

A Financial Analysis of Homestead Native Chicken Raising: A Climate-Smart Agriculture Option Adopted in the Province of Koh Kong, Cambodia

Working Paper No. 362

CGIAR Research Program on Climate Change,
Agriculture and Food Security (CCAFS)

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RESEARCH PROGRAM ON
Climate Change,
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Abstract

In 2018, the International Institute for Rural Reconstruction (IIRR) and the Cambodian Center for Study and Development for Agriculture (CEDAC) under the Asian Development Bank's Cambodia Biodiversity Conservation Corridors Project (BCC) implemented the Community Development Funds Project in the Koh Kong and Mondul Kiri provinces which included the capacity building activity on improving native chicken production for smallholder farmers specifically, broiler production, and hatchery. This study supported by the International Research and Development Center (IDRC) analyzed the financial benefits gained by households in the Koh Kong province from this climate smart agriculture approach to small scale poultry production.

When native chickens were raised for meat purposes (broiler production), the total net income received by the households amounted to USD 6,286.00 in 2019, and USD 8,003.00 in 2020. As the volume of sales increased, the average net income showed an increasing trend while the production cost per kilogram of broiler sold decreased. The study also revealed that profitability was highest among households that sold more than 100 kg of broilers compared to other households with lesser sales volume (using the Operating Profit Margin Ratio as a gauge). Hatchery operators earned a total net income of USD 10,136.00 in 2019 which increased to USD 13,604.00 in 2020.

Broiler production and hatchery operation can be useful climate resilient enterprises to supplement the household income while complementing the existing economic activities of the village households such as growing crops and raising small livestock. Local food systems are enriched in the process and agrobiodiversity of small livestock is conserved through their sustainable use. This native chicken project was also gender fair and of special relevance to women in the communes.

Keywords

Climate resilient enterprises, climate-smart agriculture, financial analysis, low carbon small poultry production, native chickens

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Table of Contents

Abstract	iv
Keywords.....	iv
About the authors	v
Acknowledgements	vi
List of Tables.....	viii
List of Figures.....	ix
Acronyms.....	1
Introduction.....	2
General description of the province of Koh Kong.....	3
Overview of the native chicken enterprises in Cambodia	4
Financial analysis of the native chicken production for smallholder farmers project of the IIRR and CEDAC	7
Broiler Production.....	7
Demographic Characteristics of Broiler Producer-Respondents	7
Farm characteristics.....	9
Net cash income from crops and livestock	10
Other sources of income.....	11
Financial Analysis of Broiler Production.....	12
Chick production (Hatchery).....	22
Number of respondents in the chick production survey	22
Demographic Characteristics of the Chick Producer-Respondents	23
Farm characteristics.....	24
Income from crops and livestock	25
Off-farm sources of income	26
Income from chick production.....	26
Conclusion and recommendations.....	32
References	35
Information Resources	36

List of Tables

Table 1. Number of persons in a household, 6 villages, Koh Kong Province, 2020	7
Table 2. Age of household members, 6 villages, Koh Kong Province, 2020	8
Table 3. Education by type of household member, broiler producers, Koh Kong, 2020	9
Table 4. Farm size of households, broiler producers, 6 villages, Koh Kong Province, 2020	9
Table 5. Crops and livestock raised by broiler producers, Koh Kong province, 2020	10
Table 6. Income from crops and livestock, 6 villages, Koh Kong Province, 2020	11
Table 7. Other sources of income by broiler producers, Koh Kong Province, 2020	12
Table 8. Broilers raised, mortality rate and inventory, broiler producers, Koh Kong province, 2019 to 2020	12
Table 9. Net income from broiler production, Koh Kong Province, in USD, 2019 to 2020	15
Table 10. Aggregate operating cost of broiler production, Koh Kong Province, 2019 to 2020	19
Table 11. Combined income from farming, broiler production and off-farm sources, in USD, Koh Kong Province, 2020	21
Table 12. Number of persons in a household, chick producers, Koh Kong Province, 2020	23
Table 13. Age of household members, chick producers, Koh Kong Province, 2020	23
Table 14. Educational attainment by type of household member, chick producers, Koh Kong, 2020 ...	24
Table 15. Area of land being farmed, chick producers, Koh Kong Province, 2020	24
Table 16. Crops and livestock raised by households, chick producers, Koh Kong province, 2020	25
Table 17. Income from crops and livestock, chick producers, Koh Kong Province, 2020	25
Table 18. Off-farm sources of income, chick producers, Koh Kong, 2020	26
Table 19. Net cash income of hatcheries, in USD, Koh Kong province, 2019 to 2020	28
Table 20. Combined income from farming, chick production and off-farm sources, in USD, Koh Kong Province, 2020	30

List of Figures

Figure 1. Traditional practice for small scale poultry production Source: Seng, et al., 2007 and FAO, undated.	5
Figure 2. Net income per household- broiler producers, 2019-2020, in USD	16
Figure 3. Production cost per kg- broiler producers, in USD	17
Figure 4. Volume of sales (chicks), Net Income (USD), cost/100 chicks, Koh Kong province, 2020	27

Acronyms

BCC	Biodiversity Conservation Corridors Project
CEDAC	Center for Study and Development for Agriculture
IDRC	International Development Research Center-Canada
IIRR	International Institute of Rural Reconstruction
OPMR	Operating Profit Margin Ratio

Introduction

The International Institute for Rural Reconstruction (IIRR) and the Cambodian Center for Study and Development for Agriculture (CEDAC) under the Asian Development Bank's Cambodia Biodiversity Conservation Corridors Project (BCC) implemented the Community Development Funds Project in Koh Kong and Mondul Kiri in March 2018. Subsumed under this project was a capacity building activity entitled, Improving Native Chicken Production for Smallholder Farmers. It aimed to provide training on improved techniques in chicken production to households that were participating in the BCC project and were already engaged in raising native chicken. The training focused on two systems of chicken farming: broiler production and hatchery. Broiler production is an enterprise that raise chicken for meat consumption. A hatchery, on the other hand, is a production system engaged in hatching fertilized chicken eggs to raise poults to be sold to chicken raisers. As a requisite, households chosen to train were to serve as demonstration farms and learning sites for other villagers who are interested in starting either a broiler farm or a hatchery. The trained household member(s) had to provide technical assistance/advice regarding their experience in applying the proper techniques in raising chicken.

This research report focused on the native chicken enterprises of smallholder farmers in the province of Koh Kong. It analyzed and documented the financial benefits gained by households from the IIRR/CEDAC project. Native chicken raising is viewed as a way of augmenting the local food system, empowering local communities through enterprise development and value addition of climate smart agriculture options and, most importantly, providing the evidence base for future outscaling and investments of these options.



