productivity, pig production efficiency, litter size, farrowing rates, etc. Parameters assessed mostly on swine economic performance are costs of production, sold of swine, prices of the swine, income and efficiency (Waithaka and Shepherd 2006; Mezgebe et al. 2018; Vermeer et al. 2014; Schodl 2015; Budiyanto et al. 2016). The economical and production parameters can be combined to have synchronization on

interacted effects simultaneously. This will be tested using assessing analysis tool such as SPPS, Stat, and R. Now a days, many experts and researchers are using SemPLS . Application of SemPLS on particular topics such as swine production and its factors economical parameters is lagging behind. This preliminary study is urgently needed to prove the application of SemPLS on this case study of city swine farmers.

The relationship of swine population (herd sizes), swine prices, swine production costs (including variable and fixed costs), sold swine and earned swine income may have meaningful benefit in understanding the swine production cycles (Pedersen 2017; Murgueitio 2017; Terry and Khatri 2009). By building the mental models in line with swine city production system (cps), particularly city swine farming (csf), the dynamic and flows will be monitored and evaluated in appropriate manners .

The objective of this manuscript was to provide such a picture of this sustaining small-home business (shb) of the city swine production (csp), and to assure that city livestock production (clp) can exist, sustains and play vital roles in economical and production purposes.

## MATERIALS AND METHODS

Selected sites of this field research are Padarni, Sanggeng, Amban, Wosi sub districts. A month of field research was done during April to May 2021. Observation and interviews were applied to 60 respondents out of the 145 city smallholding swine farmers (41.37%). It was interested to gain knowledge and keen on their swine production, economic development and income generation.

### Parameters

The outer model (formative) consisted of population of swine, cost of swine, sold swine, price of swine, and income of swine. We used SemPLS when simulating key target constructs or identifying key driver construct. Formative constructs are easy to use in the structural model, the structural model is complex, small sample size and data not normally distributed, and the last one is to use latent variable scores in subsequent analyses. Ghozali (2008) provided protocol to analyze SemPLS using Outer model analysis using AVE indicator, Composite reliability (CR) and Goodness of Fit (GoF) (Sulistiawati et al. 2018; Safitri et al. 2017).

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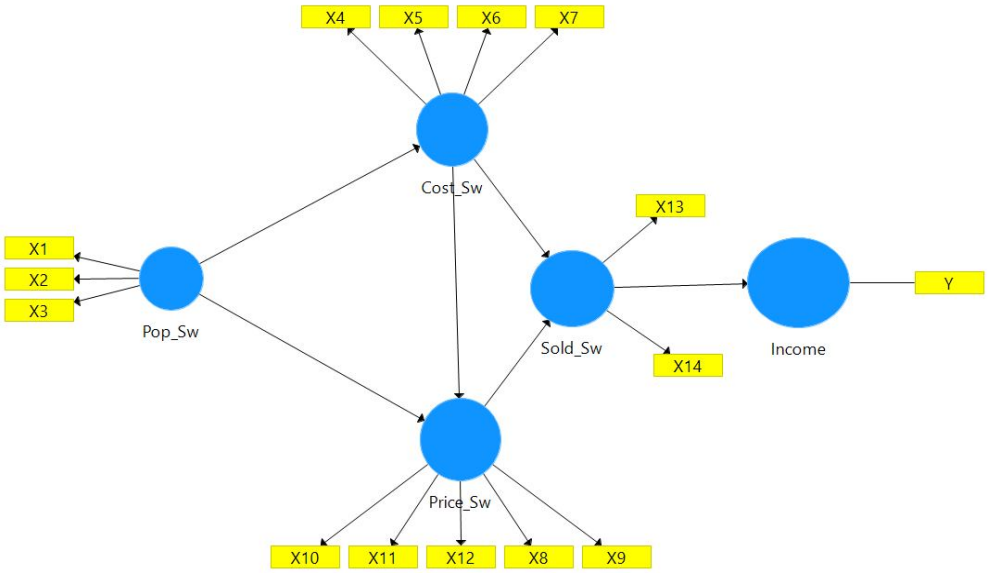


Figure 1. Mental model drawn using SemPLS. X1:Population piglet, X2:Population weaners, X3:Population adults, X4: Cost breed, X5:Cost medicine, X6:Cost feed, X7: cost housing , X8:Cost tools, X9:Price weaners, X10: Price adult, X11: Total price, X12: Cost total, X13: Sold piglet, X14: Sold weaners, Y:Income

