# ECONOMIC AND FINANCIAL ANALYSIS FOR RURAL ROAD SUBPROJECT IN KAMPONG CHAM PROVINCE

## A. INTRODUCTION

1. This economic and financial analysis (EFA) assess the economic viability of a representative inter-commune road rehabilitation and agricultural development subproject under the Tonle Sap Poverty Reduction and Smallholder Development – Additional Financing (TSSD-AF) Project. The EFA consists of two main components. Firstly, the financial analysis is to validate the financial attractiveness of the subproject to the beneficiary households, the subproject's primary stakeholders. Only when these activities are financially attractive can the subproject's envisioned benefits be realized and sustained. Additional consideration is given to the extent of operation and maintenance (O&M) required for the continuous functioning of the road. Finally, the economic analysis is to validate if the subproject's benefits, measured in economic terms, sufficiently outweigh its economic costs. The result of the economic and financial analysis is summarized by the internal rates of return or the net present value (NPV) metrics.

2. The EFA is based on assessment of the difference in the without- and with-project scenarios. Data were collected by PPTA consultant from interviews with informant farmers in March-April 2017.[1] Following the assessment of these two scenarios in financial terms, economic costs and benefits were derived by applying standard conversion methodologies. Sensitivity tests were conducted to test the robustness of the analysis results.

## B. MACROECONOMIC CONTEXT

3. Following the global economic downturn in 2008-2009, Cambodian economy has recovered quickly thanks to growth in the agricultural sector between 2009 and 2011. Since then, the agricultural sector's performance has been weak. Starting from 2012, the industry and service sectors have grown faster and significantly outpaced growth in the agricultural sector, squeezing the latter's share of gross domestic product from 33.5% in 2012 to 28.6% in 2015 (Table 1). Especially after 2012, its growth has abruptly declined and has been nearly negligible.

**Table 1: Key Macro-Economic Indicators of Cambodia**

| Indicator | At constant 2000 Prices | | | | |
|---|---|---|---|---|---|
| | 2012 | 2013 | 2014 | 2015 | 2016 |
| GDP (US$ mil) | 8,662 | 9,313 | 9,971 | 10,686 | 11,442 |
| GDP per capita (US$) | 599 | 637 | 672 | 714 | 755 |
| GDP growth (percent) | 7.3 | 7.4 | 7.1 | 7.0 | 7.2 |
| Sectoral growth (percent) | | | | | |
| - Agriculture | 4.3 | 1.6 | 0.3 | 0.2 | 1.8 |
| - Industry | 9.3 | 10.7 | 10.1 | 11.7 | 11.5 |
| - Services | 8.1 | 8.7 | 8.7 | 7.1 | 7.3 |

[1] About 150 farmers were interviewed, in addition to members of commune councils, commune extension workers and officers of provincial departments of agriculture, forestry and fisheries. Of the 150 informant farmers, 64 were female. Interviews were conducted in a group of 2 to 4 individuals at each session. The informants were from the subprojects' target communes, adjacent communes, and existing Tonle Sap Poverty Reduction and Smallholder Development Project (TSSD) communes. The last group is especially relevant for an assessment of the project's potential benefits, and the extent of farmers' adoption of new agricultural technologies that will be introduced by TSSD-AF. The range of data covers (i) the existing cultivation area of different crops and livestock; (ii) the existing crop or livestock budget which include production parameters farmgate prices, inputs quantity and prices, access to and costs of agricultural services and credits; (iii) adoption rates of new technologies, and (iv) assessment of benefits that can be achieved by the subproject activities.

| Indicator | At constant 2000 Prices | | | | |
|---|---|---|---|---|---|
| | 2012 | 2013 | 2014 | 2015 | 2016 |
| Sectoral share | | | | | |
| - Agriculture | 33.5 | 31.6 | 28.9 | 28.6 | n/a |
| - Industry | 23.0 | 24.1 | 25.6 | 29.7 | n/a |
| - Services | 37.8 | 38.5 | 39.7 | 41.7 | n/a |

GDP = gross domestic product; n/a = non-available.
Sources: National Bank of Cambodia 2016, Ministry of Economy and Finance 2017 and Ministry of Agriculture, Forestry and Fisheries 2017.[2]

4. Despite the sector's stagnant growth, agriculture remains the backbone of rural households, both for food security reason and as a significant source of livelihoods. The Cambodian Agricultural Census (2013), the very first agricultural census in Cambodian history, reports that 82% of the country's 2.6 million households are engaged in agricultural activities, including crops cultivation and poultry, and livestock raising.[3]