Image 1. Native chicken farming in Koh Kong province. Source: IIRR-Cambodia

General description of the province of Koh Kong

The province of Koh Kong is located southwest of Cambodia. It has a “long undeveloped coastline and a mountainous, forested and largely inaccessible interior...” (NIS, 2013). The area suffers from climate-related problems such as storm surges, droughts, floods, and seawater intrusion (Sa, 2017). In fact, the natural landscape of the province does not have much to offer to its communities whose main economic activity is farming. This condition seemed to be further aggravated by climate change projections for the province which indicate longer and hotter dry seasons and stronger winds, higher waves, and an increase in the frequency of storms during the wet season (IUCN, 2013). Statistics showed that about 64% of the population in the province depend on agriculture- related economic activities where rainfed rice production is the main driver of growth

(www.seaknowledgebank.net/koh-kong-province, retrieved 6/20/21 and JICA, 2010).

However, rice production basically remains at the subsistence level (JICA).



Image 2. A local raising native chickens in Koh Kong province. Source: IIRR-Cambodia

Overview of the native chicken enterprises in Cambodia

Small scale native chicken raising is a common practice among rural households in Cambodia. The local breeds of chicken that are commonly raised by the households include Skouy, Sampeov, Kragnas, Tear Angkam (layers), and Tear Sampeov (layers & broilers) (FAO). The traditional production system is “characterized by low inputs, allowing birds to scavenge for food, and using hens to restock the flock” (FAO). However, many households today provide home formulated feed to their flock to supplement scavenging. The common feedstuff fed to the birds are grains that are produced from their own farms, but some mix the grains with commercially purchased feeds (FAO, 2009). Birds lay eggs four times a year with an average of 14 eggs per production cycle or 56 eggs per year (FAO, 2009). Birds

produced under the traditional system are mostly consumed by the household, given away as gifts, or reserved for festivities (e.g., Pchum Ben, Khmer New Year and several Chinese celebrations) while the surplus are sold at the farmgate to buyers (CelAgrid, 2010). The festivities are also the best time to sell the birds because they can sell them for a higher price. A typical production sequence for a backyard chicken enterprise is described in Figure 1.

Most households keep one or more hens to hatch eggs for restocking and home consumption. One local breed hen can produce about 14 eggs per cycle for four generations. Figure 1 illustrates an example of production activities for one generation of eggs. Of the 14 eggs laid, about 2 are consumed at home while 12 are left to hatch. Of the dozen eggs left to hatch, only six chickens survive to adulthood of which three are sold, two are consumed at home and one is kept for a special occasion to honor a house guest. Many households keep several hens and can produce a greater number of chickens, however, space limitations often prevent flock expansion.

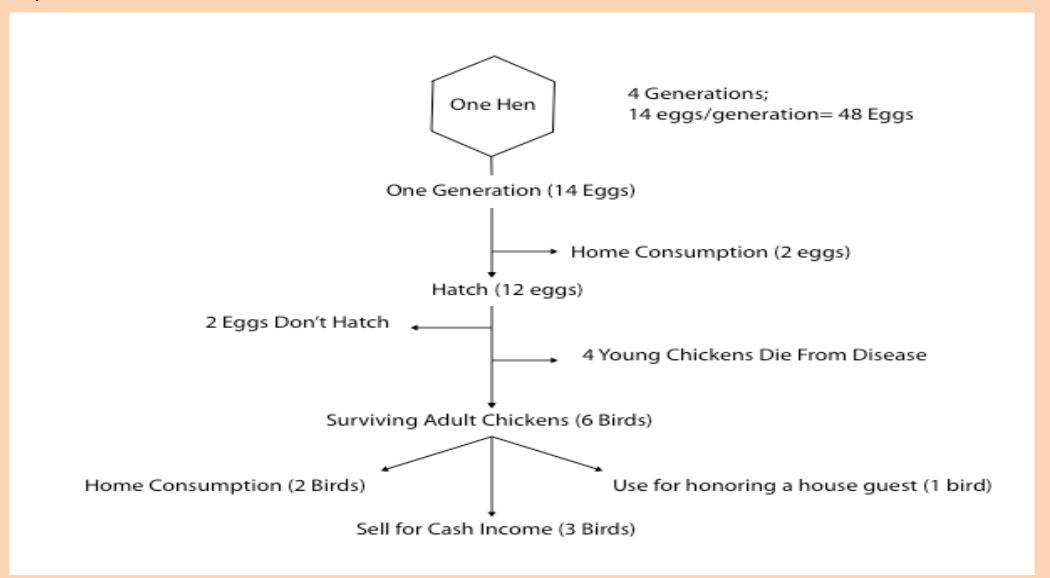


Figure 1. Traditional practice for small scale poultry production Source: Seng, et al., 2007 and FAO, undated.

The coastal province of Koh Kong is a typical rural community in Cambodia where most households grow native chicken and follow the traditional way of raising the flock. They keep five to 20 heads of adult chicken (hens and roosters) at one time, and this could increase up to 150 to 180 heads if there are no disease outbreaks (CelAgrid, op.cit.). Both husband and

wife share the task of raising poultry although the women provide more time in doing the work since most of them stay at home to do their household chores. The women also make the decision as to when to sell the chicken. The men, on the other hand, work in the field or perform off-farm jobs (CelAgrid, op.cit.). The use of commercially available vaccines and antibiotics to prevent diseases is not a common practice among the backyard chicken raisers. They instead rely on traditional concoctions using herbs, hot chilli, black pepper, and sugar palm syrup.



Image 3. A woman feeding native chickens in Koh Kong province. Source: IIRR-Cambodia

Financial analysis of the native chicken production for smallholder farmers project of the IIRR and CEDAC

This study interviewed households located in the villages of Brolean, Chhouk (Chikhar Leu Commune), Koki, Prolean (Kandaol Commune), Prai (Andoung Teuk Commune), and Prek Svay (Thamadonpov Commune) in Koh Kong. These were households that received training from the IIRR/CEDAC project on improved technologies in raising native chicken including other households that received technical assistance from the IIRR/CEDAC-trained families.

Broiler Production

Demographic Characteristics of Broiler Producer-Respondents

Number of persons residing in a household

Twenty five households that were involved in the broiler enterprise participated in this study. Twenty-four of these households were raising native chicken solely for the production of broilers while one household combined raising broilers and chick hatchery. Majority (88%) of these households consisted of four to six members (Table 1). Eight percent of the households had one to three members and only one household (4%) had seven to nine members.

Table 1. Number of persons in a household, 6 villages, Koh Kong Province, 2020

Persons per Household	Frequency	Percent
1 to 3	2	8%
4 to 6	22	88%
7 to 9	1	4%
Total	25	100%

Age of household members

Table 2 shows that there were a total of 121 individuals residing in the 25 households that were interviewed. Among the age group brackets, the toddlers (0 to 9 years old) and the adolescents (10 to 19 years old) made up almost half (47%) of the total number of household members. The young adults (20 to 29 and 30 to 39 years old) also represented a

significant proportion (43%) of the household members. Only a small percentage (10%) belong to the older age brackets (40 years and older).

