

FINANCIAL ANALYSIS FOR HIGH-VALUE AGRICULTURE LIVELIHOODS FOR ANGKOR BOREI

I. THE PROJECT

1. The proposed Community Based Tourism COVID-19 Recovery Project will help accelerate post-coronavirus disease (COVID-19) recovery in rural communities living near Preah Vihear (Preah Vihear province) and Phnom Da (Takeo province) heritage sites. The project aims to (i) strengthen local capacity for inclusive community-based tourism (CBT) development and promotion; (ii) support tourism and commercial agricultural livelihood activities; and (iii) enhance community-based public facilities and services. Initially, the project will promote domestic tourism, which is less affected by COVID-19 related travel restrictions. As Cambodia's borders open to international travel the project focus will shift to promoting intra-regional tourism.

II. KEY FINDINGS ON AGRICULTURE FEASIBILITY STUDY

A. Existing and potential vegetables cultivation in Phnom Da of Angkor Borei district

2. Angkor Borei district is a seasonal water-based district of which the district is sourced the water from the main canal 15. Villagers of the district are mainly growing dry rice farming with additional vegetables plantation, livestock, and fishing. In term of vegetables cultivation, the existing crops include watermelon, cucumber, soybean, lemon grass, chili, ginger, cabbage, and morning glory. However, only cucumber, watermelon and lemon grass which are the commercial purpose cultivation while the rest are only homestead production. Based on the consultation with District Office of Agriculture, Forestry and Fisheries and the District Governing Board on the 3rd September 2020, there one most potential vegetables production recommended based on the nine assessment criteria (See Box 1. Explanation of the criteria). Watermelon selection has been validated and verified with commune and village authorities as well as in-depth discussion with key farmers from Angkor Borei (See Table 1).

Box 1. Explanation of the assessment criteria

1. Seed access: To what extent that vegetables seed could be easily accessed in the community?
2. Production cost: Is the production cost for the vegetables are low?
3. Uniqueness: Do the vegetables consider as the unique product of the village or Preah Vihear province?
4. Land & Climate Change Adaptation: Does the vegetables cultivation have less negative impact on land degradation?
5. Market Price: Whether the market price for vegetables is good?
6. Market demand: Do the vegetables are hugely needed in the village or surrounding areas?
7. Water economy: Does the vegetables cultivation consume less irrigated water?
8. Consumer's preference: Do the people in the village or surrounding areas prefer to consume these vegetables?
9. Women's economic empowerment: Is that the vegetables cultivation that women could effectively involved and managed?

3. The assessment used the scoring system from 1 point – 5 points of which 1 is the lowest score and 5 is the best score. The participants from District Office of Agriculture, Forestry and Fisheries and authorities are requested to select the most relevant points and put in the criteria.

Table 1: Assessment of potential vegetables in Phnom Da, Angkor Borei

Vegetables and crop	Assessment Criteria (Score from 1 lowest - 5 best)									Total score points
	Seed	Production cost	Uniqueness	Land & CC adaptation	Price	Demand	Water economy	Preference	WEE	
Maize (food)	2	2	3	3	2	2	3	2	4	23
Cassava	1	2	2	2	1	1	2	2	3	16
Sweet potato	3	2	2	3	2	2	3	3	3	23
Cucumber	3	3	2	3	3	4	2	3	3	26
Bitter melon	1	2	2	2	1	1	2	2	3	16
Long bean	2	2	3	3	2	2	3	2	4	23
Peanut	1	3	2	3	3	3	2	2	4	23
Eggplant	1	2	2	2	1	1	2	2	3	16
Cabbages	2	3	2	2	2	2	1	2	3	19
Watermelon	4	4	5	3	4	5	2	5	4	36
Tomato	2	2	3	3	2	2	3	3	3	23
French soybean	1	3	3	3	3	3	2	3	3	24
Pumpkin	1	2	2	2	1	1	2	2	4	17
Morning glory	2	2	3	3	2	2	2	2	4	22
Carrot	1	1	1	2	4	2	3	2	3	19
Lemon grass	4	4	2	3	2	2	3	3	3	26
Ginger	2	3	3	2	3	4	2	3	3	25
Onion	1	2	2	3	2	2	3	3	3	21
Chili (local)	4	2	3	3	2	2	3	2	4	25

B. Existing and potential livestock and aquaculture in Phnom Da, Angkor Borei

4. The prioritization of the livestock production in Angkor Borei is applied the same procedure and methods as vegetables cultivation with District Office of Agriculture, Forestry and Fisheries and local authority's verification. The result confirmed one prioritized livestock production is free range chicken (local breed). In term of aquaculture, the most significant production is freshwater prawn.

Table 2: Assessment of potential livestock in Phnom Da, Angkor Borei

Livestock production	Assessment Criteria (Score from 1 lowest - 5 best)									Total score points
	Seed	Production cost	Uniqueness	Land & CC adaptation	Price	Demand	Water economy	Preference	WEE	
Free range chicken	5	3	4	5	4	4	4	5	5	39
Hybrid chicken	3	2	3	5	5	3	4	3	5	33
Broiler	3	2	2	4	5	2	3	3	4	28
Domestic pig	3	2	3	2	2	3	3	3	4	25
Hybrid pig	2	1	2	2	2	2	3	2	4	20
Wild pig (hybrid)	1	1	2	2	3	3	3	3	4	22

Table 3: Assessment of potential aquaculture in Phnom Da, Angkor Borei

Aquaculture or Fish raising	Assessment Criteria (Score from 1 lowest - 5 best)									Total score points
	Seed	Production cost	Uniqueness	Land & CC adaptation	Price	Demand	Water economy	Preference	WEE	
Tilapia	2	4	2	3	2	3	3	2	3	24
Silver barb	1	3	3	3	3	3	3	3	3	25
Clarias	1	3	2	3	3	3	3	2	3	23
Frog	1	2	3	3	4	3	3	2	4	25
Freshwater Prawn	3	3	5	3	5	5	3	5	4	36

C. Analysis of production chains of vegetables and plants in Angkor Borei village

1. Watermelon

1.1 Input materials and costs

5. The analysis of watermelon cultivation is based on randomly consultation with villagers who are currently producing the watermelon in Prek Taphor village of Angkor Borei. The input materials of watermelon cultivation are easily access especially from Angkor Borei market (the district central market) such as fertilizer (both fruit and white fertilizer – chemical fertilizer), worn pesticide, tens and drip irrigation pipe (pipe with holes) except the good quality of watermelon seeds that farmers need to purchase from Prey Lvea market of Prek Kabas district. Besides these materials, farmers could easily find power tiller for plough and 10 laborers for supporting the harvesting job for one day per one cycle. Farmers in Angkor Borei do not use any diesel water pumping machine (upgrade) machine but manual water pumping machine. The cost of input materials for one year of watermelon cultivation is based on the current market price with the size of operation: 0.8 ha of cultivated land and 3 cycles of production. The detailed input costs are as below:

Table 4: Input costs for watermelon cultivation in 1 year (3 cycles)

Input material items	Unit/size	Quantity	Unit cost USD	Total cost USD	Duration of Usage	Depreciation or calculated to 1-year production	Total cost USD
Seed	Box	12 boxes	8	96	1 cycle	288	288
Tens	Roll	9 rolls	13.75	123.75	3 cycles	123.75	123.75
Fertilizer (fruit)	Box	3 boxes	30	90	1 cycle	270	270
Fertilizer (white)	Box	2 boxes	18.75	37.50	1 cycle	112.5	112.5
Pesticide	Time	6 times	15	90	1 cycle	270	270
Water pipe (with hole)	Roll	7 rolls x 100 meters	10.50	73.50	3 cycles	73.50	73.50
Water Tank	Tank (5000 liter)	1	1	500	5 years	100	100
Water pumping machine	Set	1 set	300	300	9 cycles or 3 years	100	100
Water pumping cost (50	USD/hour	20 hours per week or 140 hours	1.125	157.5	1 cycle	472.5	472.5

Input material items	Unit/size	Quantity	Unit cost USD	Total cost USD	Duration of Usage	Depreciation or calculated to 1-year production	Total cost USD
days or 7 weeks for 0.8ha)		per 7 weeks					
Labor for harvesting	Person day	10	7.5	75	1 cycle	225	225
Total input costs						2030.25	2030.25

6. The investment capital for watermelon cultivation is estimated USD 2030.25 per year for three harvesting times. This investment is taken from the Agriculture Cooperative loan combined with family's saving.

Table 5: Alternative input cost for watermelon cultivation for 1 year (3 cycles) with diesel water pumping machine (upgrade)

Input material items	Unit/size	Quantity	Unit cost USD	Total cost USD	Duration of Usage	Depreciation or calculated to 1-year production	Total cost USD
Seed	Box	12 boxes	8	96	1 cycle	288	288
Tens	Roll	9 rolls	13.75	123.75	3 cycles	123.75	123.75
Fertilizer (fruit)	Box	3 boxes	30	90	1 cycle	270	270
Fertilizer (white)	Box	2 boxes	18.75	37.50	1 cycle	112.5	112.5
Pesticide	Time	6 times	15	90	1 cycle	270	270
Water pipe (with hole)	Roll	7 rolls x 100 meters	10.50	73.50	3 cycles	73.50	73.50
Water Tank	Tank (5000 liter)	1	1	500	5 years	100	100
Diesel water pumping machine (upgrade)	Set	1	1	300	3 years	100	100
Diesel cost	Lumpsum	1	67	67	3 cycles	67	67
Labor for harvesting	Person day	10	7.5	75	1 cycle	225	225
Total input costs						1629.75	1629.75

7. Alternatively, if the farmer would apply diesel water pumping machine (upgrade) to irrigate water for watermelon, the investment capital for watermelon cultivation is estimated USD 1629.75 per year for three harvesting times.

1.2 Technical capacity

8. There are totally 15 farmers with the average land size of 0.8 ha who grow watermelon in the whole Angkor Borei site but only 3 coming from Prek Taphor village of which they obtained the technical capacity from Youtube and Facebook platform although there is an Agriculture Cooperative established by PDAFF ASPIRE program. Farmers have not participated in any official trainings by the government's or development agency's project.

1.3 Production calendar

9. The watermelon cultivation is done 3 cycles per annual after rice cultivation from January to June of the year (dry season). The production period for watermelon is 50 days.

Table 6: Calendar of watermelon cultivation

Vegetables	Year											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Watermelon cultivation	xxx	xxx	xxx	xxx	xxx	xxx	x	x	x	x	x	x

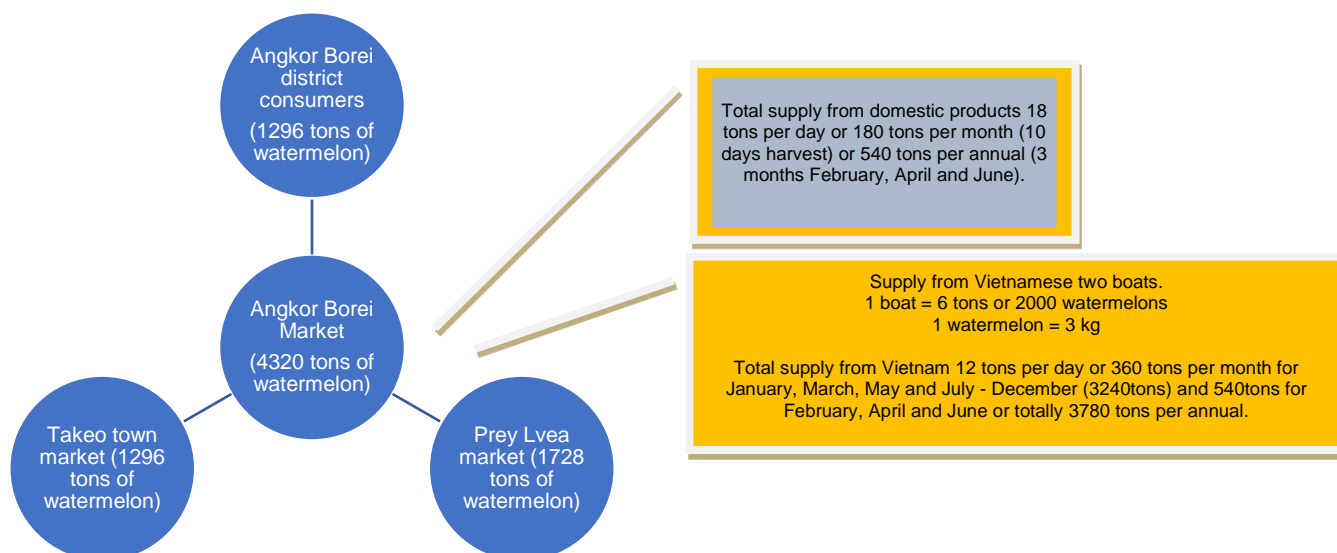
10. Although the farmers could grow watermelon with six months period of the year, they could harvest only three times including February, April, and June within an average production of 12 tons per cycle per family (12 tons x 15 families x 3 cycles = 540 tons per annual). The duration of watermelon production is 50 days to be ready for harvesting. Every cycle of 50 days, the farmers could harvest around 10 days non-stop.