5. Not only is agriculture important for Cambodian rural households, its development is an integral component of the economic diversification policy of the Royal Government of Cambodia (the government). The government's desire to promote the agricultural sector development is evidenced by its effort in planning and implementing, for examples, Paddy Rice Production and Milled Rice Export Policy (2010); Master Plan on the Promotion of Agricultural Investment in Cambodia (2013); Agricultural Sector Strategic Development Plan 2014-2018; a $20 million Boosting Food Production Programme2016-2018 which is fully funded with its own financial resources; and National Strategic Aquaculture Development Programme2016-2030.

6. The proposed TSSD-AF will contribute to the Government's Rectangular Strategy on Growth, Employment, Equity and Efficiency 2014–2018, especially on enhancement of the agriculture sector (diversification, value addition, and productivity); and infrastructure development, and the Agricultural Sector Strategic Development Plan 2014-2018 which focuses on increase of value addition and development of transport infrastructure and irrigated lands. It is also aligned with the Asian Development Bank (ADB) Cambodia Country Partnership Strategy,[4]Country Operations Business Plan (2017–2019),[5] and ADB's assessment, strategy, and road map (ASR) for the agriculture, natural resources, and rural development sector.[6]

## C. LESSON LEARNT FROM TSSD EXPERIENCE

7. TSSD's major outputs include road rehabilitation, irrigation scheme rehabilitation, and poverty-targeting livelihood improvement groups (LIGs) support. Under the TSSD, the poorest households were first organized into LIGs. The range of LIGs support include sponsoring regular meetings to facilitate knowledge sharing and technology transfer; training on basic record management and business planning; agricultural extension service; training and demonstration on chicken raising, fish and frog farming, and vegetables cultivation; group-based revolving fund for working capital loan. A rapid assessment of TSSD indicates that it has performed well economically, yielding an economic internal rate of return (EIRR) above 20%.

[2] Government of Cambodia. 2016. *Economic and Monetary Statistics*. Phnom Penh; Government of Cambodia, Secretary of State of MEF. 2017. *Cambodia: Past, Present and Future*. Phnom Penh; Government of Cambodia. 2017. *Annual Report of Ministry of Agriculture, Forestry and Fisheries*. Phnom Penh.
[3] Government of Cambodia. 2015. *Census of Agriculture of the Kingdom of Cambodia 2013*. Phnom Penh.
[4] ADB. 2014. *Country Partnership Strategy: Cambodia, 2014–2018*. Manila.
[5] ADB. 2016. *Country Operations Business Plan: Cambodia, 2017–2019*. Manila.
[6] Sector Assessment Summary (accessible from the list of linked documents in Appendix 2 of the report and recommendation of the President [RRP]).

8. TSSD-AF covers the same outputs as TSSD, and has additional elements. Despite TSSD's overall success, not all TSSD subprojects were successful. The major lessons learned are as follows:

(i) Rebuilt or rehabilitated irrigation schemes for wet season supplementary irrigation improved food security, but yield limited benefits during dry season due to a dearth of water. When their investment costs were considered, these schemes were not economically viable;

(ii) Rebuilt or rehabilitated village roads under by the TSSD do not help lift the economic wellbeing of communities unless they are connected to a wider road network;

(iii) Demonstration farms did not encourage adoption of new farming practices or technologies unless they were linked with organized farmer groups, such as LIGs, to help draw visitors and propagate knowledge; and

(iv) Specific assistance targeting the poor and female-headed households through LIGs had a significant positive impact, and the LIGs knowledge and information sharing function was important. In view of TSSD's success, other donor funded projects, for example, the World Bank's Local Economic Association of the Poor Project, Land Allocation for Social and Economic Development Project have adopted the TSSD approach, specifically the LIG support model.

9. Lessons from TSSD informed TSSD-AF's design project. Particularly, TSSD-AF will only finance irrigation schemes with sufficient water resources to support a second or even a third crop, or subproject roads that connect the beneficiary communities to a wider network. In addition, TSSD-AF will no longer support new demonstration farms.

