LAO: Northern Rural Infrastructure Development Sector Project – Due Diligence for Additional Financing
Nam Haad Right Bank Irrigation Subproject in Pha Oudom District, Bokeo Province

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CURRENCY EQUIVALENTS
(as of March 2016)

Currency unit – kip (KN)
{Symbol} 1.00 = $0.00012
$1.00 = KN 8300

ABBREVIATIONS

ADB – Asian Development Bank
DCO – District Coordination Office
EIRR – Economic Internal Rate of Return
FGD – Focus Group Discussion
FPG – Farmer Production Group
ISF – Irrigation service fee
LFNC – Lao Front for National Construction
NPMO – National Project Management Office
NRI – Northern Rural Infrastructure
O&M – Operation and Maintenance
PAFO – Provincial Agriculture and Forestry Office
PBME – Project Benefit Monitoring and Evaluation
PPO – Provincial Project Office
PPTA – Project Preparatory Technical Assistance
SIA –
SRI – System of Rice Intensification
WUA – Water User Association
WUG – Water User Group

WEIGHTS AND MEASURES

ha – hectare
km – kilometer
m – meter
m² – square meter

NOTE
In this report, "$" refers to US dollars.
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Figure 2: Map of Nam Haad Right Bank Irrigation Subproject

Completion Map of Nam Haad Subproject, Pha Oudom District, Bokeo Province

Legend

- Weir
- RMC
- LSC
- Command Area
- Undeveloped Area
- Nam Haad River

No. of Beneficiary Village = 4
Total Household = 628
Beneficiary Household = 133

Completed works:
- Concrete weir (L=23m, W=50m, H=2.5m)
- Main canal (concrete lining) = 2,725m
- Main canal (earth) = 2,000m
- Access road
- Command Area = 150 Ha

SCALE 1: 10,000

0 250 500 Meters
I. INTRODUCTION

1. The Northern Rural Infrastructure (NRI) Development Sector Project is planned for implementation in the four provinces of Bokeo, Luang Namtha, Phongsaly and Oudomxai (Figure 1). The NRI main aim is to provide the rural community with access to and participation in the market economy. The Project will address key constraints to rural economic growth and the commercialization of agriculture. The project objectives are to enhance agricultural productivity through irrigation development and rehabilitation and to improve access roads (rehabilitation of rural access roads).

2. NRI has four main outputs: (i) production and productivity enhancing rural infrastructure constructed and/or rehabilitated; (ii) productivity and impact enhancing initiatives adopted; (iii) capacities of national, provincial and district agencies strengthened to enable a sector development approach; and (iv) efficient and effective delivery of subprojects and Project management.

3. The irrigation development and rehabilitation will include the rehabilitation of small to medium scaled gravity-fed irrigation schemes and may involve the rehabilitation of head-works (including the replacement of makeshift weirs with permanent structures), lining of primary and secondary irrigation canals, construction of minor water management structures, and rehabilitation of reservoir walls. The scope of rural access road subprojects will include civil works for minor realignment and for the improvement of road surfaces, drainage, slope protection and stabilization, and possible widening.

4. The purpose of this socio-economic impact assessment is to determine the emerging impacts and benefits of three sample subprojects that have been completed for more than a year. It must be understood, that since the subprojects had undergone irrigation operation for just a year or two cropping seasons since the completion of their construction, the results of the assessment is limited to the impact of the two cropping season operation of the irrigation system and the associated initiatives delivered through the subproject. The sample subprojects include: (i) Nam Dai Irrigation Subproject, Sing District, Luang Namtha Province, completed in February 2014; (ii) Nam Haad Right Bank Irrigation Subproject, Pha Odoum District, Bokeo Province, completed in December 2013; and (iii) Nam Lan Irrigation Subproject, Bountai District, Phongsaly Province, completed in April 2014.

5. The assessment is based on the results of the NRI Project Benefit Monitoring and Evaluation (PBME) Reports, NRI Progress Reports, updating of the Economic Internal Rate of Return (EIRR), and interviews/Focus Group Discussions (FGD) with representatives of the village authorities, ethnic groups, men, women and the Lao Front for National Construction (LFNC) conducted on 27 to 30 May in four beneficiary villages.

II. THE HAAD RIGHT BANK IRRIGATION SUBPROJECT PROFILE

6. The Nam Haad Right Bank Irrigation Subproject is located in Pha Odoum District, Bokeo Province at a distance of approximately 84 kilometer (km) by road. Construction activities for the subproject started on 23 November 2012 and were completed on 18 December 2013.

7. The subproject involves the replacement of a temporary wooden structure with a concrete weir. This water will be used for downstream irrigation of an existing 90 hectare (ha) irrigated area and for the development of an additional 60 ha of land suitable for paddy development (already cleared and under seasonal production) on the right bank of the Nam
Haad River. Associated initiatives include: (i) support for water user groups (WUGs) established to operate and maintain the facility; (ii) resourcing the technical extension services to introduce modern production technologies; and (iii) catchment zoning and village land-use planning to ensure sustainability of the investment.

8. The subproject beneficiaries reside in the four villages of Phonexay, Pha Oudom, Thin Keo, and Phienkham with approximately 1.5 km separating the most westerly village Phonexay from the most easterly, Phienkham. Pha Oudom village is also the district center and was first settled in 1768 with Thin Keo, Phonexay and Phienkham following in 1942, 1980 and 1996 respectively. The more recently established villages comprise mainly non-Lao-Thai groups relocated under the village consolidation program. Of the four major ethno linguistic groups in Lao PDR, only two are represented in the subproject area, Lao-Thai and Mon-Khmer, the first consisting mainly of Lue and the second mainly of Khmu and Lamet.