Table 7: Calendar of watermelon harvesting time along the year

Vegetables	Year											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Harvest watermelon (ton) per day for 1 farmer with 0.8 ha of land	0	1.2	0	1.2	0	1.2	0	0	0	0	0	0
Harvest watermelon (ton) per 10 days for 1 farmer with 0.8 ha of land	0	12	0	12	0	12	0	0	0	0	0	0
Harvest watermelon (ton) per day for 15 farmers	0	18	0	18	0	18	0	0	0	0	0	0
Harvest watermelon (ton) for 10 days for 15 farmers	0	180	0	180	0	180	0	0	0	0	0	0

1.4 Market demand and supply

11. The market demand for watermelon of the whole Angkor Borei market is huge of which watermelon products are consumed around 12 tons per days or equivalent to 4320 tons per annual. These 4320 tons of watermelon (including both domestic production 540 tons and import watermelon from Vietnam 3780 tons) are distributed to three different markets including 1296 tons for Angkor Borei market (30%), 1296 tons for Takeo town (30%) and 1728 tons (40%) for Prey Lvea market of Prey Kabas district.



12. Due to the limited production and supply from the different locations such as Prey Lvea

and Angkor Borei itself from January to June of the year; the watermelon is imported from Vietnam by 2 giant boats replaces the demand gaps which is approximately 360 tons per month for January, March, May, and July to December (Totally 3780 tons per annual) with the price of USD0.325/kg or 1300 Khmer Riel and 180 tons per month for February, April and June of the year (Totally 540 tons per annual). However, during the period of February, April and June of the year once the 15 farmers could produce 180 tons per month of the watermelon, the market supply is surplus and price is going down compared to the demand of the rest 9 months therefore farmers have to transfer the watermelon to sell in Takeo town and Prey Lvea market to keep better price of USD0.275/kg or 1100 Khmer Riel (See Table 8).

Table 8: Market demand and supply for watermelon along the year

Vegetables	Year											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Demand for watermelon for entire Takeo province (ton)	360	360	360	360	360	360	360	360	360	360	360	360
Watermelon supply from Angkor Borei – Khork Thlorok commune (ton) ¹	0	180	0	180	0	180	0	0	0	0	0	0
Market Gap or Surplus (ton)	360	180	360	180	360	180	360	360	360	360	360	360
Watermelon supply from Vietnam (ton)	360	180	360	180	360	180	360	360	360	360	360	360

1.5 Water consumption and cost

13. The water consumption is around 240 cubic meters per week or 1680 cubic meters per cycle (240 cubic meters per week x 7 weeks irrigating water per cycle equals to 1680 cubic meters) or 5040 cubic meters per annual within six months production (3 cycles) for 0.8 ha of irrigated land for watermelon and it costs USD472.5 for gasoline and USD200 for pumping machine and water tank per 3 cycles of production (See Table 10. Volume and cost of water). Therefore, the difference between using diesel water pumping machine (upgrade) and ordinary system to pump the water is USD405.5 per annual production of watermelon. However, farmers are not well introduced about the diesel water pumping machine (upgrade) system application as well as they are not confidence in maintenance the system. However, poor farmers are not affordable to purchase at the beginning of the production (total cost of diesel water pumping machine (upgrade) and water tank is USD1000 while ordinary cost only USD800 excluding the gasoline cost).

Table 9: Water volume and cost for watermelon along the year

Vegetables (0.8ha of land)	Cost for diesel water pumping machine (upgrade) (USD)		Cost of ordinary Pumping (USD)		
	Diesel water pumping machine (upgrade) and diesel cost	Water tank	Pumping machine	Water tank	Gasoline
5040 cubic meters of water for 0.8 ha of watermelon cultivated land	167	100	100	100	472.5
Comparative cost	267		672.5		

1.6 Return of internal investment analysis

14. The return of internal investment for one farmer watermelon cultivation could be confirmed

¹ Watermelon harvest from 15 families within 10 days length of which 1 day for 15 families could harvest 12 tons.

that positive based on the water quality and market preference of local consumers. The total cost of investment during the period of one year or three cycles of watermelon cultivation is USD 2030.25 covering system, equipment, materials, laboring fee and other related costs. Compared to the three times harvesting productivities of 36 tons (each farmer could produce 12 tons per cycle with 0.8 ha of land, therefore, each farmer could produce 36 tons per annual) with 10% of production loss, farmers could sell watermelon around 32.4 tons² to three different markets (Takeo town, Angkor Borei market and Prey Lvea market) with the price of USD0.275 or 1100 Khmer Riel per kilogram. Thus, total gross income whole year of each watermelon farmer is USD8910 therefore the annual net profit is USD6879.75. However, if the farmers apply diesel water pumping machine (upgrade) for pumping water to irrigate the watermelon, the margin of profit supposes to be USD7280.25 per annual (See Table 10).

Table 10. Economic return for watermelon cultivation in one year

Input material items	Unit/size	Quantity	Unit cost USD	Total cost USD	Duration of Usage	Depreciation 1 year	Total cost USD
Seed	Box	12 boxes	8	96	1 cycle	288	288
Tens	Roll	9 rolls	13.75	123.75	3 cycles	123.75	123.75
Fertilizer (fruit)	Box	3 boxes	30	90	1 cycle	270	270
Fertilizer (white)	Box	2 boxes	18.75	37.50	1 cycle	112.5	112.5
Pesticide	Time	6 times	15	90	1 cycle	270	270
Water pipe (with hole)	Roll	7 rolls x 100 meters	10.50	73.50	3 cycles	73.50	73.50
Water Tank	Tank (5000 liter)	1	1	500	5 years	100	100
Water pumping machine	Set	1 set	300	300	9 cycles or 3 years	100	100
Water pumping cost (50 days or 7 weeks for 0.8ha)	USD/hour	20 hours per week or 140 hours per 7 weeks	1.125	157.5	1 cycle	472.5	472.5
Labor for harvesting	Person day	10	7.5	75	1 cycle	225	225
Total input costs						2030.25	2030.25

Total economic return			
Description	Unit	Qty	Amount
Total production yields	Time	3	36 tons
Total production loss or gap	%	10	3.6 ton
Total production sale in Feb, Apr and Jun (including 10% loss)	Time	1	32.4 tons
Product price in Feb, Apr and Jun	Kg	1	USD 0.275
Total gross income from in 3 periods (Feb, Apr and Jun) – whole year	Kg	32400	USD8910
Option A: Total investment cost whole year by ordinary water pumping	USD2030.25		
Total net income whole year by ordinary water pumping	USD6879.75		

² 36 tons per farmer per annual (3 production cycles) with 10% production loss, the watermelon production sale is 32.4 tons per each farmer.