Table 2. Age of household members, 6 villages, Koh Kong Province, 2020

Age Bracket (Years)	Frequency	Percent
0 to 9	28	23%
10 to 19	29	24%
20 to 20	16	13%
30 to 39	36	30%
40 to 49	5	4%
50 to 59	6	5%
>100	1	1%
Total	121	100%

Educational attainment

The level of educational attainment of the household members was found to be extremely low. Most of the husbands did not complete an elementary education (45%) or had no formal education at all (41%) (Table 3). Similarly, majority of the wives only had some elementary education (44%) or did not go to school (40%). It is worth noting, however, that there was one husband who had a college degree and a wife who had some college level training. The children were mostly in elementary school or had just completed elementary education. A number were in high school or had completed high school and were taking up college level courses. The classification, Others, pertain to parents, parents-in-law, brother or sister of the husband or wife who live in the same household. Most of them also were not able to finish an elementary education.

Table 3. Education by type of household member, broiler producers, Koh Kong, 2020

Education	Husband	Percent	Wife	Percent	Son/ Daughter*	Others	Total	Percent
No Formal Education	9	41%	10	40%	12	0	31	26%
Nursery/ Kindergarten	0		0		4		4	3%
Some Elementary	10	45%	11	44%	27	8	56	48%
Completed Elementary	2	9%	3	12%	14		19	16%
Some High School	0		0		0	0	0	0%
Completed High School	0		0		4	1	5	4%
Some College			1	4%	4		1	1%
Completed College	1	5%	0		0	0	1	1%
Total	22	100%	25	100%	65	9	117	100%

*Below school age

Farm characteristics

Farm size

The area of land used for farming ranged from 0.5 hectare to areas larger than 2.0 hectares (Table 4). All farm lots are owned by the farmer-respondents where majority (68%) operate on farm land larger than 2.0 hectares. The other households have farms with an area between 0.5 to 2.0 hectares.

Table 4. Farm size of households, broiler producers, 6 villages, Koh Kong Province, 2020

Farm size (ha)	Frequency	Percent
0.5 to 1.0	1	4%
1.01 to 1.5	2	8%
1.51 to 2.0	5	20%
2.0	17	68%
Total	25	100%

Type of crops and animals raised in the farm

Aside from raising native chicken, majority (80%) of the 25 households grow rice as their main crop (Table 5). In addition to rice, 36% of the households also produce cashew nuts. A number of households have also diversified into growing corn, long beans, cucumber, eggplant, wax gourd, water spinach, chili, tomato, pumpkin, Chinese cabbage, watermelon as well as pigs and cattle raising.

Table 5. Crops and livestock raised by broiler producers, Koh Kong province, 2020

Crops/Livestock Raised	Frequency*	Percent**
Rice	20	80%
Cashew	9	36%
Corn	1	4%
Long beans	1	4%
Cucumber	2	8%
Eggplant	5	20%
Wax gourd	4	16%
Water spinach	2	8%
Chili	2	8%
Tomato	4	16%
Pumpkin	2	8%
Water melon	2	8%
Chinese cabbage	3	12%
Pigs	4	16%
Cattle	3	12%
Total	64	

* Multiple responses

** Percent of 25 households

Net cash income from crops and livestock

Sixteen of the 25 households earned a combined Net Income of USD 18,862.00 from growing rice and vegetables and raising livestock (Table 6). Each of these households generated an average Net Income of USD 1,179.00. However, actual earnings per household varied from a mere USD 40.00 to as much as USD 3,780.00. There were eight households which failed to earn a profit from crop production and/or livestock raising. Loses ranged from USD 165.00 to

USD 973.00. One household did not engage in any crop or livestock enterprise except for broiler production.

Table 6. Income from crops and livestock, 6 villages, Koh Kong Province, 2020

Item	Total*	Average*	Range
		USD	
Gross revenue	22,546	1,409	175 to 3,945
Total cash cost	3,684	230	0 to 1,010
Net income	18,862	1,179	40 to 3,780
No. households with positive net income		16	
No. households with negative net income		8	(165) to (973)
Not farming		1	
Total households		25	

*Households with positive Net income

Other sources of income

In addition to agricultural production, several household members contribute to family income by working off-farm. More than half (52%) of the 25 households run a microbusiness (eg., grocery store) (Table 7). The average income generated by these households in 2020 was USD 1,469.00. Household members (40%) that were employed as seasonal workers or hired on a piece-work basis earned an average of USD 470.00. Also, 16% and 8% of households generated income from unskilled and skilled formal employment, respectively. Unskilled employment refers to jobs such as domestic helper, laundry woman, janitors, and the like. Skilled formal employment are salaried jobs such as clerical/secretarial work or as salespersons in stores in urban areas. Fishing was reported by one household as a source of livelihood.

Table 7. Other sources of income by broiler producers, Koh Kong Province, 2020

Source of Income	Frequency*	Percent**	Ave. income (USD/Year)	Range (USD/Year)
Microbusiness	13	52%	1,469	16.2 to 4,500
Casual labor	10	40%	470	0.4 to 1,200
Unskilled formal employment	4	16%	175	0.9 to 370
Skilled formal employment	2	8%	611	21 and 1,200
Fishing	1	4%	40	
Total	30			

*Multiple responses

** Percent of 25 households

Financial Analysis of Broiler Production

Broilers raised, mortality rate and broiler inventory

The broiler producers in Koh Kong raised a total of 2,148 heads of chicken in 2019 but suffered a mortality of 259 heads (Table 8). Thus, the total number of chicken was reduced to only 1,889 heads. The following year, a slight increase in the number of chicken was noted. There were 2,654 birds raised in 2020 with a mortality rate of 13% leaving 2,309 heads available for sale and home consumption. On the average, each household were able to produce 83 and 102 broilers accompanied by a mortality of 10 and 13 heads in 2019 and 2020, respectively. Each household were assumed to have raised 73 birds in 2019 and 89 birds in 2020.

Table 8. Broilers raised, mortality rate and inventory, broiler producers, Koh Kong province, 2019 to 2020

Item	All Households		Per Household	
	2019	2020	2019	2020
Broilers raised (heads)	2,148	2,654	83	102
Mortality (heads)	259	345	10	13
Mortality rate	12%	13%	12%	13%
Broiler inventory (heads)	1,889	2,309	73	89

Income from broiler production

In determining the Net Income, the broiler producers were classified into three groups based on the volume of broilers sold. Selling the broilers by weight (kilograms) instead of per head basis is the common practice in the broiler market of Koh Kong. Hence, the number of kilograms of broilers sold by the households in 2019 and 2020 became the basis of the classification, i.e., 1 to 50 kg, 51 to 100 kg, and greater than 100 kilograms. Subdividing the producers by sales volume aimed to provide information on the earning capacity of households as differentiated by their scale of operation. In the backyard chicken raising, the volume of sales approximates the number of broilers raised per cycle of production but giving allowance to two roosters and 4 hens for restocking. Thus, the grouping come close to the sizes (small, medium, semi-commercial) of backyard chicken raisers common to the area.

Net Income was computed based on the cost and return data of households that generated a positive net income. Data of households that failed to generate a profit were excluded because this would skew the cost and return values of the profit earners. There was one household in 2019 and two in 2020 that had negative profits. Another just started in late 2019 and, therefore, had no broilers that have reached a marketable weight by that time.