Manifest variables (exogenous latent variables) consisted of population of piglet, population of weaners, population of adults, cost of breed, cost of medicine, cost of feed, cost of pens (house), cost of tools, sold of piglet, sold of weaners, sold of adults, price of piglet, price of weaners, price of adult, total prices, revenue, cost of total swine, and income. Latent variables are population of swine, cost of swine, sold swine, price of swine, revenues of swine, proportion of sharing, and income of swine. Structural model / inner model consisted of population of swine (pop-swine), sold-swine, cost-swine, price-swine, income swine. Structural equation model of Partial Least Squares, namely SmartPLS version 3.0 was employed (Ghozali and Latan, 2015).

## Hypothesis

1. The prices of swine are affected by swine population herd size)
2. The population of swine influence cost swine
3. Sold swine are determined by the prices of swine and swine costs
4. Incomes of the farmers depended on sold swine

## RESULTS AND DISCUSSIONS

Farmers characteristic consisted of ages ranged in the productive ages. Each households has 2-10 head / hh ($\bar{x}$=5 head). Farmers have experiences in keeping swine from 1-37 years. They can keep a number of swines on the ranges of 1-89 AU / hh ($\bar{x}$=5.73 AU / hh).

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Table 1. Characteristic of city swine farmers performance.

| Variable | Observations | Minimum | Maximum | Mean | Std. deviation |
|---|---|---|---|---|---|
| Ages (y) | 60 | 15.000 | 60.000 | 33.150 | 10.789 |
| Member (head) | 60 | 2.000 | 10.000 | 5.133 | 2.236 |
| Experience (y) | 60 | 1.000 | 37.000 | 8.300 | 6.468 |
| Herd size (head) | 60 | 1.000 | 89.000 | 11.583 | 17.384 |
| X1:Pop_piglet (head) | 60 | 0.000 | 50.000 | 5.733 | 9.053 |
| X2:Pop_Wean (head) | 60 | 0.000 | 20.000 | 3.100 | 4.375 |
| X3:Pop_Adult (head) | 60 | 0.000 | 18.000 | 2.033 | 3.014 |
| X4:Cost_Breed (IDR) | 60 | 0.000 | 800000 | 283333.333 | 241931.96 |
| X5:Cost_Medicine (IDR) | 60 | 0.000 | 50000 | 2166.667 | 7611.692 |
| X6:Cost_Feed (IDR) | 60 | 0.000 | 900000 | 243000.000 | 215149.140 |
| X7:Cost_House (IDR) | 60 | 0.000 | 2000000 | 340233.333 | 506471.22 |
| X8:Cost_Tools (IDR) | 60 | 0.000 | 300000 | 34000.000 | 73696.584 |
| Cost_Total (IDR) | 60 | 0.000 | 7000000 | 1007733.333 | 1012847.201 |
| X9:Price_piglets (IDR) | 60 | 0.000 | 700000 | 260000.000 | 224891.688 |
| X10:Price_Weaners (ID) | 60 | 0.000 | 1000000 | 310000.000 | 366245.264 |
| X11: Price_Adults (IDR) | 60 | 0.000 | 9000000 | 2416666.667 | 3076932.584 |
| Price_Total (IDR) | 60 | 0.000 | 32000000 | 6425000.000 | 7594302.615 |
| Sold_piglet (IDR) | 60 | 0.000 | 10.000 | 2.533 | 2.646 |
| X13: Sold_Weaners (IDR) | 60 | 0.000 | 7.000 | 1.283 | 1.823 |
| X14: Sold_Adults (IDR) | 60 | 0.000 | 4.000 | 0.650 | 0.971 |
| Y: Income (IDR) | 60 | 1800000 | 32000000 | 5418933.333 | 7333724.038 |

Piglet size ranges between 0-50 (x:5.73 head/hh), weaner reached 20 head/hh), and adults reached 0-18 head/hh (2.00±3.014), while adult size was 2 head/hh in average. The breed cost spent by the CSF was IDR 283,333, medicine IDR 2166,67 (quite cheaper). The ranges of cost spent in ranges of IDR 2,166-1,077,333. Cost spent by CSF in proportion dominated by housing cost (33.76%), followed by breed cost (28.1%), feed (24,11%), tools (3,37) and medicine (0,22%). The proportion of prices dominated by adult prices (37.61%), followed by weaner price (4.82%) and piglet (4.05%). The proportion of sold piglet is 56.72% higher than sold weaner (28.73%) and sold adults (14.55%). Net income obtained from this small-home business is IDR 5,41,933 head/hh. From this figures, farmers have been earning small amount of income.