9. The subproject will impact a total of 617 households and 3,303 persons in four villages. At the present, these villages own approximately 234 ha of irrigated land surrounding the villages with households from Pha Oudom owning more than half of that area. The subproject will enable intensification (increased frequency) of cropping in the area through increased reliability of water supply. Those without irrigated land also support and express need for the subproject as it will increase the demand for farm labor and there will also be employment from construction.

10. The project construction started in November 2012 and was completed in December 2013. The handover to the WUG was held on 2 April 2014. The direct civil works cost is Kip3,743,485 587 equivalent to $467,935.

Table 1: Nam Haad Right Bank Irrigation Subproject Profile

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Project and Location</td>
<td>Nam Haad Right Bank Irrigation Subproject, Pha Oduom District, Bokeo Province</td>
</tr>
<tr>
<td>2. Beneficiary Villages</td>
<td>The subproject benefits the villages of: (i) Thin Keo; (ii) Phonexay; (iii) Pha Oduom; and (iv) Phienkham. The four villages have a total of 617 households and a population of 3,303 belonging to the Lao-Thai and Mon-Khmer ethno-linguistic groups, the first consisting mainly of Lue and the second mainly of Khmu and Lamet.</td>
</tr>
<tr>
<td>3. Total Subproject Cost</td>
<td>1) Rural Infrastructures (including design) $524,088 2) Associated Initiatives $ 45,000 3) Indirect cost $ 94,230 Total Cost $663,318</td>
</tr>
<tr>
<td>4. Construction Period</td>
<td>23 November 2012 to 18 December 2013</td>
</tr>
<tr>
<td>5. Subproject Components/Description</td>
<td>The subproject components are as follows: 1) Production and productivity enhancing rural infrastructure  a) Construction of Nam Haad Concrete Weir (L=23 m, W=50 m; H=2.5m)  b) Main Canal Concrete Lining (2,725 m)  c) Earth Main Canal (2,000 m)  d) Related Main Canal Structures 2) Productivity and impact enhancing initiatives</td>
</tr>
</tbody>
</table>
### Item | Description
--- | ---
- | Establishment and registration of Water Users’ Group/Association (WUG/WUA)
- | Capability development for the WUG/WUA for the management, operation and maintenance of the irrigation scheme (O&M, financial, WUG/WUA management & administration)
- | Land use planning and management (preparation of irrigation block map for the irrigation system and catchment land use management plan)
- | Gender/indigenous training/activities (Gender awareness campaign, HIV/human trafficking/basic sanitation and hygiene education campaign)

### 6. Irrigation Development
- Area irrigated before construction: 90 ha
- Design area (including extension area): 150 ha
- Wet Season Cropping: 150 ha
- Dry Season Cropping: 30 ha
- Irrigation Beneficiaries: 133 households

### 7. WUG/WUA
The Nam Haad Right Bank WUG/WUA was established on 16 June 2012 with 133 households as members with nine Executive Committee Members (4 females)

### 8. Farmers Production Group
Four Rice Production Groups are established with 12 Executive Committees (4 females) and 92 member-households. One Seed Production Group is also established with four Executive Committee Members (1 female) and 25 member households.

### III. EMERGING IMPACTS/BENEFITS

#### A. Irrigation

11. The subproject involves the replacement of a temporary wooden structure (weir) with buttress type (KKU-LAO) of concrete weir (L=23 m, W=50 m, H=2.5 m). The subproject involved the relocation and construction of the main delivery canal and associated water management structures together with the construction of secondary canals in the incremental areas. By relocating the weir higher up the Nam Haad River, it became possible to gravity-fed water to the area immediately above the current irrigated area as well as extend the command area on the eastern extremity. General layout of completed irrigation system is presented in Figure 2.

12. Increase in irrigated area both wet season and dry season: Before the subproject construction, the system could only fully irrigate 90 ha of paddy rice during the wet season. Rainfed areas include 50 ha of paddy rice and 10 ha of yellow corn. After the project completion the total 150 ha of service area can be fully irrigated during the wet season for paddy rice. In addition to the increase in irrigated area, incremental benefit arising from the subproject is the yield increase from rainfed condition to irrigated condition of the additional 60 ha of irrigated area.

13. During the dry season, before the subproject construction, the irrigation system could supply irrigation water for corn at about 30 ha. After the completion of subproject construction, initial dry season operation irrigated 145 ha of paddy rice and about 5 ha of peanut. This shows significant increase in the area grown to paddy rice and other crops under irrigation. According to the farmer beneficiaries interviewed they do not grow diversified crops because there is no
stable market for diversified crops. When the market for diversified crops becomes stable they will be motivated to plant diversified crops. Another reason is the goal to attain first the rice requirement for the district or the province.

14. Based on the designed area of 150 ha before the project completion, the cropping intensity was barely 120% and after the project completion although only two cropping season was accomplished the cropping intensity increased as high as 200%. The difference of cropping intensity before and after the project completion shows the impact of the irrigation system. This was attained due to the improved sufficiency of irrigation water.