## D. RATIONALE

10. Development problems in the agriculture sector in Cambodia include: (i) low agricultural productivity; (ii) under-developed value chains; and (iii) deteriorating natural capital stock and high vulnerability to climate threats. For the poor in particular, inefficient use of resources, poor productive infrastructure and limited access to rural financial services are major constraints. Since 1998, ADB has invested in rural infrastructure, agricultural productivity, and natural resources management in the Tonle Sap Basin. These investments have lifted millions out of poverty. However, the number of vulnerable people remains high; the loss of only $0.3 per day would bring Cambodia's poverty rate back to 40%.[7]

11. Furthermore, disasters including extreme climate events such as floods and droughts have aggravated adverse impacts on agriculture and other sectors. Cambodia is consistently ranked among the top 10 countries most vulnerable to extreme climate events.[8] With climate change, these impacts may worsen over time. Vulnerability of the poor, compounded by the expected adverse climate change impacts, and disasters triggered by natural hazards, makes it essential to continue to build on the successes achieved in the current TSSD.

[7] World Bank Group. 2015. *Cambodian Agriculture in Transition: Opportunities and Risks.* Washington, D.C.

[8] Germanwatch. 2014. *Global Climate Risk Index 2015: Who Suffers Most from Extreme Weather Events? Weather-related Loss Events in 2013 and 1994 to 2013.* Bonn; and United Nations University. 2012. *World Risk Report 2012*.Berlin.

12. The subproject will rehabilitate an existing inter-commune road and support poor and female-headed households to improve their agricultural livelihoods in Chbar Ampov commune in Batheay district of Kampong Cham province. There are 1,518 rural households living in the commune's four villages. Farm livelihoods support 53% of the commune's population; however, only 29% of the households remain dependent on it. 47% of the commune's population is now reliant on non-farm occupations. Of this 47%, 30% (211 persons) is employed in nearby garment, shoe and apparel factories. At least 32% of the households in the communes remain poor, which is above provincial average.

13. The inter-village road to be rehabilitated is the main road used by the population of the four villages of the commune. It will benefit 6,242 residents of the four villages in the 1,518 households, inclusive of the 32% poor households, in the commune. This road is crucial not only for the 211 factory workers but also for transport of farm produce, local residents' trips to markets, and medical facilities in Batheay, Pa-av and Skun.

14. In addition to rebuilding the inter-commune road, the subproject will extend support on agricultural development and marketing. It will continue support provided by TSSD to existing and new LIGs, deliver agricultural extension service and promote value chain development specifically for rice, vegetables, chickens, and aquaculture.

15. Reconstruction of the inter-commune road and agricultural value chain development support are mutually complementary. The road will facilitate transport of agricultural produce and movement of agricultural machineries, while value chain support will increase agricultural produce and therefore the utilization of the road. The subproject was taken as a representative inter-commune road subproject of the TSSD-AF and its EFA was performed.

## E. SELECTION OF ALTERNATIVE SUBPROJECTS

16. All subprojects must meet the following primary criteria:[9] (i) community support which may include preparing a commune plan to contribute to infrastructure operation and maintenance (O&M); (ii) the infrastructure investment cost not to exceed $200,000; (iii) the economic internal rate of return (EIRR) exceeds 12%; (iv) construction be completed within 2 years; (iv) no major resettlement or environmental issues; (v) at least 40% of beneficiaries be female.

17. In addition, priority will be given to subprojects that (i) have high poverty ratios; (ii) reduce disaster risks; (iii) involve rehabilitation which is likely to be less costly; (iii) have strong community participation and support, particularly for O&M; (iv) have suitable soil or topographic conditions suitable for agriculture; and (iv) improve production and market access.

18. During a national consultative workshop held in Kampong Thom province on 28 March 2017, the Chbar Ampov road subproject was discussed and agreed upon by the relevant government agencies as a representative subproject. It meets all the aforementioned criteria and was selected in part because it meets a least cost per beneficiary household criterion as recommended in the TSSD Technical Audit Report.[10]

[9] Appendix 3 of TSSD-AF Project Administration Manual.