The AVE value was employed to analyze discriminant validity value with correlation between construct and other constructs in the mental model. The AVE values has to have value above 0.5. We got cost swine 0.479 and price swine under 0.5. Other parameters are above 0.5. The significant of the AVE is for assuring further feasibility assessing convergent reliability. The requisite values of composite reliability shall above 0.6 and the outputs in the Table 2 reached by these indicators setup.

Table 2. Average extracted value and composite reliability

| Latent variables | AVE | Composite reliability |
|---|---|---|
| Cost swine | 0,479 | 0,620 |
| Income | 1,000 | 1,000 |
| Population of swine | 0,766 | 0,908 |
| Price_Swine | 0,496 | 0,793 |
| Sold_Swine | 0,553 | 0,710 |

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In the Table 3., the manifest variables that reached above 0.5 are X1 to X14 including Y. Due to several loading factors did not achieved standards of 0.5, these parameters shall be culled-out, namely X4, X7, and X8 (Fig. 2).

Table 3. Values of loading factors in the measurement model.

| Indicator | Loading Factor Value |
|---|---|
| X1=Population piglet | 0.925 |
| X2=Population weaners | 0.857 |
| X3=Population adults | 0.842 |
| X5=Cost medicine | 0.420 |
| X6=Cost feed | 0.884 |
| X9=Price weaners | 0.770 |
| X10=Price adult | 0.821 |
| X11=Total price | 0.666 |
| X12=Cost total | 0.524 |
| X13=Sold piglet | 0.661 |
| X14=Sold weaners | 0.818 |
| Y=Income | 1.000 |

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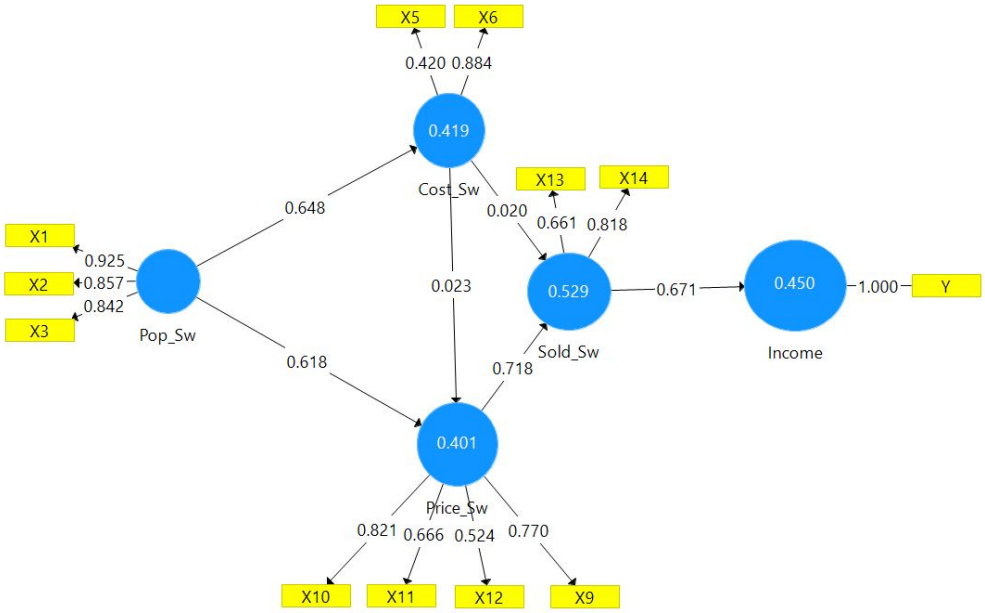


Figure 2. Results of the first analysis for checking loading factor values. X1:Population piglet, X2:Population weaners, X3:Population adults, X5: Cost medicine, X6:Cost feed, X9:Price weaners, X10: Price adult, X11: Total price, X12: Cost total, X13: Sold piglet, X14: Sold weaners, Y:Income

Table 4. Result test of hypothesis.