<table>
<thead>
<tr>
<th>Table 2: Nam Haad Right Bank Command Area Land Use</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wet season:</strong></td>
</tr>
<tr>
<td>(1) Irrigated rice</td>
</tr>
<tr>
<td>(2) Rainfed rice</td>
</tr>
<tr>
<td>(3) Rainfed Yellow corn</td>
</tr>
<tr>
<td>(Subtotal of Wet Season)</td>
</tr>
<tr>
<td><strong>Dry season:</strong></td>
</tr>
<tr>
<td>(1) Irrigated rice</td>
</tr>
<tr>
<td>(2) Yellow corn</td>
</tr>
<tr>
<td>(3) Peanut</td>
</tr>
<tr>
<td>(Subtotal of Dry Season)</td>
</tr>
<tr>
<td><strong>Total Cropped Area</strong></td>
</tr>
<tr>
<td><strong>Cropping Intensity</strong></td>
</tr>
</tbody>
</table>

15. Increase in crop yield: Yield of crops is a contribution of different factors of crop production, such as quality of seeds, fertilization, crop management and irrigation. The contribution of irrigation in the yield of crops is a very important factor but is difficult to separately quantify. Hence, it is enough to contend with the increase yield without determining the contribution of each factor in this assessment.

16. Before the subproject construction the farmers do not usually apply inorganic fertilizer to their paddy rice. They claimed that the soil is fertile and suited for paddy rice (local variety) even without fertilizer. However after the completion of the subproject a significant number of farmers are now applying fertilizer to their crops.

17. The average yield of irrigated paddy rice during the wet season was 3.0 tons per ha before the subproject construction, and 2 tons per hectare under rainfed condition. Wet season and dry season paddy yield after the completion of the subproject averaged at 5.5 tons/ha per season. The total paddy rice production before the project was computed at 370 tons for the whole year compared to the production of 1,623 tons after subproject completion. The incremental paddy production of 1,253 tons could be attributed as impact of the subproject.

18. Yield of diversified crops like yellow corn is generally low with 2 tons during the wet season and 3 tons during the dry season. The total production of corn is 115 tons. Peanut
planted during the dry season has a yield of 2.1 tons/ha and the total production barely reached 10.5 tons. No comparison could be done for rainfed and irrigated corn because no corn was planted in the irrigation command area after project completion. Peanut was not planted before the subproject construction.

Table 3: Crop Yield Before and After the Project

<table>
<thead>
<tr>
<th>Crop</th>
<th>Before the Project (ton/ha)</th>
<th>After the Project (ton/ha)</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet season:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Irrigated rice</td>
<td>3.0</td>
<td>5.5</td>
<td>Increased by 2.5 ton/ha</td>
</tr>
<tr>
<td>- Rainfed rice</td>
<td>2.0</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>- Yellow corn</td>
<td>2.5</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Dry season:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Irrigated rice</td>
<td>-</td>
<td>5.5</td>
<td></td>
</tr>
<tr>
<td>- Yellow corn</td>
<td>3.0</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>- Peanut</td>
<td>-</td>
<td>2.1</td>
<td></td>
</tr>
</tbody>
</table>

19. Savings on the operation and maintenance: The FGDs with the WUG were conducted on 27 to 30 May 2015 in the four beneficiary villages. The FGDs pointed out that the improvement of the irrigation system also resulted to reduction of maintenance frequency for the irrigation system. Before the Project, every family household contributed 10 man-days work per year for the repair and maintenance of the system. The activities include cleaning of the canal and repair of the weir.

20. After the Project construction the farmer beneficiaries were assigned to specific area along the main canal depending on how wide the area of his farm to clean and maintain the good flow of water. This is equivalent to big reduction in the manpower man-days requirement for the repair and maintenance of the irrigation system. On the social side, the subproject resulted to improved discipline among the farmers to cooperate and unite for the operation and maintenance of the irrigation system. The only participation now from the farmers is the cleaning of the canal embankment.

Table 4: Savings on the Operation and Maintenance of the Irrigation System

<table>
<thead>
<tr>
<th>Activity</th>
<th>Before the Project</th>
<th>After the Project</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weir repair</td>
<td>4-6 times repair</td>
<td>No repair</td>
<td>Savings in labor cost</td>
</tr>
<tr>
<td>Main Canal cleaning &amp; repair</td>
<td>4 times cleaning</td>
<td>2 times cleaning</td>
<td>Savings in labor cost</td>
</tr>
<tr>
<td>Material cost for repair</td>
<td>Kip1,000,000</td>
<td>No more</td>
<td>Savings on material cost</td>
</tr>
<tr>
<td>Number of persons involved in the repair of the weir</td>
<td>50</td>
<td>No repair needed</td>
<td>Savings in labor cost</td>
</tr>
</tbody>
</table>

B. Access Road

21. The construction of the roads along the main canal reduced the cost of hauling the farm products to the village likewise bringing the farm inputs to the farm. It was estimated based on the farmers interview that around 30% of the transport cost was saved due to the construction of
the road along the main canal. Thereby, the impact of the project to the farmers along this line is the cost savings on the transport of their farm products to existing main roads for and to market centers.

22. The increased number of hand tractors in the villages illustrates the good impact for the construction of road along the main canal. There is also an observed increase in the number of private vehicles plying to and from the villages compared to before the project construction. The enhancement and rehabilitation of the irrigation system and the construction of the road contributed to the multiple effects of improving the level of living condition in the village.