Option B: Total investment cost whole year by sdiesel water pumping machine (upgrade)	USD1629.75
Total net income whole year by diesel water pumping machine (upgrade)	USD7280.25

1.7 Production challenges

15. The 15 consulted watermelon farmers reported that market preference of the watermelon is quite potential for domestic products as well as the nutrient of land in Angkor Borei is quite fit with the watermelon production as it is part of Mekong Delta system. Also, the productive land is surrounding by natural water. However, the cost of pumping water for irrigating watermelon, input supplies are not easily access of which it needs to purchase from Prey Lvea market or Koh Thom district for better quality. Although the watermelon product in Angkor Borei is preferred by either Angkor Borei villagers or other locations such as Takeo town and Prey Lvea, still farmers can't produce during the rest six months due to water level is rising up. Furthermore, the technical production is not well introduced by PDAFF or Office of Agriculture, Forestry and Fisheries especially the organic production with high productivity (current production yield is 36 tons per 0.8ha while the standard is 80 tons per ha), water economy technology, and climate resilience technique such as diesel water pumping machine (upgrade). Farmers still apply the chemical substances which caused the lower price than natural ones (organic watermelon price is USD0.325 per kilogram. Moreover, limited number of farmers who could produce enough watermelon to supply in the market which allow the chance of imported watermelon from Vietnam to supply almost along the year. There are many potential opportunities for watermelon cultivation which could help farmers in Angkor Borei to generate huge income for the family if the project could connect to vegetables wholesale company such as Natural Agriculture Village (NAV) where they could buy the product from farmers to sell in Phnom Penh in case that farmers' products are aligned with Good Agriculture Product (GAP) and Participatory Monitoring System (PGS) of the company with better price of USD0.325 per kilogram. Furthermore, the huge demand for watermelon consumption by local tourists at the Museum as well as different restaurants for the whole year period.

Table 11: Intervention Arrangement for Watermelon

Intervention logic	Addressed issues	Beneficiaries	Responsibilities
Diesel water pumping machine (upgrade) system	<ul style="list-style-type: none"> High water cost Time spent in water irrigation of women and men Climate resilience 	<ul style="list-style-type: none"> 20 farmers including existing and new inspired farmers The 20 farmers must compose by poor families and at least 30% of female headed households/female farmers. 	<ul style="list-style-type: none"> Farmers are subjected to co-finance the other operational cost such as access to seed and other input materials (USD1289.25 for 0.8ha of land after deduction of water tank and diesel water pumping machine (upgrade) – Table 5) and land space The project supports diesel water pumping machine (upgrade) system cost depending on the size of production Farmers and project personnel will coordinate with suppliers for equipment maintenance manual/guide as well as amortization.
Drip irrigation system	<ul style="list-style-type: none"> High cost for water pumping Saved water consumption 	<ul style="list-style-type: none"> 20 farmers including existing and new inspired farmers The 20 farmers must 	<ul style="list-style-type: none"> Farmers are subjected to co-finance the other operational cost such as access to seed and other input materials

Intervention logic	Addressed issues	Beneficiaries	Responsibilities
		compose by poor families and at least 30% of female headed households/female farmers.	(USD1289.25 for 0.8ha of land after deduction of water tank and diesel water pumping machine (upgrade) – Table 5) and land space <ul style="list-style-type: none"> The project supports drip irrigation system cost depending on the size of production Farmers and project personnel will coordinate with suppliers for equipment maintenance manual/guide as well as amortization.
Technical training, follow up on watermelon production	<ul style="list-style-type: none"> Low productivity Low number of farmers producing watermelon due to lack of appropriate skills such as PGS, seed selection, caring etc. 	<ul style="list-style-type: none"> 20 farmers including existing and new inspired farmers The 20 farmers must compose by poor families and at least 30% of female headed households/female farmers. Family members of 20 farmers who received echo-coaching. 	<ul style="list-style-type: none"> Natural Agriculture Village (NVA) under project support, provide capacity building for 2 courses together with several follow up coaching to 20 farmers on PGS for watermelon. Farmers are subjected to participate and implement the watermelon productions.
Facilitating market access through contract farming	<ul style="list-style-type: none"> Lower sale price of watermelon Lack of access to market 	<ul style="list-style-type: none"> 20 farmers including existing and new inspired farmers The 20 farmers must compose by poor families and at least 30% of female headed households. Family members of 20 farmers who participate in production Other villagers who grow watermelon 	<ul style="list-style-type: none"> NAV under the project support shall visit, check and establish contract farming with clear instruction to farmers on the quality of required watermelon. Farmers are subject to follow the PGS and purchasing standard.

2. Free range local chicken

2.1 Input materials

16. The chicken production in the Angkor Borei as other surrounding tourism areas is very popular and almost every household raising chicken but only for household subsistence (in average 10 heads of chicken) especially free-range chicken – local breed, which is 100% based on the 18 farmers consultation. However, chicken raising families who are raising chicken for commercial purpose are 10 families (300 heads). The consultation with chicken raising families identified series of input materials deployment in order to raise local breed free range chicken including finish feed, homemade feed (rice husk, broken rice and vegetables), vaccine, medicine, chicken house, small water cup, water well, water pumping machine and pipe, water and cost. The input materials are locally available including chick buys from chick producer in Angkor Borei (3 chick producers in Angkor Borei – Prey Phkom commune which is approximately 20km from the district central point), broken rice and rice husk buys from rice miller in Angkor Borei, chicken house built by their own with bought wooden/bamboo except the pumping machine, pipe, water

cup and vaccine is bought from the market. Most importantly, access to chick is a constraint although there are 3 producers but living far from Phnom Da or Prek Taphor village together with high cost of purchasing (USD1 per chick without vaccination).