| Result of hypothesis test | T-value | P values |
|---|---|---|
| Cost-Swine -->Price_Swine | 0.747 | 0.455 |
| Cost-Swine-->Sold_Swine | 0.478 | 0.633 |
| Pop-Swine -->Cost_Swine | 5.053 | 0,000 |

| | | |
|---|---|---|
| Pop-Swine --> Price_Swine | 2.855 | 0.004 |
| Price_Swine -->Sold_Swine | 10.181 | 0.000 |
| Sold_Swine --> Income | 6.344 | 0.000 |

From Table 4. the output of refinement model to test the hypothesis resulted by the number of the significant values where population of swine will determine cost swine (p=0.000), including population of swine will significantly affect prices of the swine. In one hand, prices of the swine will also in turn determine sold swine. We also found that sold swine will induce increasing income of the swine farmers (p=0.000). Cost of swine do not have significant influence of prices of swine (p=0.455) and sold swine (p=0.633).

## DISCUSSIONS

Swine costs consisted of variable and fix costs (Iyai 2011; Zebua and Siagian 2017; Phiri 2012a). From Table 1. variable costs consisted of breed cost (X4), medicines (X5) including treatment and veterinary cost, feed cost (X6), while fix cost consisted of housing (X7) and tools costs (X8). From these figures, the breed cost (X4) and housing cost (X7) and tools (X8) are dropped out due to under loading values 0.5. The breeding, housing and tool cost do not determine relationship of the total costs on swine income simultaneously. Seeing this phenomenon, it reveals that consumers and farmers do not have preference in determining chosen breed to buy and breed to sold (Montsho and Moreki 2012). The breeds of swine in WNGP are not varied a such breed in outside WNGP and Indonesia (Widayati et al. 2018; Iyai et al. 2018; Wea et al., 2020). In Europe, ASIA, America, breeds can determine the costs, sold, prices and gained income generation (Correia-Gomes et al. 2017; Boogaard et al. 2011; Relun et al. 2015; Pedersen 2017; Horsted et al. 2012; de Barcellos et al. 2013). Preferred breeds can improve efficiency in raising swine, consumers demand and/or preferences. The city swine producers do not see these phenomenon of market demands on breed preferences (Lassen et al., 2006; Phuong et al. 2014; Ouma et al. 2013; Chau et al., 2017; Govoeyi et al. 2019). Studies and information on breed preferences do not raise this issue become the prioritize to improve each certain and typical breeds.

Variable costs on housing and tools used in the CSF do not have appropriate facilities. Swine housing and its inside compartment do not provide in fulfilling standard and quality (Pedersen 2017; Grimberg-Henrici et al. 2016; Krystallis et al. 2009; Jonge et al. 2008; Yun et al. 2013; Colson et al. 2012). The housing and rooms inside do not meet the animal welfare and animal rights. This causes slow production and demand of the consumers to purchase. This in turn will determine the prices and sold swine. Appropriate housing with the size including length, height, and width will affect the number of head animal will be raised inside the housing. The herd size will determine pig production productivity and pig production efficiency (Sani et al. 2020; Tekle et al. 2013; Iyai et al. 2018; Wabacha et al. 2004; Iyai 2011).

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Under slums, small-home business (SHB) will become the first choice and priority (Olson et al. 2003; Correia-Gomes et al. 2017). Several researchers in WNGP have proven it. Coastal livestock farmers particularly the swine farmers have been dependent on this kind of city swine production (Muhanguzi et al. 2012; Ly et al. 2001; Chau et al. 2017; Phiri 2012b). The CSF is the one that realistic being practiced and applied until sold their swine outside Manokwari.

## CONCLUSIONS

City swine farming productivity will reach its potential income generation applied by city livestock farmers particularly city swine production via using indicators of economic cycle on swine production, swine cost, swine prices and sold swine. City swine farmers have considered breeds, housing and tools improvement. Calculation proved that cost spent by CSF in proportion dominated by housing cost, followed by breed cost, feed, tools and medicine. The proportion of prices dominated by adult prices, followed by weaner price and piglet. The proportion of sold piglet is 56.72% higher than sold weaner and sold adults. Net income obtained from this small-home business is IDR 5,41,933 head/hh. The CSFs have been earning small amount of income.

In achieving city livestock production and city swine production, good swine practices must be applied. Small-home business will reach optimal income generation by considering relationships of the parameters that in turn enhancing city swine farmers earn higher economic efficiency. The SemPLS has been proven to be a flexible and an analytical tool that suitable to test a number of parameters simultaneously.

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