Table 5: Savings on Transportation Cost

<table>
<thead>
<tr>
<th>Items</th>
<th>Before the Project</th>
<th>After the Project</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of transportation</td>
<td>Kip20,000</td>
<td>Kip15,000</td>
<td>Decrease by Kip5,000 (30% decrease)</td>
</tr>
<tr>
<td>Time spent per travel from farm to village</td>
<td>1 hour</td>
<td>30 minutes</td>
<td>Savings in travel time by 30 minutes</td>
</tr>
<tr>
<td>Transport availability</td>
<td>50 hand tractors</td>
<td>100 hand tractors</td>
<td>Increase of 57 hand tractors</td>
</tr>
</tbody>
</table>

C. Agricultural Extension and Marketing

23. The farmers’ technical knowledge and technique on improved farming technology is usually transferred to them by the District Coordination Office (DCO) and Provincial Agriculture and Forestry Office (PAFO). However, due to budget limitation the said government offices could not impart the full horizon of extension and support services. Extension services rendered by them are the proper application of fertilizer and agro-chemicals, and post-harvest practices to include the sourcing for market of the farm produce.

24. In addition, the existence of contract farming and System of Rice Intensification (SRI) in the area has demonstrated a good venue for rendering agricultural extension services on improved rice seed production and improving the yield of paddy rice. Likewise, the diversified crops production through contract farming which is focused during the dry season has contributed a lot in increasing farmers’ income. Marketing of the diversified crops are embodied in the contract farming system.

Table 6: Impact of Agricultural Extension and Marketing Activities

<table>
<thead>
<tr>
<th>Items</th>
<th>Before the Project</th>
<th>After the Project</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical training of improve crop production</td>
<td>Very limited</td>
<td>Sufficient training: conducted by the District Coordination Office and Provincial Project Office</td>
<td>Observed farmers’ adaptation of the training is high (claimed at 90%)</td>
</tr>
<tr>
<td>Establishment and training of Water User’s Group (WUG)</td>
<td>Inactive WUG</td>
<td>Very active WUG (Executive Committee formed with women and ethnic group representation; completed training on operation and</td>
<td>Improved cooperation, unity and discipline among farmers; Improved water distribution; collection of Irrigation Service Fees to support the cost of</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Items</th>
<th>Before the Project</th>
<th>After the Project</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>maintenance, WUG Management and Financial Management</td>
<td>routine operation and maintenance of the irrigation system.</td>
</tr>
<tr>
<td>Contract Farming</td>
<td>No contract farming and no farmers’ production groups formed in the villages. No experience in product price negotiation with traders.</td>
<td>Established Farmers Production Groups (FPG) in 2013. Established Farmers Rice Seed Multiplication Group to produce rice seed (R3)</td>
<td>Contract farming provides protection to farmers on the price and marketing of produce; Contributes to establishing market linkage and increase in farmers’ income; The establishment of FPG and the farmer’s rice seed multiplication group contributes in the production and availability of quality seeds for increased paddy rice yield and rice production.</td>
</tr>
<tr>
<td>Establishment of demonstration farms and conduct of study tours</td>
<td>No demonstration farms and study tour</td>
<td>System of Rice Intensification demonstration farms were established and study tours were conducted.</td>
<td>Enhanced the technical know-how and capability of the farmers in crop production</td>
</tr>
<tr>
<td>Existence of market for farm inputs and outputs</td>
<td>Limited market</td>
<td>In the case of contract farming, farmers have assured market for their products to include the supply of the farm inputs.</td>
<td>Contract farming ensures market of crop produced as well as safeguards fair returns and income.</td>
</tr>
<tr>
<td>Establishment of Farmers Production Group</td>
<td>No farmers production group formed</td>
<td>WUG formed the farmers production group</td>
<td>Ensure the sustainability of crop production</td>
</tr>
<tr>
<td>Volume of agricultural products sold</td>
<td>Limited volume of agricultural products was sold</td>
<td>Bigger volume of rice produce is sold.</td>
<td>With the difference in volume sold. It is evident that the farmer’s income is improved</td>
</tr>
</tbody>
</table>

### D. Updated Economic Internal Rate of Return

25. The economic evaluation follows the usual procedure of evaluating irrigation projects by assessing all the benefits attributed to the project and all the costs involved in the project construction. To identify project cost and benefits two situations must exist in order to compare them, that is without project situation and the with project situation. Adopted in the economic evaluation is a simplified cost and return analysis for each crop grown in the command areas both without and with project condition. For the without project condition the data used in the preparation of the feasibility study by the PPTA team was adopted in the preparation of cost and return analysis. For the with project condition, the data gathered during the recent field survey
was used in the computation of the cost and return analysis. Crop budget per ha per season was prepared to determine the crop income for each crop grown for both condition. The derivation of incremental benefits would be the difference of the total net income for all the crops grown with their corresponding area. The derived incremental benefits were compared with the incremental cost by subjecting them to discounting method in the entire economic life of the project.

26. The basic assumptions adopted in the economic evaluation are as follows:

(i) Prices of internationally traded commodities like rice, corn, soybeans and fertilizers were based on the world market (World Bank Commodity Price Forecast dated 25 October, 2014) and adjusted taking into account the freight and handling charges.

(ii) Prices of non-tradable goods were priced at the prevailing market in the area.

(iii) All prices of benefit and cost are at constant 2015 level.

(iv) The average exchange rate of Kip8,115 Kip per $ was applied.

(v) Domestic price numeraire is adopted.

(vi) Standard conversion factor of 0.9 was adopted and applied to non-tradable goods and services, while 0.8 was used as a shadow wage rate factor for rural unskilled labor.

(vii) Labor contribution by the family in the farm activities was valued at the same rate with hired labor.

(viii) Operation and maintenance (O&M) cost is 3% of the total direct project cost.

(ix) Economic life of the project will be 30 years.