Cash Cost of Sale refers to the cost of production inputs that were paid in cash such as feeds, water, electricity, antibiotics. Depreciation cost was computed by dividing the cost of chicken housing built by the households by the lifespan (number of years) that were assigned to the chicken pens by the households. These cost components were discussed in detail in the following section of this report. The sum of the Cash Cost of Sale and the Depreciation Cost is the Total Cost of the broiler production.

The per unit cost (Total Cost/kg) of production was obtained by dividing the Total Cost by the sales volume (Kg) made by the producers with a positive Net Income in each of the three classifications. The per unit cost of production (Cost/Kg) is equivalent to the Breakeven Price for each kilogram of broiler sold. The selling price per kilogram should be larger than the Breakeven Price to make a profit.

Table 9 summarizes the estimates of the Net Income of the broiler producers based on their scale of operation. In 2019, there were 8 producers (n=8) that belonged to the group that

sold 1 to 50 kg of broilers that earned a profit. These households generated a combined annual Net Income equivalent to USD 860.00 or an average of USD 108.00 per household. Income ranged from USD 8.00 to USD 236.00 per household. The broilers were sold at an average price of USD 7.60/kg which was much higher than the cost of production (Breakeven Price) which was USD 3.00/kg enabling the households to earn a profit of USD 2.80/kg.

During the same year (2019), there were five households whose size of sales volume was under the 51 to 100 kg category. Together, they generated a Net Income of USD 1,175.00. On a per household basis, Net Income was equivalent to USD 235.00 and varied between USD 87.00 to USD 450.00. This group of producers operated at a cost of USD 2.80/kg and sold their broilers at an average farmgate price of USD 5.60/kg. The selling price was also higher than their production cost but noticeably lower than what the first group received.

The third group (> 100 kg of broilers sold) was composed of six producers in 2019. They earned a Net Income of USD 4,251.00 or an average income of USD 698.00 per household. They sold the broilers at a farmgate price of USD 6.20/kg against a production cost of USD 2.60/kg.

In 2020, 11 households were classified as producers that sold 1 to 50 kg of broilers with a positive Net Income. The production cost of these households was USD 4.00/kg or a total of USD 1,264.00. Thus, they generated a Net Income of USD 974.00 or USD 89.00 per household.

Only one producer had a sales volume of 51 to 100 kg in 2020. This producer earned a Net Income of USD 171.00 by producing at a cost of USD 3.20/kg and selling at USD 5.00/kg.

Eight households sold more than 100 kg of broilers and generated USD 6,858.00 as Net Income in 2020. Each household earned a Net Income of USD 847.00 by maintaining a production cost of USD 3.00/kg and selling the broilers at USD 6.60/kg.

Table 9. Net income from broiler production, Koh Kong Province, in USD, 2019 to 2020

Item (USD)	Birds sold												Total		Average	
	1 to 50 (Kg)				51 to 100 (Kg)				> 100 (Kg)							
	Total		Average		Total		Average		Total		Average		2019	2020	2019	2020
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
	n=8	n=11	n=8	n=11	n=5	n=1	n=5	n=1	n=6	n=8	n=6	n=8	n=19	n=20	n=19	n=20
Gross revenue*	1,649	2,238	206	203	2,328	480	466	480	6,432	11,206	1,072	1,401	10,409	13,924	548	633
Cash cost of sale*	729	1,214	91	110	928	299	186	299	1,851	3,782	309	473	3,508	5,295	185	241
Depreciation cost**	60	50	8	5	225	10	45	10	330	566	66	81	615	626	32	31
Net Income	860	974	108	89	1,175	171	235	171	4,251	6,858	698	847	6,286	8,003	331	361
Range			8 to 236	36 to 227			87 to 450				266 to 1809	430 to 1627			8 to 1809	36 to 1627
Cost/Kg (Breakeven Price)***			3	4.3			2.8	2.9			2.3	2.5				
Farmgate Price/Kg			7.6	7.8			5.6	5			6.2	6.6				
OPMR	52%	44%			50%	36%			66%	61%			60%	57%		
HH with neg. income	1	2			0	0			0	0			1	2		
HH with no sales	1	2											1	2		
Broilers consumed	48 kg	221 kg			24 kg	0			36 kg	175 kg			108 kg	396 kg		
No. of households consuming	2	9			1	0			1	7			4	16		

*Based on households with positive Net Income

**2 households had no chicken cages

*** Based on total cost

An increasing trend could be observed when the average Net Income was compared among the broiler producers belonging to the three groups. Income per household increased as sales volume increased in 2019 and 2020 (Figure 2). The net income per household ranged from USD 108.00 for producers with less than 50 kg of sales volume to as much as USD 698.00 for volume of sales greater than 100 kg. Similarly, in 2020, net income climbed from USD 89.00 to USD 847.00 per household in parallel with the increase in sales volume. The observed trend could be explained by the concept of Economies of Scale. This concept states that production cost per unit tend to decrease as quantity of output approaches an efficient level. This is achieved because average costs are spread over a larger quantity of outputs. In the case of the broiler producers, per unit cost decreased from USD 3.00/kg to USD 2.30/kg in 2019 as sales volume increased (Figure 3). A similar diminishing trend could be more clearly observed from the production cost in 2020, ie., from USD 4.30/kg the cost decreased to USD 2.50/kg as the volume of broilers sold increased.