17. The cost of input materials chicken production is based on the current market price with the size of production in average 300 heads of chicken and 3 chicken houses – big chicken house size 40 cubic meters (4 m x 5 m x 2 m) and 2 small chicken houses size 0.72 cubic meter (1 m x 1.2 m x 0.6 m) with duration of 360 days (3 cycles per annual, 1 cycle spends 120 days). The detailed input costs are as below:

Table 12: Input costs for local breed chicken raising for 1 year (3 cycle or 360 days)

Input material items	Unit/size	Quantity	Unit cost USD	Total cost USD	Duration of Usage	Depreciation 1 year	Total cost USD
Chick	Head	300	1	300	1 cycle	300	300
Finish feed for chicks with age of 28 days	Kg	98	0.6	58.8	28 days	176.4	176.4
Rice husk	Kg	135	0.2	27	90 days	81	81
Broken rice	Kg	135	0.2	27	90 days	81	81
Vegetables	Kg	945	0.1	94.5	90 days	283.5	283.5
Maize	Kg	135	0.5	67.5	90 days	202.5	202.5
Vaccine and medicine	Bottle	10	1.5	15	360 days	15	15
Water cup	Cup	4	1.5	6	360 days	6	6
Feed cup	Cup	4	1.5	6	360 days	6	6
Chicken houses (3)	Set	1	550	550	3 years	183	183
Water pumping machine	Set	1	50	50	3 years	17	17
Pipe	Meter	50	0.2	25	3 years	8	8
Water well	Set	1	125	125	10 years	12.5	12.5
Water (30 liters per day or 10.8 cubic meters for 1 year or 3 cycles) Note: 1-day pumps cost USD 0.15 for electricity.	Cubic meter	360	0.15	54	360 days	54	54
Total input costs						1425.9	1425.9

18. The investment capital for local breed chicken raising is estimated USD 1425.9 per year for three cycle of chicken production. Most of the farmers use their saving cash from dry rice farming income in order to raise free range chicken.

2.2 Technical capacity

19. The consulted chicken raising families are trained by PDAFF under ASPIRE program of which they have followed the technical procedures stated in the manual. The mortality ratio is reported 10% of which mostly caused by fever and cholera due to limited veterinary services available in the areas. Furthermore, the cost of finishing feed is high caused it is imported from Vietnam and capacity of farmers to select and maintain the good quality of hens and cocks are not appropriate.

2.3 Production calendar

20. The local breed chicken raising is continuous activity along the years of which farmers

could keep the hens and cocks for the second and third cycle of production. The farmers in Angkor Borei normally start chicken raising in January until April to supply during Khmer New Year and restart the second cycle in June and supply in September during Pchum Ben period (take rest in May when is the mostly dangerous period of early raining which is difficult for temperature adaptation (heat – cold). Lastly, the farmers start their third cycle of chicken raising in October and supply in late January for Chinese New Year. The price in these three events are high due to high demand (USD 5.5 per kg) while the normal price during the year is USD 4.5 per kg.

Table 13: Calendar of chicken raising

Local breed chicken	Year											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Local breed chicken	xxx	xx	xx	xxx	x	xx	xx	xx	xxx	xx	xx	xx

21. Through two brokers collect from chicken farmers 30 kg or 20 heads per day during the normal day in order to supply to 10 restaurants at Phnom Borei resort and Angkor Borei market. During the weekend, the two brokers order 75 kg or 50 heads of chicken in order to supply to the 10 restaurants. Therefore, daily sell of free-range chicken is estimated around 88 days for 2640 kg per cycle for normal day plus 600 kg per month or 2400 kg per cycle. Totally, the chicken demand is estimated 5040 kg per cycle or 15120 kg per year. This excluded the special events such as Khmer New Year, Water Festival and Chinese New Year which the demand of chicken for that period requires 1500 kg in April, 750 kg in September and 2250 kg in late January accordingly.

2.4 Market demand and supply

22. Market demand of local breed chicken is really good as it is preferable for both household consumption, tourist food and beverage restaurants at Phnom Borei and the special ceremony of the nation. Currently, there are 2 brokers who are in Angkor Borei district to order chicken from Angkor Borei's chicken farmers of which both of them demand 20 heads or 30 kg every day or 660 kg per month or 2640 kg per cycle or 9720 kg per annual plus another 600 kg per month or 2400 kg of the weekend demand per cycle or 7200 kg per annual (75 kg per day x 32 weekend days x 3 cycles) in order to sell to the Angkor Borei market and Phnom Borei restaurants who serve food for domestic tourists. Moreover, special events such as Chinese New Year, Khmer New Years, and Pchum Ben, both of them additionally put the order 1500 kg for Khmer New Year, 750 kg for Pchum Ben and 2250 kg for Chinese New Year in order to transfer to Phnom Penh. Therefore, the regular daily demand from 10 restaurants at Phnom Borei and Angkor Borei market is around 15120 kg and 4500 kg for three mentioned events along the year. Totally, there are approximately around 19620 kg of chicken meat requires per year (among the total of current 10 families).

23. However, the chicken producers of 10 families could sell in average 1 head or 1.5 kg each or 15 kg every day or 330 kg per month or 2970 kg per annual from 10 families except February and March to supply to the two brokers during the normal day and the regular order of the weekend of 480 kg per month or 4320 kg per annual except February and March while during 2 days of the special events, they could produce up to 750 kg (75 kg each). It is confirmed that all current 10 chicken raising farmers could produce a maximum of 9540 kg per annual to supply or in average 954 kg per each chicken raising family.

24. Therefore, the gaps in supplying local breed chicken is approximately 10080 kg per annual for either regular market or during the special events. In order to fulfil the gap, the brokers in

Angkor Borei has collected the chicken from Prey Lvea market to supply the regular demand of Phnom Borei restaurants and Angkor Borei market (See Table 14).

Table 14: Market demand and supply for local breed chicken along the year (10 families)

Local breed chicken demand and supply in Angkor Borei (kg)	Year												Total (kg)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Regular demand for local breed chicken (kg) for normal day	660	660	660	660	660	660	660	660	660	660	660	660	7920
Regular demand for local breed chicken (kg) for weekend day	600	600	600	600	600	600	600	600	600	600	600	600	7200
Special demand during the events (kg)	2250	0	0	150 0	0	0	0	0	750	0	0	0	4500
Sub-total demand (kg)	3510	1260	1260	276 0	126 0	126 0	126 0	126 0	201 0	126 0	126 0	1260	19620
Regular supply for local breed chicken (kg) for normal day	0	0	330	330	330	330	330	330	330	330	330	330	2970
Regular supply for local breed chicken (kg) for weekend day	0	0	480	480	480	480	480	480	480	480	480	480	4320
Special supply during the events (kg)	750	0	0	750	0	0	0	0	750	0	0	0	2250
Sub-total supply (kg)	750	0	0	156 0	810	810	810	810	156 0	810	810	810	9540
Market Gap or Surplus (kg)	- 2760	- 1260	- 1260	- 120 0	-450	-450	-450	-450	-450	-450	-450	-450	-10080
Alternative chicken supply from other areas (kg) from Prey Lvea and Koh Thom market	2760	1260	1260	120 0	450	450	450	450	450	450	450	450	10080

2.5 Water consumption and cost

25. The volume of water consumption for chicken raising with 300 heads is not really high but a bit costly. For the whole year of 3 cycles production, it consumes only 10.8 cubic meters for each farmer and cost around USD 91.5 including water well, pipe, pumping engine and gasoline. It is considered costly for water supply in chicken production in Angkor Borei.