27. The project benefits were derived mainly on the direct quantifiable benefits emanating from the improvement of the irrigation facilities. In valuing the benefits constant prices in 2015 was applied. The farm gate prices of traded goods like, rice, corn soybeans and fertilizer were derived from the world market. In the case of non-traded commodities the prevailing market prices in the area is used and adjusted using the standard conversion factor of 0.90 to arrive at the economic farm gate price. The derived benefits were computed from the difference between the with project condition and the without project condition. The incremental benefit generated from crop production amounts to Kip873,400,408 equivalent to $107,628. The annual savings in the O&M is also included as benefits and computed at $8,650. The attainment of incremental benefits will be gradual and proportionately distributed in a 5 year agricultural development period.

28. The total project completion financial cost is $663,318 equivalent to $636,907 in economic terms. It consist of: (i) civil works which include construction materials and labor (ii) detailed design and survey, construction supervision; (iii) associated cost comprising development and support initiatives, land use planning management initiatives agricultural extension, marketing and value added initiatives; (iv) equipment and materials; and (v) consultant services. The annual O&M cost is $16,418, computed at 3% of the total direct cost of the project.

29. Full agricultural development is assumed to be attained on the fifth year and assumed to be constant throughout the economic life of the project. The reason for this is the farmers’ absorptive capacity and financial capability.
The EIRR is computed based on the stream of costs and benefits. By discounting the streams of cost and benefits for the period of 30 years, the computed EIRR is 12% which is lower compared to the Feasibility Study computed EIRR at 15%.

Table 7: Comparison of Economic Internal Rate of Return (EIRR)

<table>
<thead>
<tr>
<th></th>
<th>The result of Feasibility Study in by PPTA</th>
<th>Updated EIRR in July 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIRR</td>
<td>15%</td>
<td>12%</td>
</tr>
</tbody>
</table>

The reason for this is the low benefit of rice production related to the low price of paddy. The price trend of paddy rice is decreasing in the world market. In the feasibility study diversified crop production which could generate higher benefits was introduced while the present situation was only for monoculture of rice. Under the criteria of the EIRR, the Nam Haad subproject has achieved its minimum requirement of 12% although it is still viable and has a big potential to increase the EIRR in the future. Other criteria like irrigation facilities, cropping intensity and technical assistance to the farmer beneficiaries by the SRI project are commendable.

In addition, the following actual situations would support to justify the present project achievements.

The Nam Haad subproject area is rather a remote area compared with Houayxai District in Bokeo province. Due to such disadvantage in transportation, traders are presently not interested in promoting more profitable fresh commodity crops such as watermelon, pumpkin and green bean in Phongsaly and Luang Namtha province.

On the other hand, the Nam Haad subproject area is appointed as a rice production priority area by the provincial and district government policy.

The rice produced in the Nam Haad subproject is now being exported not only to Houayxai District, Bokeo Province but to Oudomxay Province, and the farmers are enjoying double rice cropping owing it to the irrigation development by the Project.

Under such situation, the Project is presently supporting the Farmers Production Groups (FPGs) to promote Contract Farming on Rice Seed Production through SRI technology in order to cover the needs of quality rice seed in the province. The Project has already provided the FPGs with (i) rice drying concrete floor; (ii) rice seed storage; and (iii) rice seed processing equipment, etc.

The promotion of contract farming for diversified crops through the subproject provides safeguard to farmers on the price as well as marketing of products is expected to promote production of high value diversified crops during the dry season in the future. Hopefully, this will happen within the 5 year agricultural development period of the subproject and will impact on further increase in farmers’ income and on the EIRR of the subproject.
E. Household Income

38. The Project impact and its performance targets and indicators in the Design and Monitoring Framework are: *Average annual household incomes in areas influenced by the project increased from KN11.6 million in 2010 to KN16.2 million by 2020.*

39. Since the target achievement year is 2020, it is too early to assess the Project impact in 2015. Under such, the socio-economic impact assessment report presents the following source of information of household income for future reference, namely: (i) Baseline Data by SIA; (ii) PBME; and (iii) FGD.

40. Baseline Data of Household Income: There are no baseline data of household income available because the feasibility study of Nam Haad Right Bank subproject was carried out by the PPTA. Since, the baseline data for SIA for Nam Haad Left Bank subproject covered the same beneficiary villages as that of Nam Haad Right Bank subproject, the baseline data of household income were derived from the results of such SIA survey.

41. The average household income is Kip21,513,869 per household composed of 30% from agriculture and 70% from non-agriculture.

42. PBME: The Project has established the PBME system to monitor the project impact at the initial stage of the Project. The agricultural production in each crop season has been monitored and presented in the PBME annual report. For Nam Haad Right Bank subproject, 20 households were selected from upstream, middle and downstream of the command area at random as the PBME monitoring base in 2012 in order to meet 10% of the command area.

43. The result of the income from agriculture in Year 2013: (i) PBME was Kip13,037,117 per household; and (ii) estimated the annual household income at Kip28,107,582 per household. While in Year 2014: (i) PBME was Kip16,818,294 per household; and (ii) estimated the annual household income at Kip31,888,000 per household, as shown in Table 8.

### Table 8: Household Income

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of beneficiary village (Village)</th>
<th>No. of monitored Household (HH)</th>
<th>Annual Income (Kip/HH)</th>
<th>Income from Agriculture (%)</th>
<th>Income from Non-Agriculture (%)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average of 2009-2011</td>
<td>4</td>
<td>40 (10 HHs/village)</td>
<td>21,513,869</td>
<td>30(*)</td>
<td>70(*)</td>
<td>(*) from Baseline Survey for SIA for Nam Haad Left Bank Subproject</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of beneficiary</th>
<th>No. of monitored</th>
<th>Annual Income from Estimated (**) Annual Income (Kip/HH)</th>
<th>(**) considering only the direct impact on agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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1. Baseline survey for SIA for Nam Haad Left Bank subproject was conducted in November to December 2011.