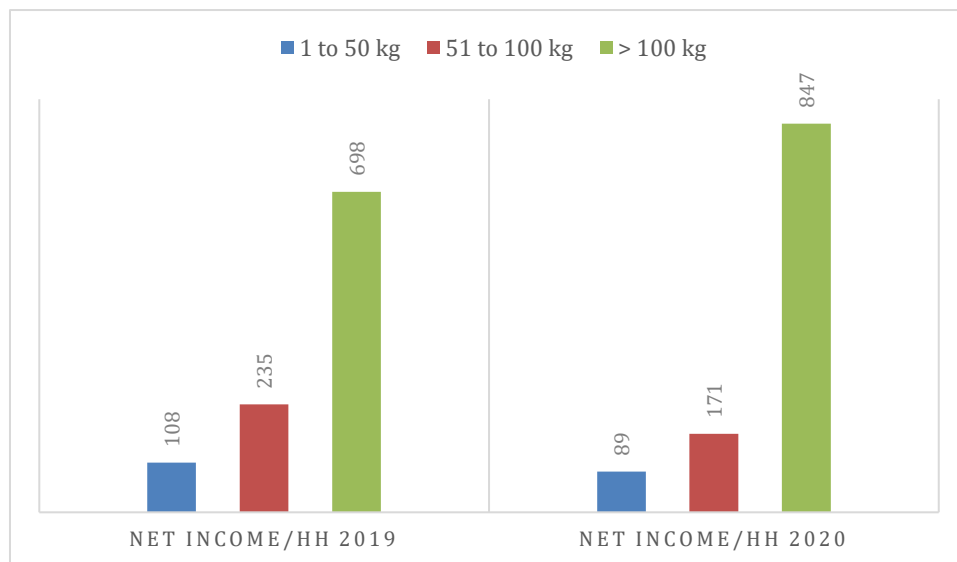


Figure 2. Net income per household- broiler producers, 2019-2020, in USD

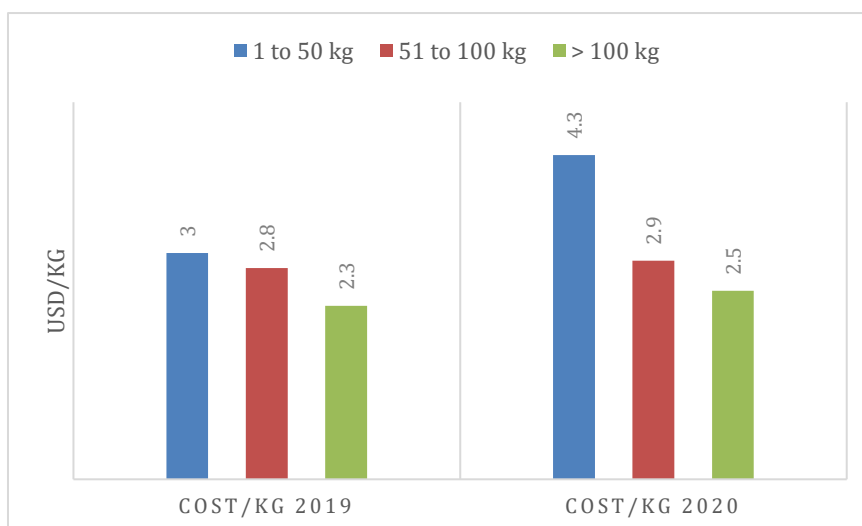


Figure 3. Production cost per kg- broiler producers, in USD

Profitability of the backyard broiler enterprises

Profit is the motivation that drives an individual to engage in any economic activity. To a farmer, when his revenue exceeds production costs, he generates a profit and considers his enterprise to be a profitable source of income. However, profits and profitability are two different concepts and, therefore, are not interchangeable. Profitability is a measure of how efficient the farm business is in utilizing its resources to generate a profit. After determining whether profit has been achieved, it is equally important to establish the profitability of the enterprise. The financial condition of broiler production in Koh Kong was evaluated in the context of profit and profitability. The Operating Profit Margin Ratio (OPMR)¹ measures the degree of profitability of an enterprise. Profit (Net Income) as well as the money that is used to pay for the cost of production inputs come from the Gross Revenue of the broiler enterprise. If the profit that a farmer keeps from the Gross Revenue is larger than the fraction that goes to his production cost, his broiler enterprise is considered to be more profitable as compared to another enterprise where the fraction of the gross revenue that is retained as profit is smaller than the portion that is used to cover the cost of production. For instance, a broiler producer with an OPMR of 60% is more profitable than another producer with an OPMR of 20%. The former is more profitable because he retains a larger percentage (80%) of the revenue as profit compared to the latter who gets to keep only 20% of the

¹ OPMR = [Net Cash Income/Gross Revenue] x 100

revenue as profit. On the aspect of costs, the enterprise with a 60% OPMR is using up only 40% of the Gross Revenue to pay for the cost of production inputs. This is relatively smaller than the percentage (80%) that is spent to cover production expenses by the enterprise with a 20% OPMR. The producer with a 60% OPMR is considered to be more efficient in minimizing his/her production cost than the producer that used up 80% of his/her Gross Revenue to cover production costs. The latter incurred a larger cost relative to its output and can, therefore, improve its profitability by lowering its production cost. In the case of the broiler producers, those under the 1 to 50 kg classification generated an OPMR of 52% in 2019 (Table 9). This indicates that the households were able to keep 52% of the Gross Revenue as profit. The remaining 48% of the Gross Revenue was used to pay for the production cost. Based on the discussion above, the broiler enterprises under the 1 to 50 kg category had a profitable operation in 2019. However, their profitability decreased in 2020 as revealed by an OPMR equivalent to 44%. Applying the principle of Economies of Scale, profitability decreased because the operating cost per unit increased from USD 3.00/kg to USD 4.30/kg.

Producers belonging to the 51 to 100 kg category garnered a 50% OPMR in 2019. The 2020 figure (OPMR=36%) was much lower since it was based on the operation of just one producer that happened to be less efficient in managing costs (cost/kg = USD2.90) and sold his broilers at a much lower price (USD 5.00/kg) compared to the other groups.

The households under the > 100 kg grouping were able to achieve an OPMR of 66% in 2019 and 61% in 2020. The decline in OPMR in 2020 happened because the percent increase in their per unit production cost (8.7%) was higher than the increase (6.5%) in their selling price.

Note that the broiler producers under the > 100 kg category surpassed the other groups in terms of profitability. In 2019, producers under the >100kg group generated a 66% OPMR while the other households under the other two categories only achieved a 52% and 50% OPMR. In 2020, the OPMR of enterprises under the > 100 kg was 61% while the OPMR of the other groups were less than 50%. The OPMR values support the earlier observation that broiler producers that raise a larger number of broilers have an advantage over those with a smaller scale of operation due to economies of scale. Those belonging to the first and

second groupings can further improve their profitability by increasing the number of broilers being raised if they have the resources to do so as well as further minimizing their production cost.

Components of cost items in broiler production

The cash costs involved in broiler production included expense items such as feeds, antibiotics, electricity and water. However, each household differed in terms of the items that they spent on. Commercial feeds and electricity turned out to be the largest cost items for the households (Table 10). These were mostly starter feeds given to young chicks as well as a smaller quantity for growers which were mixed with homegrown grains. Water did not contribute significantly as a production cost because most of the households obtain water from deep wells. Vaccine/antibiotics was the least expense item. Labor was not reported as a component of the cash costs since it is mainly provided by the household and, therefore, did not represent any cash out from the family. Depreciation cost of chicken pens is a noncash cost that was included as part of the cost of each household's broiler production. Construction of chicken pens was part of the technology that was recommended by the IIRR/CEDAC project and, therefore, its depreciation cost must be accounted for as a cost item in the financial analysis.

Table 10. Aggregate operating cost of broiler production, Koh Kong Province, 2019 to 2020

Item	2019	2020
Feeds (USD/year)	2,170	3,765
Range (USD/year)	6.20 to 225	3.10 to 356.25
Average (USD/year)	120	149
Vaccine/Antibiotics (USD/year)	40	100
Range (USD/year)	3.25 to 18.75	3.25 to 25
Average (USD/year)	9	14
Water (USD/year)	240	280
Range (USD/year)	32 to 90	32 to 90
Average (USD/year)	53	53
Electricity (USD/year)	1,058	1,150
Range (USD/year)	5 to 210	5 to 210
Average (USD/year)	64	73
Total	3,508	5,295

Broilers consumed at home

Some of the broilers raised were consumed at home. Four households reported that they consumed 70 broilers in 2019. This number increased to 445 birds in 2020 as the number of households who reported their consumption also increased from four to 19. The limited mobility to access food during the COVID-19 pandemic could be one factor that led to the increase in the consumption of broilers at home.