[10] The technical audit report recommended that an irrigation subproject capable of providing supplementary wet season irrigation should be selected if it costs less than $50/household. Any subproject that costs more than $50/household but less than $100/household are subject to more eligibility criteria. Any potential subproject that costs more than $100/household is ineligible. The number of beneficiary is defined by beneficiary of the infrastructure. The least-cost-

## F. MAJOR ASSUMPTIONS AND METHODOLOGY

19. The economic analysis has been conducted using the Asian Development Bank's (ADB's) *Guidelines for the Economic Analysis of Projects,*[11]and *Key Areas of Economic Analysis of Investment Projects: An Overview*.[12]The major assumptions include:

(i) The economic analysis is carried out over 20 years, coinciding with the subproject's expected economic life, starting in 2018 and including a 5-year subproject implementation period;

(ii) The EFA uses the world price (US dollars, $) numeraire. Local currency, in Cambodian riel (KR), are converted to $ using an exchange rate of KR4,023.0 = $1;

(iii) Financial investment costs were provided by the PPTA consultants. They were already in $;

(iv) Financial farm gate prices including farm wages were based on field works that were carried out during March-April 2017. Vehicle operating costs, time costs and crop and livestock budgets were first collected in KR and then converted to $ using the stated exchange rate;

(v) To covert the items' financial values into economic values, taxes and subsidies are net out from the gross financial values. Appropriate conversion factors were then applied on the local and unskilled labor components of each item to derive the final economic values;

(vi) When data is available, for the main tradable agricultural inputs and outputs, their economic values are estimated based on the World Bank's Commodity Price Forecasts of January 2017 after adjusting border prices to farm gate prices. Estimation of economic prices of these commodities was over the period 2017 to 2030;

(vii) The standard conversion factor (SCF) of 0.92 was applied to local component and local labor (both skilled and unskilled); in addition, local unskilled labor was further adjusted by a shadow wage rate factor (SWRF) of 0.90;

(viii) The EFA used an economic internal rate of return (EIRR) threshold of 12.0%.

## G. SUBPROJECT COSTS AND BENEFITS

### 1. Subproject Costs

20. Major costs of the subproject investment were estimated by the PPTA's engineers and financial and cost expert. Main cost components of the subproject comprise:

(i) Inter-communal DRR-road rehabilitation and related road design and supervision support;

per household criteria was adopted during consultation but was subsequently replaced by the economics criteria (EIRR to exceed 12%).

[11] ADB. 2017. *Guidelines for Economic Analysis of Projects*. Manila, Philippines.

[12] ADB. 2014 *Key Areas of Economic Analysis of Investment Projects: An Overview.* Manila, Philippines.

(ii) Operation and maintenance of the road in the initial years (Year 3-5). The fund can be used for physical maintenance or capacity building of beneficiary communes; after project completion, the routine O&M funding will be provided by the government or beneficiaries;

(iii) Support to 11 LIGs (in 10 villages) and agricultural value chain development, specifically for rice, vegetables, native breed chicken raising, and aquaculture (fish and frog farming);

(iv) Other support including agriculture information and communication technology, DRR training, and multi-stakeholder value chain platforms. The costs of these activities are pro-rated and assigned to the subproject, but the benefits are not quantified; and

(v) Project management costs.

21. Total estimated cost of the subproject is $279,138 (Table 2). The amount is in financial terms and is later converted to economic values in the economic analysis.

22. The economic life of the subproject depends on the useful life of the rehabilitated road and, to a limited extent, the continued relevance of introduced/new agricultural and marketing practices.

23. Road rehabilitation will use locally available construction materials, such as earth, laterite, crushed rocks and gravels, and incorporate DRR design. Many TSSD-funded roads albeit village roads, which were visited by the consultant during field work, have remained in good conditions after years of building without O&M. Note that the TSSD-funded village roads were not based on DRR-design and used DRR-resistant materials. A DRR-resilient road will require limited or no maintenance. To further extend the economic life of the physical assets, TSSD-AF will provide financial resources to support O&M in the initial years (Year 3 to 5). For the representative subprojects, the O&M budget allocation is estimated at 2% per annum of the total irrigation system's rehabilitation cost, and will keep the system in usable conditions for at least 12 to 15 years after the project completion.

**Table 2: Subproject Financial Costs**

| | Financial cost ($)[a] | Composition | | | | Economic cost ($)[b] |
|---|---|---|---|---|---|---|
| | | Local (%) | Foreign (%) | Unskilled (%) | Skilled (%) | |
| **Components** | | | | | | |
| 1. Civil works | 162,086 | 50% | 20% | 20% | 10% | 150,027 |
| 2. Design | 12,615 | 38% | 0% | 0% | 62% | 11,185 |
| 3. Civil works O&M[c] | 9,725 | 50% | 20% | 20% | 10% | 9,002 |
| 4. Commune/Community | 37,948 | 22% | 6% | 17% | 94% | 34,118 |
| 5. Other support[d] | 39,862 | 3% | 5% | 0% | 54% | 35,658 |
| 6. Project management | 16,901 | 55% | 0% | 0% | 45% | 15,203 |
| **Total** | **279,138** | | | | | **255,192** |

O&M = operation and maintenance

[a] Inclusive of taxes and physical contingency. Total values are not discounted.