2. Selection Criteria for Agriculture Production Monitoring: (i) farmers should be direct beneficiaries of the project irrigation system; (ii) one farmer should be selected from at least every 10 ha of the command area; (iii) farmers should be selected from each irrigation block; (iv) farmers should be involved in monitoring their agricultural production continuously until the end of the Project in 2017; and (v) farmers will be required to be interviewed in each crop season (or twice a year).
<table>
<thead>
<tr>
<th>Year</th>
<th>No.of beneficiary village (Village)</th>
<th>No.of monitored Household (HH)</th>
<th>Annual Income (Kip/HH)</th>
<th>Income from Agriculture (%)</th>
<th>Income from Non-Agriculture (%)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>4 village (Village)</td>
<td>20 Household (HH)</td>
<td>13,037,117</td>
<td>28,107,582</td>
<td>Increase by 31%</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>4 village (Village)</td>
<td>20 Household (HH)</td>
<td>16,818,294</td>
<td>31,888,759</td>
<td>Increase by 41%</td>
<td></td>
</tr>
</tbody>
</table>

44. Table 8 shows the annual income in 2013 and 2014 increased by 31% and 41% respectively, compared with before the Project (average between 2009 and 2011). Since the construction works were completed in December 2013, the contribution to the increase of the annual income in 2013 and 2014 is not always by irrigation improvement but may be by other factors such as agricultural extension activities.

45. FGD: The FGDs were carried out on 27 to 30 May 2015 in the four beneficiary villages. During the FGDs, it was reported by the participants that the household incomes are around Kip40,000,000 per household.

F. Water User Group/ Water User Association Establishment and Development

46. Nam Haad Right Bank Irrigation System WUG was established according to the letter of approval by the District Governor on 16 February 2012. The WUG Executive Committee is composed nine persons with four (44%) females. The WUG is sub-divided into six irrigation blocks with a total of 133 household beneficiaries and a population 3,482 people (1,753 of them are female). In terms of ethnic group in the WUG Executive Committee there are four Lue ethnic group, three Khmu ethnic group and one Lamet ethnic group.

47. Trainings provided to the WUG include irrigation system O&M, WUG Management, Financial Management, Study tour on Water Management and SRI, Production Group Training and SRI. Women participation in these trainings involved about 353 people with about 46% female representation.

48. The WUG agreed to collect Irrigation Service Fees (ISF) to finance the routine maintenance and operation costs of the irrigation system. The agreed ISF rates are Kip50,000 per ha for wet season rice, Kip70,000 per ha for dry season rice, and Kip50,000 per ha for dry season commodity crops. Based on a rough estimation of 150 ha of wet season rice and 90 ha (60%) of dry season rice, Kip13,800,000 (about $1,720) of annual ISF will be collected.

49. It is reported by the WUG that the actual collected ISF for 2014 wet season was Kip5,938,000 from 149 households, and for 2014-2015 dry season Kip6,037,000 from 104 households, totaling to Kip11,975,000 per year, indicating a good performance of WUG’s management capacity.

50. Periodic maintenance costs such as restoration/major repairs and replacement of steel gates, etc. are estimated at 2% of the direct cost (equivalent to about $13,000) as an upper limit on the O&M. Due to limitation of ISF, the periodic maintenance costs should be burdened by the provincial government and PAFO with some parts of ISF.
51. Emergency repairs costs are difficult to project when and how serious the emergency repairs will be needed. According to Article 35 of the Law on Irrigation, in case natural disasters occurred which caused damages to irrigation projects, the Agriculture and Forestry Sector shall immediately coordinate with other relevant sectors and local authorities which include PAFO to repair damages in order to make the system ready for seasonal production.

52. Interviewed WUG Executive Committee and Members claim the following impacts of the Subproject:

(i) Increase in food security and income due to crop production for two seasons.
(ii) Savings on labor and materials in the repair and maintenance of the irrigation system. Before, repair of weir is 4-5 times per year requiring labor and local materials. The savings on labor, farmers claim can be devoted for other income generating activities.
(iii) Improved water distribution and reduce water use related conflicts.
(iv) Reduction on the burden of women in participating for labor in the repair and maintenance of the system.
(v) Food security and increase in income for ethnic groups.
(vi) Improved cooperation, discipline and unity among irrigated farmers (WUG members).
(vii) WUG members and the Executive Committees claim that there is improved members’ participation in maintenance works and meetings (twice per year).

G. Ethnic Groups and Women

53. The Subproject benefits the villages of: (i) Thin Keo; (ii) Phonexay; (iii) Pha Odoum; and (iv) Phienkham. The four villages have a total of 617 households and a population of 3,303 belonging to the Lao-Thai and Mon-Khmer ethno-linguistic groups, the first consisting mainly of Lue and the second mainly of Khmu and Lamet.

54. The participation of all ethnic groups and women are promoted in all project activities such as consultation meetings, trainings, study tours, in conducting regular maintenance works twice a year, and as members of the WUG and FPG.

55. The above is confirmed by interviewed representatives of the village authorities, ethnic groups and women. They informed that the different ethnic groups and women were involved in subproject activities from the planning of the subproject to implementation and then now at the O&M stage of the subproject. They also confirmed that the subproject had resulted to increase in production and income due to the possibility of doing two crop seasons per year after the subproject construction. The interviewed ethnic groups and women also informed that they observed no negative impact of the subproject.