2.6 Return of investment analysis

26. The return of internal investment for local breed chicken raising of one farmer with existing practice could be confirmed that relatively high income for the family based on the 300 heads of chicken raising for 10 raising families. The total cost of investment during the period of one year or 3 cycles of chicken raising is USD 1425.9 covering system, equipment, materials and other input costs. Compared to the regular and special events sales of 9540 kg with 10% of loss (954 kg), all 10 farmers could sell chicken around 8586 kg to 2 brokers who come to collect free-range chicken with different price varieties (USD 4.5 per kilogram for regular sale for 5103kg³ and USD 5.5 per kilogram for special events for 3483kg⁴). Thus, total gross income whole year of 10 local breed chicken farmers is USD42120 or USD4212 per each farmer therefore the annual net profit is USD2786.1 under existing ordinary system (See Table 15).

³ 2916 kg and 2187 kg

⁴ 675 kg and 2808 kg

Table 15.: Economic return for local breed chicken production in one year

Input material items	Unit/size	Quantity	Unit cost USD	Total cost USD	Duration of Usage	Depreciation 1 year	Total cost USD
Chick	Head	300	1	300	1 cycle	300	300
Finish feed for chicks with age of 28 days	Kg	98	0.6	58.8	28 days	176.4	176.4
Rice husk	Kg	135	0.2	27	90 days	81	81
Broken rice	Kg	135	0.2	27	90 days	81	81
Vegetables	Kg	945	0.1	94.5	90 days	283.5	283.5
Maize	Kg	135	0.5	67.5	90 days	202.5	202.5
Vaccine and medicine	Bottle	10	1.5	15	360 days	15	15
Water cup	Cup	4	1.5	6	360 days	6	6
Feed cup	Cup	4	1.5	6	360 days	6	6
Chicken houses (3)	Set	1	550	550	3 years	183	183
Water pumping machine	Set	1	50	50	3 years	17	17
Pipe	Meter	50	0.2	25	3 years	8	8
Water well	Set	1	125	125	10 years	12.5	12.5
Water (30 liters per day or 10.8 cubic meters for 1 year or 3 cycles)	Cubic meter	360	0.15	54	360 days	54	54
Note: 1-day pumps cost USD 0.15 for electricity.							
Total input costs						1425.9	1425.9

Total economic return (10 families)			
Description	Unit	Qty	Amount
Total production of local breed chicken in regular day	Time	3	3300 kg
Total production of local breed chicken in weekend	Time	3	4800 kg
Total production of local breed chicken in special	Time	3	2250 kg
Total production of local breed chicken	Time	3	9540 kg
Total production loss	%	10	954 kg
Total production for sale	Time	3	8586 kg
Total production sale during regular period (May to	Time	1	2916 kg ⁵
Total production sale during regular period (October -	Time	1	2187 kg ⁶
Total production sale during regular period (January)	Time	1	675 kg ⁷
Total production sale during regular period (April and	Time	1	2808 kg ⁸
Total gross income from May-August with normal	Kg	2916	USD13122
Total gross income from October - December with	Kg	2187	USD9841.5
Total gross income in January with special price	Kg	675	USD3712.5
Total gross income from April and September with	Kg	2808	USD15444
Total gross income for all 10 families and all periods of the year			USD42120
Total gross income for each farmer for all periods of the year			USD4212
Total investment cost whole year by ordinary water pumping		USD1425.9	
Total net income whole year by ordinary water pumping		USD2786.1	

⁵ 810 kg per month minus 10% of loss (81 kg) x 4 months = 3240 kg – 324 kg

⁶ 810 kg per month minus 10% of loss (81 kg) x 3 months = 2430 kg – 243 kg

⁷ 750 kg minus 10% of loss (75 kg) x 1 month = 750 kg – 75 kg

⁸ 1560 kg per month minus 10% of loss (156 kg) x 2 months = 3120 kg – 312 kg

2.7 Production challenges

27. Local breed chicken production is tolerance to climate condition and disease outbreak. Moreover, the preference of villagers and domestic tourists at Phnom Borei on local breed is relatively high due to the very good taste and quality. The consumption demand for local breed chicken is potential as it requires between 1620 kg per month for nine months and 2010kg, 2760kg and 3510kg within three months of special events while producers could reach up to 810kg for seven months and 750kg for one month and 1560kg for two months. Therefore, there is a gap of 450kg for eight months, 1200kg for one month, 1260kg for two months and 2760kg for one month which is totally 10080kg annual chicken meat gap. Local breed chicken technical production is not a constraint for farmers as they have learned from PDAFF under ASPIRE program with proper production including vaccination, care, watering, feeding and disease treatment. However, there are 2 major constraints that farmers are facing recently on the high cost of input materials especially the finishing feed and access to low-cost chick and healthy chicks (vaccination).

Table 16: Intervention arrangement for chicken production

Intervention logic	Addressed issues	Beneficiaries	Responsibilities
Provision of chick production cases	<ul style="list-style-type: none"> Unclear and unhealthy chicks' access High chick price (USD1 per unit with improper vaccination) 	<ul style="list-style-type: none"> 2 farmers including existing and new inspired farmers 	<ul style="list-style-type: none"> Farmers are subjected to co-finance the other operational cost of chick production such as electricity, water, vaccination and other related costs and land space for establishing chick breeding place Farmers are subjected to agree in selling chick with chicken raising farmers for USD0.75 price for chick purchase. Project supports two chick production cases. Project facilitates the connection between chick producer with suppliers of the equipment.
Feed mixing and balling machines	<ul style="list-style-type: none"> High cost of finishing feed and grow out feed 	<ul style="list-style-type: none"> 20 farmers including existing and new inspired farmers The 20 farmers must compose by poor families and at least 30% of female headed households/women. 	<ul style="list-style-type: none"> Farmers are subjected to co-finance the other operational cost such as access to subsidized chick cost, raw materials for feed making, and other input materials and land space for chicken production The project supports 20 feed making machines cost Farmers and project personnel will coordinate with suppliers for equipment maintenance manual/guide as well as amortization.
Technical training, follow up on chicken production	<ul style="list-style-type: none"> Low productivity and high mortality ratio Low number of farmers raising chicken due to lack of appropriate 	<ul style="list-style-type: none"> 20 farmers including existing and new inspired farmers The 20 farmers must compose by poor families and at least 30% of female headed households/women. Family members of 20 farmers who received echo-coaching. 	<ul style="list-style-type: none"> Khmer Organic Cooperative (KOC) under project support, provide capacity building for 2 courses together with several follow up coaching to 20 farmers on PGS for chicken raising. Farmers are subjected to participate and implement the chicken raising productions.