Combined income from farming, broiler production and off-farm sources

Most of the household income of Koh Kong villagers comes from raising crops and livestock. Additional income is generated from off-farm employment. This study conducted a rapid cashflow analysis to determine the liquidity condition of the households based on these income sources and determining the effect of revenue from broiler production. The results showed that there were only 16 out of the 25 households that were studied which had a positive net cashflow. This was based on their revenue from raising crops and livestock in 2020. Eight households were unable to recover their production costs and, therefore, registered a negative cashflow (Table 11). One household did not produce any crop during that year. However, when income from off-farm employment was added to their income from farming, three households out of the eight with a negative Net Cashflow became liquid and increased their cashflow. Two households which suffered losses to farming and reported a negative income generated a positive Net Cashflow due to off-farm employment. In addition, another household that did not engage in farming earned some income from an off-farm job. Table 11 shows that the households' combined Net Cashflow from farming was USD 18,862.00. This increased to USD 42,612.00 (or a 126% increase) after adding the total earnings of USD 23,750.00 from off-farm employment. The effect of broiler production, on the other hand, on household cashflow was then determined by incorporating the income from the sale of broilers (USD 8,003.00) in the cashflow analysis. Broiler sales increased the households' Net Cashflow by 19% and even enabled two other households with a negative Net Cashflow to improve their liquidity condition. The study further revealed that, of the eight households that were in a negative position, only five remained cash strapped in 2020. The diversification effort to include broiler production in their existing sources of livelihood did not trigger a movement from a negative to a positive cashflow situation. The fact is,

these households have already suffered from a huge negative cashflow from farming while receiving only minimal off-farm income. Furthermore, they were classified under the small scale broiler production (1 to 50 kg). Thus, revenue from broiler sales was relatively small and was not enough to help change their cashflow condition.

In summary, the resulting combined net income of households from farming, broiler production, and off-farm sources was USD 50,615.00. These three sources of income helped 20 of the 25 households that were studied to generate a positive Net Cashflow. Five, however, remained with liquidity problems.

Table 11. Combined income from farming, broiler production and off-farm sources, in USD, Koh Kong Province, 2020

Item (USD)	Crops & Livestock*	Off-farm Income**	Total Net Cashflow	% Increase	Broiler Production*	Total Net Cashflow	% Increase
Cash inflow	22,546	23,750			13,924		
Cash outflow	3,684				5,921		
Net cashflow	18,862	23,750	42,612	126%	8,003	50,615	19%
Households with positive net cashflow	16	19			20		
Households with negative net cashflow	8	6			5		
Households with zero cashflow	1						
Total households	25	25			25		

*Households with positive Net income

**19 households

Chick production (Hatchery)

Number of respondents in the chick production survey

Six households that established a hatchery to raise young chicks for sale were interviewed for this study. Five of the households solely produced chicks from layers to be sold to chicken growers. The sixth household combined raising chicks as well as broilers. This particular household was also included in the analysis of broiler production in the previous section of this report.

There were no households that sold eggs to buyers. Hence, egg production was not discussed in this study.



Image 4. Native chick production in Koh Kong province. Source: IIRR-Cambodia

Demographic Characteristics of the Chick Producer-Respondents

Number of persons residing in a household

Five of the respondents who were interviewed had four to six members living in their household (Table 12). The sixth household only had three family members.

Table 12. Number of persons in a household, chick producers, Koh Kong Province, 2020

Persons per household	Frequency	Percent
1 to 3	1	17%
4 to 6	5	83%
Total	6	100%

Age of household members

The members of the households are relatively young. Forty six percent were toddlers and teenagers (Table 13). Most (34%) of the parents were 30 to 39 years old. Only 10% belonged to the 40 to 49 years old age group.

Table 13. Age of household members, chick producers, Koh Kong Province, 2020

Age (Years)	Frequency	Percent
0 to 9	7	24%
10 to 19	6	21%
20 to 29	2	7%
30 to 39	10	34%
40 to 49	3	10%
Total	29	100%

Educational attainment

The highest educational attainment of the adult members of the family was some level of high school education (a husband) while a wife reported that she has a Vocational Training Certificate (Table 14). There were two households where the husband and the wife have some elementary education. Two of the husbands and three of the wives have no formal education. The children were either below school age or were taking up elementary and high school education.

Table 14. Educational attainment by type of household member, chick producers, Koh Kong, 2020

Educational Attainment	Husband	Percent	Wife	Percent	Son/ Daughter*	Others	Total	Percent
No Formal Education	2	40%	3	60%	3	0	8	28%
Some Elementary School	2	40%	2	40%	8	0	12	41%
Completed Elementary Sch.	1	20%	0	0%	3	0	4	14%
Vocational Trng. Certificate	0	0%	1	20%	0	0	1	3%
Some High School	1	20%	0	0%	2	1	4	14%
Total	6	100%	6	100%	16	1	29	100%

Farm characteristics

Farm size

All of the chick producers own the land that they farm. The area of land operated by majority (83%) of the respondents ranged from 1.1 to over 2.1 hectares (Table 15.) One household own a land with an area of less than 1.5 hectares but was not actively producing any crop at the time of the study.

Table 15. Area of land being farmed, chick producers, Koh Kong Province, 2020

Size of farm land	Frequency	Percent
1.1 to 1.5 ha	1	17%
1.51 to 2 ha	2	33%
2.1 ha or more	3	50%
Total	6	100%

Crops and animals raised by chick producers

The households were raising a variety of cash crops including pigs and cattle as their main source of income (Table 16). Majority of the households were growing rice (80%) and wax gourd (60%). The other crops being raised were corn, long beans, cucumber, eggplant and

water spinach. There were two households that were raising pigs and one household was raising cattle.

Table 16. Crops and livestock raised by households, chick producers, Koh Kong province, 2020

Crops/Livestock Raised	Frequency*	Percent**
Rice	4	80%
Corn	1	20%
Long beans	1	20%
Cucumber	0	0%
Eggplant	1	20%
Wax gourd	3	60%
Water spinach	1	20%
Pigs	2	40%
Cattle	1	20%
Total	14	

*Multiple responses

**Percent of 5 households, 1 household was not farming

Income from crops and livestock

Four households earned a profit of USD 2,951.00 from raising crops and livestock in 2020 (Table 17). On the average, each of these household generated a Net Income of USD 590.00. The per household income ranged from USD 185.00 to as much as USD 1,773.00. One household failed to generate a profit from farming while another did not produce any crop during that year.

Table 17. Income from crops and livestock, chick producers, Koh Kong Province, 2020

Item	Amount	Average	Range
		USD	
Gross revenue	3,545	709	
Total cash cost	594	119	
Net income	2,951	590	185 to 1,773
No. households with positive net income	4		
No. households with negative net income	1		
Not farming	1		
Total households	6		

Off-farm sources of income

Several household members among the chick producers supplemented their farm income by putting up a micro-grocery store or by taking non-farm jobs. Five households (83%) reported that they were operating a micro-grocery store (Table 18). The estimated combined net earnings of these stores was USD 1,605.00 in 2020. Two households had family members earning income from working off-farm as part-time laborers and/or as skilled employees. Another household had a member that was employed as an unskilled worker. Part-time work as well as skilled and unskilled employment enabled these households to earn an additional income amounting to USD 980.00.