56. Women appreciated the subproject because they claim that it had eased their burden from providing labor for the repair and maintenance of the system due to the permanent weir and improved canal, and in crop production because of the improved availability of water.

57. Ethnic groups and women are represented in the WUG Executive Committee. Out of the nine WUG Executive Committee, four (44%) are female, four of them are from the Lue ethnic group, three Khmu ethnic group and one Lamet ethnic group. From the four Executive Committees for the Rice Production Group, one member (25%) is a female.
58. The involvement and participation of ethnic groups and women are improved through the subproject.

H. Others

1. Environmental

59. There are no reported environmental impacts as a result of the subproject at the time of the preparation of this report. Since 2013, Safeguard Monitoring by an external team (Faculty of Environmental Sciences, National University of Laos) has been carried out regularly (twice per year) covering all the ongoing subprojects of NRI Project. The reports indicated that the impacts of the Nam Haad Right Bank subproject construction activities were mitigated according to the Environmental Management Plan of the subproject. Further, the latest report dated 30 June 2015 presented that there are no indications that use of chemicals has increased or intensified from the before subproject situation. However, the safeguard monitoring report suggested continuous monitoring of water quality at upstream and downstream of the subproject.

2. Resettlement

60. The construction of the Nam Haad Irrigation Subproject had minor effect on agriculture land and trees. There are 59 affected households (322 population). There are 13 poor households, 43 middle class households and two rich households. Total affected to productive land is 27,928 m$^2$ which is equivalent to 2.69% of the total 1,039,902 m$^2$ productive land of the 58 affected households. There are 41 households affected with less than 5% affected land and two households affected land between 5-10%. Out of the 58 affected households, there are 44 households with 605 affected trees (9.9% of the total 6,099 trees owned), all of which were all cut down and used/or sold before the construction started.

61. The affected households agreed to voluntarily donate affected land for the development of the subproject. There are no reported negative impacts of the lost assets to the economic well-being of the affected households as of writing this report.

62. Regarding the Land Acquisition issues, the latest external safeguard monitoring report dated 30 June 2015 indicated that all potential impacts were consulted and mitigated through the proper grievance process required by Lao regulation and ADB requirements, and confirmed all the affected lands were <5% of affected households’ total productive lands and the affected households were willing to donate for the Project of such land areas voluntarily, as summarized in Table 9.

### Table 9: Affected Assets and Compensation

<table>
<thead>
<tr>
<th>Types of asset</th>
<th>Description of loss</th>
<th>Rounded amounts (kip)</th>
<th>No. HHs</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of land</td>
<td>(28,614 m$^2$)</td>
<td>143,514,000</td>
<td>58</td>
<td>This amount is not necessary as all affected households agreed in voluntary donation of their affected land to the subproject.</td>
</tr>
<tr>
<td>Loss of House and structures</td>
<td>No infrastructure</td>
<td>No cost</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>
### Types of asset

<table>
<thead>
<tr>
<th>Types of asset</th>
<th>Description of loss</th>
<th>Rounded amounts (kip)</th>
<th>No. HHs</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of crops</td>
<td>No damage of crops by construction works</td>
<td>No cost</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Loss of tree</td>
<td>605 trees</td>
<td>118,990,000</td>
<td>30 out of 58 HHs</td>
<td>This amount is not necessary as all affected households cut down and use/or sold before the construction started.</td>
</tr>
<tr>
<td>Loss of common property resources</td>
<td>No any relocation of common properties</td>
<td>No cost</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Income restoration</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
</tbody>
</table>

#### 3. Mediation and Grievance Mechanism

63. The village LFNC is the key player for mediation and grievance mechanism in each village level. Since such mechanism is already set under the government policy, the Project did not do any activities directly to the village LFNC, but encouraged involvement in each project activity. During the FGDs from 27 to 30 May 2015, it was confirmed that the involvement of the village LFNC had strengthened the representation of ethnic groups in subproject activities. The LFNC is recognized for the role of mediation and grievance resolution within the village. The LFNC ensures proper representation and involvement of the different ethnic groups in the locality.

#### 4. Institutional Changes

64. Various capability development trainings were provided to staff of the National Project Management Office (NPMO), Provincial Project Office (PPO) and DCOs. Interviewed NPMO, PPO and DCO staff informed that their capabilities in performing their responsibilities had improved. The capabilities of the NPMO, PPO and DCO on project planning, implementation and management had been improved as summarized in Table 10.