Intervention logic	Addressed issues	Beneficiaries	Responsibilities
	skills such as PGS, vaccination and disease treatment, caring etc.		
Facilitating market access through contract farming	<ul style="list-style-type: none"> Lack of access to higher value-market 	<ul style="list-style-type: none"> 20 farmers including existing and new inspired farmers The 20 farmers must compose by poor families and at least 30% of female headed households/women. Family members of 20 farmers who participate in chicken production Other villagers who raise chicken. 	<ul style="list-style-type: none"> KOC under the project support shall visit, check and establish contract farming with clear instruction to farmers on the quality of required live chicken. Farmers are subject to follow the PGS and purchasing standard.

3. Freshwater Prawn

3.1 Input materials

28. Currently, there are only 2 families in the Angkor Borei who raise Freshwater Prawn in late 2018 with intensive technique from former JICA funded project and implemented by Fisheries Administration (FiA) of Cambodia.

29. The consultation with 2 families identified series of input materials deployment in order to raise Freshwater Prawn including larva, water quality test kit, snail cell, fish powder, artemia, maize, pond, water supply, pumping machine, pipe and gasoline. The input materials are locally available such as snail cell, maize, water, pumping machine, pipe and gasoline except fish powder which is imported from Thailand and Vietnam as well as the water test kit which is available in Phnom Penh. Moreover, the freshwater prawn larva is imported from Vietnam as it is not available in Angkor Borei.

30. The access to larva and fish powder are the most constraints as there is no freshwater prawn hatchery station established and fish powder and artemia suppliers in Angkor Borei district. Farmers have to order at least 100,000 freshwater prawn larvae with the price of USD0.075 per head from Vietnam. Moreover, the cost of fish powder is expensive (USD87.5 per pack of 50 kg). The cost of input materials is based on the current market price with the size of production including 100,000 freshwater prawn and pond size of 30000 cubic meters (100m x 100m x 3m) with duration of 6 months (1 cycle per annual) which is recommended starting from April to September due to from October, it is so windy. The detailed input costs are as below:

Table 17: Input costs for freshwater prawn raising for 1 year (1 cycle or 6 months)

Input material items	Unit/size	Quantity	Unit cost USD	Total cost USD	Duration of Usage	Depreciation 1 year or 1 cycle of 6 months	Total cost USD
Prawn larvae	Head	100000	0.075	7500	1 cycle	7500	7500
Pond (10000 square meters)	Set	1	3000	3000	10 years	300	300
Artemia	Pack	10	1000	10000	1 cycle	10000	10000
Fish powder (40kg per day x 150 days)	Kg	6000	1.75	10500	1 cycle	10500	10500

Input material items	Unit/size	Quantity	Unit cost USD	Total cost USD	Duration of Usage	Depreciation 1 year or 1 cycle of 6 months	Total cost USD
Water pumping machine	Set	1	2000	2000	3 years	667	667
Pipe	Meter	100	0.36	36	3 years	12	12
Water quality test kit	Set	1	3000	3000	5 years	600	600
Regular water exchange by pumping 22500 cubic meters per week or 540000 cubic meters for 24 weeks or 6 months) Note: 60 liters x 24 weeks = 1440 liters	Liter	1440	0.75	1080	1 cycle	1080	1080
Labor (2 persons x USD7.5 x 180 days = USD2700)	Person/day	360	7.5	2700	1 cycle	2700	2700
Total input costs						33359	33359

31. The investment capital for freshwater prawn raising in 30000 cubic meters size of pond or 10000 square meter is estimated USD33359 per year for 1 cycle of production.

3.2 Technical capacity

32. Currently, among the two farmers, there is one farmer obtained the technical production of freshwater prawn from JICA's project since 2008 while another one is obtained from own trail. The first farmer normally produces freshwater prawn with 50% of mortality rate while the second farmer does not record the mortality rate. However, both of them confirmed that water quality maintenance and first 30 days of feeding post-larvae are critical phase of survival due to the post-larvae needs artemia as their feeds.

3.3 Production calendar

33. Freshwater prawn is implementing within six months along the year with 1 cycle of production. The production starts from April to September and early harvesting starting from October. The farmers just keep the pond under treatment in order to start next year in April. Due to the areas where farmers are raising freshwater prawn are closed to natural brackish water therefore there is no risk of lacking suitable water for prawn raising.

Table 18: Calendar of Freshwater prawn raising

Freshwater Prawn	Year											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Freshwater prawn culture	x	x	x	xxx	xxx	xxx	xxx	xxx	xxx	x	x	x

34. It is recommended to start freshwater prawn raising in April and to be harvested in October until December as it is fit to the seasonality. The price of freshwater prawn is varied according to the size/grade. E.g. 1 kg = 7 heads get USD30 per kg, 1 kg = 10 heads get USD20 per kg and 1 kg = 20 heads get USD10 per kg. It is quite good market price for the local cultured freshwater prawn compared to imported gets only USD7.5 per kg with the grade of 1 kg = 20 heads.

3.4 Market demand and supply

35. Market demand of cultured freshwater prawn is relatively high not only in Angkor Borei but also other provinces of Cambodia. It is reported that freshwater prawn is imported from Vietnam approximately 7.5 tons per day/week or 30000 kg per month or 360000 kg per annual from Chrey Thom border to supply in Cambodia while supply of natural freshwater prawn is accounted for 6300 kg per month or totally 25200 kg from September to December, 3150 kg per month or totally 9450 kg from January to March and 420 kg per month or totally 2100 kg from April to August of the year. Moreover, the current two farmers could only supply within 6000 kg per each annually (with 2nd grade freshwater prawn or 1 head = 0.1 kg for 4000 kg and 1st grade 1 head = 0.15 kg for December approximately 1000 kg). Therefore, there is continuously gap in freshwater prawn supply along the year. E.g. 26.85 tons per month require from January to March, 29.58 tons per month from April to August, 23.7 tons per month for September, 19.7 tons per month for October and 22.7 tons per month for November and December (See Table 19).