Table 18. Off-farm sources of income, chick producers, Koh Kong, 2020

Off-farm sources of income	No. Households*	Percent**	Total Income (USD)
Microbusiness	5	83%	1,605
Casual/Part time labor	2	33%	150
Unskilled employment	1	17%	80
Skilled employment	2	33%	750
Total	10		2,585

*Multiple responses

**Based on 6 households

Income from chick production

In 2019, chicks sold by three households ranged from 500 to as much as 5,400 birds or a total of 10,700 pieces. The young birds were sold at USD 1.25 per piece (Table 19). The combined Net Income amounted to USD 10,136.00 and ranged from USD 529.00 to USD 5,470. By 2020, six households were able to sell young chicks. The quantity sold varied from 550 to 3,600 birds at a price of USD 1.25 to USD 1.50 per piece. The Net Income generated by the households ranged from USD 554.00 to as high as USD 3,814.00.

Commercial grower feeds was the major cost item in raising young chicks. These were used to supplement the feeds that the young flock could find through scavenging. Electricity cost was minimal because most of the incubators used by the households operate using solar powered cells. Depreciation cost was based on the depreciation of the chicken cages including the incubators of households that invested in one. The household with the smallest flock size allow the layers to hatch their eggs instead of investing in an incubator.

Note that production cost per unit among the households tended to decrease as volume of sales increased (except for one household, PRO004) (Figure 4). Just like the broiler producers, the households with a larger number of chicks raised and sold were able to attain certain degrees of economies of scale.

Using the OPMR as a gauge, all the hatcheries were found to be profitable. The lowest ratio was 64% while the highest OPMR that was recorded was in 2019 where one household (PRE001) achieved an OPMR of 85%.

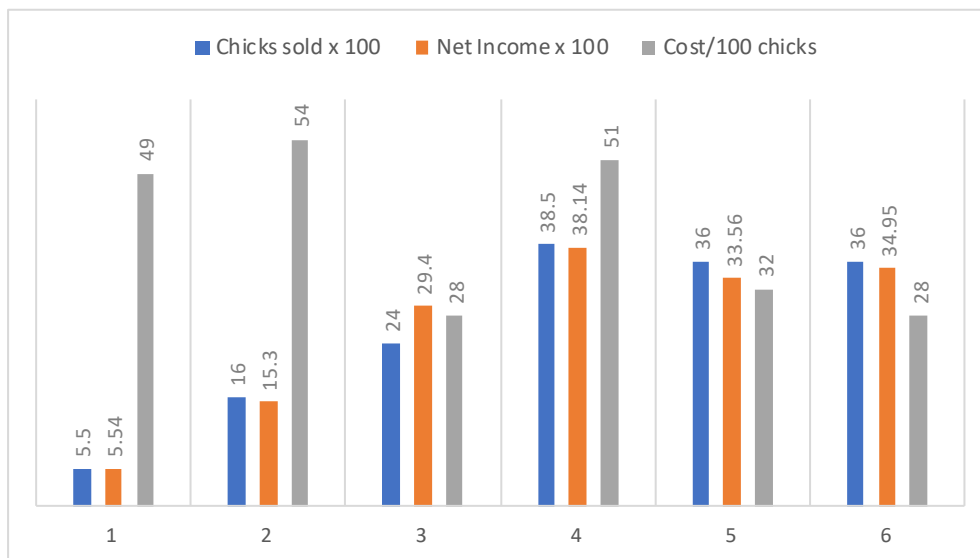


Figure 4. Volume of sales (chicks), Net Income (USD), cost/100 chicks, Koh Kong province, 2020

Table 19. Net cash income of hatcheries, in USD, Koh Kong province, 2019 to 2020

Respondents	CHH002	CHH001	PRE001	PRO004	Chytreh001	Koki001	Total
Chicks sold (heads)							
2019	0	0	500	0	4,800	5,400	10,700
2020	550	1,600	2,400	3,850	3,600	3,600	13,450
Selling price (USD/head)							
2019	0.00	0.00	1.25	0.00	1.25	1.25	3.75
2020	1.50	1.50	1.50	1.50	1.25	1.25	5.50
Gross revenue (USD) 2019							
	0	0	625	0	6,000	6,750	13,375
2020							
	825	2,400	3,600	5,775	4,500	4,500	18,375
Production cost (USD)							
Feeds and vaccines							
2019	0	0	11	0	798	315	1,124
2020	211	690	297	1,061	814	255	2,427
Water							
2019	0	0	20	0	350	750	1,120
2020	60	180	90	0	330	750	1,170
Electricity							
2019	0	0	0	0	0	0	0
2020	0	0	450	450	0	0	900
Total cash cost 2019							
	0	0	31	0	1,148	1,065	2,244
2020							
	271	870	211	1,511	1,144	1,005	3,871
Depreciation cost							
	148	173	65	427	288	214	994
Total production cost							
2019	0	0	96	0	1,436	1,280	3,239

Respondents		CHH002	CHH001	PRE001	PRO004	Chytreh001	Koki001	Total
2020		271	870	661	1,961	1,144	1,005	4,771
Net income (USD)								
2019		0	0	529	0	4,564	5,470	10,136
2020		554	1,530	2,939	3,814	3,356	3,495	13,604
OPMR	2019			85%		76%	81%	76%
	2020	67%	64%	82%	66%	75%	78%	74%
Production cost per unit (USD/chick)								
2019		0.00	0.00	0.19	0.00	0.30	0.24	0.30
2020		0.49	0.54	0.28	0.51	0.32	0.28	0.35

Effect of income from chick production, farming, and off-farm sources on the combined cashflow of chick producers

The main source of livelihood of the six households that established hatcheries to raise young chicks is farming. They supplemented their income by taking off-farm jobs. A rapid cashflow analysis conducted by this study showed how these households fared in generating financial resources from their economic activities in 2020. The results revealed that four of the households were able to generate some cash (positive net cashflow) from raising crops and livestock (Table 20). On the other hand, one household was unsuccessful in recovering its production cost, thereby bringing about a negative net cashflow. The sixth household did not raise any agricultural crop or livestock during that year. Thus, the total net cashflow generated by the households from farming amounted to USD 2,951.00. Off-farm income helped in improving the cashflow of all households. Total net cashflow increased by 88%, i.e., from USD 2,951.00 to USD 5,536.00, with all six households exhibiting a positive financial position after adding the income from off-farm jobs. When the net income from chick production was added, the households' net cashflow significantly increased by 246%. The combined net income from raising chicks was USD 13,604.00 (18,375.00 less 4,771.00). Adding this amount to USD 5,536.00 resulted in a total net cashflow of USD 19,140.00.