**Table 10: Institutional Changes**

<table>
<thead>
<tr>
<th>Item</th>
<th>Topic</th>
<th>Before the Project</th>
<th>Status as July 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Financial Management</td>
<td>PPO and DCO staff have limited capacity in financial management of the Project.</td>
<td>PPO and DCO staff are able to manage their provincial project subaccount.</td>
</tr>
<tr>
<td>2</td>
<td>Village consultation/ Skill of facilitator</td>
<td>PPO and DCO staff have limited capacity as a facilitator in the village consultation, which is required further involvement of villagers’ participation.</td>
<td>PPO and DCO staff are able to play a role of a facilitator in the village consultation to involve further participation of the villagers in the project activities.</td>
</tr>
<tr>
<td>3</td>
<td>Project Benefit Monitoring and Evaluation</td>
<td>PPO and DCO staff have limited understanding in the PBME including data collection and reporting.</td>
<td>PPO and DCO staff are able to PBME work including data collection and reporting.</td>
</tr>
<tr>
<td>Item</td>
<td>Topic</td>
<td>Before the Project</td>
<td>Status as July 2015</td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
<td>-------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>5</td>
<td>WUG organization</td>
<td>PPO and DCO staff have limited knowledge about WUG and its organization including the process of registration, rules and regulations, etc.</td>
<td>PPO and DCO staff are now able to conduct the village workshop for establishment of WUG and follow up the process of WUG registration.</td>
</tr>
<tr>
<td>6</td>
<td>Irrigation O&amp;M</td>
<td>PPO and DCO staff have no experience to conduct a training of Irrigation O&amp;M to the beneficiary farmers using the training handouts which includes the irrigation block map and cropping calendar of each subproject.</td>
<td>PPO and DCO staff are now able to develop the irrigation O&amp;M training handouts including the irrigation block map and cropping calendar of each subproject, and conduct a training to the beneficiary farmers.</td>
</tr>
<tr>
<td>7</td>
<td>Gender/ Ethnic Group</td>
<td>PPO and DCO staff have limited understanding about the importance of the gender/ethnic group involvement in the implementation of the Project, through implementation of awareness campaign to the community.</td>
<td>PPO and DCO staff are now able to conduct awareness campaign on gender/ethnic group/ sanitation, HIV prevention to the community. They are also completed the requirements of more than 30% of female/ethnic group representative participation in various project activities.</td>
</tr>
<tr>
<td>8</td>
<td>Village/ District/ Provincial Safeguard Officer</td>
<td>No provincial/ district safeguard officers such as (i) Lao Women's Union; and (ii) District/Provincial Office of the Ministry of Natural Resource and Environment were involved in monitoring of the project activities.</td>
<td>The provincial/district Lao Women's Union and Ministry of Natural Resource and Environment are involved in the project implementation as required. In addition, such safeguard officers are joining the external safeguard monitoring team’s field visit, and workshop and interview with the villagers.</td>
</tr>
<tr>
<td>9</td>
<td>Land use planning</td>
<td>PPO and DCO staff have no experience to use the geographic information system (GIS) software for developing of Land Use Management Plan.</td>
<td>PPO and DCO staff are able to develop the Land Use Management Plan using the GIS software, and conduct a workshop on the Land Use Management Plan of the subproject area including its catchment area.</td>
</tr>
<tr>
<td>10</td>
<td>Agricultural Extension/ Farmer Production Group (FPG) and Contract Farming</td>
<td>PPO and DCO staff have limited experience of (i) agricultural extension, and (ii) promotion of contract farming through strengthening of FPGs. implementation.</td>
<td>PPO and DCO staff are able to carry out agricultural extension through system of rice intensification and commercial crops demonstration activities. Further, they are able to (i) organize the farmers to establish the FPGs; (ii) promote contract farming; (iii) monitor the contract farming; and (iv) evaluate the results of the contract farming and plan for the next season together with FPGs.</td>
</tr>
</tbody>
</table>

### 5. Impact to Non-Irrigated Farmers in the area

During the FGDs on 27-30 May 2015 with the village authorities, farmers, females and ethnic group, the participants confirmed that the subproject resulted benefit or positive impacts.
(direct and indirect) to people in the area. The subproject benefits are not limited to households who own irrigated paddy fields in the command area but also non-irrigated village members within the subproject area.

66. Initial impact/benefits observed is the increased demand/opportunity for hired farm labor due to the increase in irrigated area and the two cropping season per year that happened in the first year of the subproject operation.

67. It is estimated that the incremental labor requirement (impact) is 14,850 man-days based on the cropping pattern before and after the Project (Labor requirement before the Project is estimated at 12,100 man-days, while that of after the Project 26,950 man-days). The estimation above would coincide with the results of FGDs indicated in the previous paragraph.

68. With the subproject promotion of contract farming in the Year 2014, more traders are visiting Pha Oudom district, also increasing job and business opportunities for people in the area.

IV. CONCLUSION

69. Considering the above, the following emerging impacts/benefits of the subproject are observed:

(i) Increase in irrigated area during the wet and dry season;
(ii) Increase in the yield and production of rice and other crops;
(iii) Increase in household income;
(iv) Improved food sufficiency;
(v) Cost and labor savings on the operation and maintenance of the irrigation system particularly on repairs of the weirs and canals;
(vi) Cost savings on transport of products from the farms to the villages and markets;
(vii) Increase in mode of transports available to people in the villages, i.e., more hand tractors and more public transport vehicles;
(viii) Improved production and market of diversified crops through contract farming;
(ix) Improved crop production technology of farmers due to agricultural extension services;
(x) Improved participation and representation of ethnic groups in subproject activities and organization (WUG, FPG);
(xi) Improved participation and representation of women in subproject activities and organization (WUG/FPG);
(xii) Strengthening sustainability of the O&M of the irrigation system through the WUG and the collection of ISF to support routine cost of O&M of the irrigation system; and
(xiii) Improved capacity of the NPMOs, PPOs and DCOs.
<table>
<thead>
<tr>
<th>Nam Haad wooden weir in wet season (before the Project)</th>
<th>Nam Haad wooden weir in dry season (before the Project)</th>
<th>Nam Haad weir (completed) with ADB review mission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nam Haad concrete weir in dry season (completed in Dec. 2013)</td>
<td>Nam Haad Right Bank Main Canal (completed in Dec. 2013)</td>
<td></td>
</tr>
<tr>
<td>Transplanting with SRI Technique</td>
<td>Weeding by rotary weeder</td>
<td>Rice Seed (Variety: Naxang)</td>
</tr>
<tr>
<td>Promotion of Contract Farming of Rice Seed Production Farmer’s Group</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>