Table 19: Market demand and supply for freshwater prawn along the year

Freshwater supply from Angkor Borei (kg)	Year												Total (ton)
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Demand for freshwater prawn (ton)	30	30	30	30	30	30	30	30	30	30	30	30	360
Freshwater supply from Nature (ton)	3.15	3.15	3.15	0.42	0.42	0.42	0.42	0.42	6.3	6.3	6.3	6.3	36.75
Freshwater supply from raising (ton)	0	0	0	0	0	0	0	0	0	4	1	1	6
Market Gap or Surplus (ton)	-	-	-	-	-	-	-	-	-	-	-	-	-
	26.85	26.85	26.85	29.58	29.58	29.58	29.58	29.58	23.7	19.7	22.7	22.7	317.25
Alternative freshwater prawn supply from Vietnam (ton)	26.85	26.85	26.85	29.58	29.58	29.58	29.58	29.58	23.7	19.7	22.7	22.7	317.25

3.5 Water consumption and cost

36. The volume of water consumption for freshwater prawn raising is moderately high and cost is relatively at the medium level. For the whole year of 1 cycle production, it consumes only 540000 cubic meters for each farmer to change the water if the metal substance increased and cost around USD 2359 including pumping engine, gasoline, pipe and testing kits.

3.6 Return of investment analysis

37. The return of internal investment for freshwater prawn raising of one farmer with existing practice is highly valued as each farmer who raise 100000 heads of freshwater prawn requires total cost of investment USD 33359 covering post-larvae, pond development, feeds including artemia and fish powder and other input costs. Compared to the freshwater prawn production sales of 5000 kg in October and November with the price of USD20 per kg, two farmers could earn USD100000 and freshwater prawn production sale of 1000 kg in December with the price of USD30 per kg, two farmers could earn USD30000. Therefore, two farmers of freshwater prawn raising could earn USD130000 per cycle or USD65000 per each. Thus, the annual net profit is USD31641 per each farmer under existing ordinary system (See Table 20).

Table 20: Economic return for freshwater prawn production in one year

Input material items	Unit/size	Quantity	Unit cost USD	Total cost USD	Duration of Usage	Depreciation 1 year or 1 cycle of 6 months	Total cost USD
Prawn larvae	Head	100000	0.075	7500	1 cycle	7500	7500
Pond (10000 square meters)	Set	1	3000	3000	10 years	300	300
Artemia	Pack	10	1000	10000	1 cycle	10000	10000
Fish powder (40kg)	Kg	6000	1.75	10500	1 cycle	10500	10500

per day x 150 days)							
Water pumping machine	Set	1	2000	2000	3 years	667	667
Pipe	Meter	100	0.36	36	3 years	12	12
Water quality test kit	Set	1	3000	3000	5 years	600	600
Regular water exchange by pumping 22500 cubic meters per week or 540000 cubic meters for 24 weeks or 6 months) Note: 60 liters x 24 weeks = 1440 liters	Liter	1440	0.75	1080	1 cycle	1080	1080
Labor (2 persons x USD7.5 x 180 days = USD2700)	Person/day	360	7.5	2700	1 cycle	2700	2700
Total input costs						33359	33359

Total economic return (2 farmers)			
Description	Unit	Qty	Amount
Total production of freshwater prawn	Time	1	12000 kg
Total production loss or gap	%	50	6000 kg
Total production sale in October with 50% loss ratio	Time	1	4000 kg
Total production sale in November with 50% loss ratio	Time	1	1000 kg
Total production sale in December with 50% loss ratio	Time	1	1000 kg
Product price in October and November	Kg	1	USD 20
Product price in December (low season)	Kg	1	USD 30
Total gross income for 2 farmers (5000 kg)	Kg	5000	USD 100000
Total gross income for 2 farmers (1000 kg)	Kg	1000	USD 30000
Total gross income for 2 families and all periods of the year			USD130000
Total gross income for each farmer for all periods of the year			USD65000
Total investment cost whole year		USD33359	
Total net income whole year		USD31641	

3.7 Production challenges

38. The potential opportunities of freshwater prawn production are relatively high demand of which freshwater prawn meat is required an average of 30000 kg per month or 360000 kg per annual while there are only 2 farmers could produce up to 6000 kg due to 50% of mortality together with natural freshwater prawn around 36750kg to supply annually. Therefore, traders have to import freshwater prawn from Vietnam to supply around 317250 kg per annual to Cambodia through Angkor Borei. The production of freshwater prawn requires high technology, adequate feed and good quality of post-larvae supply as well as the proper water quality regulation in order to lower down the mortality rate while currently farmers can't control all of these difficulties.

Table 21: Intervention Arrangement for Freshwater Prawn

Intervention logic	Addressed issues	Beneficiaries	Responsibilities
Establishment of freshwater prawn hatchery stations	<ul style="list-style-type: none"> Lack of access to post larvae freshwater prawn and 	<ul style="list-style-type: none"> 2 experienced farmers in Angkor Borei 	<ul style="list-style-type: none"> Farmers are supposed to have large scale of land and accept lease for establishment as the hatchery station, counselling

Intervention logic	Addressed issues	Beneficiaries	Responsibilities
	<p>high cost to access from Vietnam.</p>		<p>office as well as central office of cooperative.</p> <ul style="list-style-type: none"> • Project supports series of equipment including water tanks, feed making machines, diesel water pumping machine (upgrade), oxygen regulatory machine, small office repairing cost as well as the 1 cycle of start up cost. • Project will facilitate to send 2 farmers to study at Asian Institute of Technology (AIT) in Thailand for hatchery implementation. • Project will facilitate the engagement of Asian Institute of Technology (AIT) for coaching at site within 30 days for hatchery establishment and start up phase.
<p>Diesel water pumping machine (upgrade) machine and feed making machine</p>	<ul style="list-style-type: none"> • High cost of water exchange • High cost of feed purchase from Thailand and Vietnam 	<ul style="list-style-type: none"> • 20 farmers including existing and new inspired farmers • The 20 farmers must compose by medium and rich families and at least 30% of female headed households/women. 	<ul style="list-style-type: none"> • Farmers are subjected to co-finance the other operational cost such as access to post larvae, raw materials for feed making, and other input materials and land space for grow out raising of freshwater prawn. • The project supports 20 feed making machines and diesel water pumping machine (upgrade) cost • Farmers and project personnel will coordinate with suppliers for equipment maintenance manual/guide as well as amortization.
<p>Technical training, follow up on grow out freshwater prawn production</p>	<ul style="list-style-type: none"> • Low productivity and high mortality ratio • Low number of farmers freshwater prawn due to lack of appropriate skills, disease treatment, caring, high mortality ratio – 60% etc. 	<ul style="list-style-type: none"> • 20 farmers including existing and new inspired farmers • The 20 farmers must compose by medium and rich families and at least 30% of female headed households/women. • Family members of 20 farmers who received echo-coaching. 	<ul style="list-style-type: none"> • AIT under project support, provide capacity building for 1 course together with 60 days follow up coaching to 20 farmers on freshwater prawn grow out raising. • Farmers are subjected to participate and implement the freshwater prawn productions.