Table 20. Combined income from farming, chick production and off-farm sources, in USD, Koh Kong Province, 2020

Item (USD)	Crops and Live-stock	Off-Income*	Total Net Cash-flow	% Increase	Chick Production	Total Net Cash-flow	% Increase
Cash inflow	3,545	2,585			18,375		
Cash outflow	594				4,771		
Net cashflow	2,951	2,585	5,536	88%	13,604	19,140	246%
Households with positive cashflow	4	6			6		
Households with negative cashflow	1						
Households with zero cashflow	1						
Total households	6	6			6		

*6 households



Image 5. A local from Koh Kong province feeding native chickens. Source: IIRR-Cambodia

Conclusion and recommendations

Native chicken breeds were selected for this enterprise effort primarily because native breeds are climate hardy, and relatively disease tolerant. Climate resilient poultry enterprises also involve the use of local housing (low ambient temperatures), low cost feeding regimes devoid of hormones and antibiotics. These approaches were designed to showcase examples of low carbon footprint enterprises in rural areas. To a certain degree, resilience to changing climates was achieved by using locally sourced natural materials for chicken housing, low cost feeds and use of native breeds of chicken. Local food systems are strengthened by enhancing the supply of meat via production systems that are locally scalable. Financing mechanisms such as that provided by local savings and financing groups were adequate, as credit negotiations were handled within the community itself. Local financing mechanisms were important factors in ensuring that certain levels of local scaling was achieved. These enterprises and credit sources were women friendly and provide equal opportunities to both men and women.

Native chicken farming, whether it is broiler production or hatching young chicks, provides supplemental income to households. The financial analysis of broiler production under the IIRR-CEDAC project consisted of 25 households whose main livelihood is growing rice and vegetables. Several of these households also raise livestock. Majority have household members that hold off-farm jobs to supplement income from farming. The technical assistance of the IIRR-CEDAC project regarding chicken farming gave the households an opportunity to explore the broiler production and hatchery enterprises thereby providing additional income to augment their limited cashflow.

Broiler production was found to be generally profitable. Except for one household that failed to generate a profit, the average Net Income earned by the broiler producers in 2019 was USD 108.00 among those that sold 1 to 50 kg of broilers, USD 235.00 among producers that sold 51 to 100 kg, and USD 698.00 for those that sold >100 kg of broilers. The Net Income received by the households ranged from USD 8.00 to as much as USD 1,809.00 depending on the volume of sales. In 2020, the average Net Income earned by the households that belonged to the first group was USD 89.00, while those under the second category earned a Net Income of USD 171.00. The households under the third group generated an average Net

Income of USD 847.00. Two households failed to make a profit from raising broilers while another two households did not report any sales in 2020. The households with a negative profit belonged to the group that sold 1 to 50 kg of broilers.

The average Net Income in 2019 and 2020 displayed an increasing trend as the volume of sales increased. Conversely, the production cost per kilogram of broiler sold decreased as the volume of sales increased. The households that raised and sold the largest number of broilers (> 100 kg) benefited the most in terms of a higher Net Income because their production cost per unit was much smaller than the other households which sold a lesser number of broilers.

Profitability, using OPMR as a gauge, was highest among households that belonged to the >100 kg category when compared to the other groups. They garnered a 66% and 61% OPMR in 2019 and 2020, respectively. In contrast, the other two groups generated an OPMR of 52% and 50% in 2019 and then 44% and 36% in 2020. Since the OPMRs are directly related to the production cost of an enterprise, it is logical to expect that the broiler producers with the lowest production cost per unit would generate a higher OPMR value.

Hatchery was adopted by six households that are likewise raising crops and livestock. There was one household that opted to raise chicken both for broiler production and to hatch young chicks. All of these households have several members who earn income from off-farm employment. Raising young chicks seemed to provide these households a substantial increase in their total income. This was particularly evident in 2020 when all of the households started the hatchery operation. The total Net Income reached USD 13,604.00 and registered an OPMR of 74%. This OPMR figure is relatively high and indicates that a large portion of the profit is kept by the households relative to their production expenses.

The Net Income and production cost per unit of households that sold young chicks displayed similar movements as the ones observed from the operation of the broiler producers. Net Income demonstrated an increasing trend while production cost per unit decreased as the number of young birds sold increased. The OPMR values followed the increasing movement of the Net Income.

While generating a profit can be expected regardless of the size of the flock being raised, the Koh Kong households that are involved in native chicken production should be made aware that greater benefits can be attained from raising a larger flock size. This is possible because the fixed cost and, to some extent, the variable cost decrease as the unit of production increases (principle of economies of scale). The data generated by this study validated this economic principle. Furthermore, the risk of losing more money to diseases with a bigger flock is lesser for native chicken raisers because local breeds are more resistant to diseases than the imported ones. In addition, variable costs (specifically, feed costs) do not increase directly as the flock size increases because the native breeds can survive through scavenging and commercially available feeds are only used as supplements. Constraints in resources (eg., available capital, land area for expansion of flock population, family labor) may serve as limits to flock expansion. However, expansion should be pursued within the boundaries of the household's available resources.

Broiler production and chick hatchery are useful enterprises to supplement the meager household income. They complement the existing economic activities of the village households such as growing crops and raising livestock. Some farm produce such as rice brokens and corn grits and left-over vegetables can be used as feeds for the chicken. Chicken production is also a good source of food and nutrition for the family. The study revealed the positive outcomes of the native chicken production project even during its infancy stage. It is still a work in progress and, outscaling activities, more households can be benefitted by this climate change resilience project.

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Information Resources

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Authors: International Institute of Rural Reconstruction and Cambodian Center for Study and Development in Agriculture
Date: 2019-01-12
Type: Brochure
Link: <http://bit.ly/3a04mkD>
2. Unleashing the Entrepreneurial Potential in Rural Cambodia: Native Chicken Production (Chicken brief)
Authors: International Institute of Rural Reconstruction and Cambodian Center for Study and Development in Agriculture
Date: 2019-09
Type: Brief
Link: <http://bit.ly/3pkBmKY>
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Authors: International Institute of Rural Reconstruction and Cambodian Center for Study and Development in Agriculture
Date: 2018-08
Type: Brief
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Type: Brief
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5. ADB BCC Policy Briefs 2020
 - a. Small Livestock: Climate-smart, Environmentally Sound, Economically Empowering, Gender-fair and Transformative Agricultural Enterprises in Cambodia
Authors: International Institute of Rural Reconstruction; Cambodian Center for Study and Development in Agriculture
Date: 2020-12-21
Type: Brief
Link: <https://hdl.handle.net/10568/111538>
 - b. Resilience Building against Climate Risks and Impacts at Local and Community Levels: A Role for Local Financing Mechanisms

Authors: International Institute of Rural Reconstruction; Cambodian Center for Study and Development in Agriculture

Date: 2020-12-21

Type: Brief

Link: <https://hdl.handle.net/10568/111540>

c. Ecosystems-Based Adaptation in the Forest and Agriculture Interface:

Operationalizing Action in Mondulkiri and Koh Kong

Authors: International Institute of Rural Reconstruction; Cambodian Center for Study and Development in Agriculture

Date: 2020-12-21

Type: Brief

Link: <https://hdl.handle.net/10568/111541>



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