[b] Derived from financial value by first netting out taxes, and applying the standard conversion factor (SCF) of 0.92 on local component, and a conversion factor of 0.83 (Shadow wage rate factor (SWRF) of 0.90 multiplied by SCF) on unskilled labor.

[c] 2% of construction costs per year, between Year 3 and 5.

[d] Include agriculture information and communication technology, DRR training, and multi-stakeholder value chain platforms. Benefits were not captured in the EFA.

Source: PPTA consultants.

### 2. Subproject Benefits

24. The design assumed that the subproject implementation will begin in 2018, taken as year 1 in the EFA. The implementation period of the subproject will coincide with the ADB's financing term, which will be between 2018 and 2023 (year 1-6). Responsibilities for the subproject will be handed over to the beneficiary communities, the concerned commune councils and the government by 2024.

25. Given its support in two main components, road and agriculture, this subproject will bring about two major source of benefits for the beneficiary households: (i) benefits from inter-commune road improvement, and (ii) benefits from agriculture-based livelihood development. Regarding the latter, during the early years the subproject will provide training for existing LIGs, but benefit hinges on farmers' adoption rate of new technologies or practices, and will not materialize immediately. Expected delay in the realization of the benefits from agriculture-based livelihood development are documented in subsequent sections.

#### a. Road benefits

26. The rebuilt road will serve mainly four villages with 6,242 residents in 1,518 households. More than half (51%) of the population is women, and 32% of the households are poor. 71% of the residential households depend on non-farm livelihoods. 211 villagers, overwhelmingly women, are employed at nearby factories, and they are the most frequent road users. At least 10% of the families in the four villages rely on factory jobs

27. The inter-commune road's benefits will come mainly from cost savings, in terms of vehicle operating costs, and time savings of passengers.[13]For vehicle operating costs specifically, data was collected for fuel and lubricating oil consumption, parts (e.g., tire, brake, and others) replacements. In addition, this was done for different vehicle types including, motorbikes, motor-tricycles, sedans, vans, locally made trucks, light truck, mid-sized trucks, motor-tillers/walking tractors, and tractors.

28. For analytical purpose, there can be three traffic categories: (i) normal traffic is sourced within the villages, are determined by exogenous factors such as income growth and occurs with or without the project; (ii) generated traffic is additional traffic, sourced within the villages, that arises due to improve road conditions; and (iii) diverted traffic is sourced from outside but rerouted to the subproject road because of better road conditions, or reduced travel time due to increased speed or reduced travel distance.

29. The subproject is not expected to induce diverted traffic since the existing inter-commune road has only one single entrance and exit point, connecting the two communes to National Highway 6. As such, the rehabilitated road will benefit mainly inhabitants of the four villages that it snakes through. In addition, generated traffic was not considered, leaving only normal traffic to be considered in the EFA.

30. The time savings depends on several factors: road length, travel speed, and the value of time for passengers, including garment factory workers, local travelers, and drivers who are local residents in the commune. Factory workers are employees of local factories, which are located

[13] Improved road conditions will also curb depreciation of vehicles. However, interviews during field study suggest the difference is not significant.

along National Highway 6 in Batheay district and Cheung Prey district, about 60 kilometers from Chbar Ampov commune.

31. Since normal traffic is non-incremental, project benefits associated with road is computed by comparing the difference in vehicle operating costs and time costs in the without-project and with-project scenarios. As an example, fuel cost for the without-project situation was computed as the product of (i) average distance traveled by a motorbike; (ii) the number of motorbikes; (iii)number of trips per motorbike; (iv)fuel consumption per motorbike; and (v)fuel price. The fuel consumption cost for the with-project situation was calculated similarly. The incremental benefit is the difference between the two values.

32. Data on road use and traffic flow on the would-be rebuilt stretch were based on traffic observations carried out at different times of the day for four days in March-April, discussions with community members and drivers and information provided by commune council members of Chbar Ampov communes. Data on existing vehicle operating costs, time cost, and expected costs savings were collected concurrently. However, since the cost savings estimates were deemed optimistic, the analysis's projections of the with-project scenario are extrapolated from the economic analysis report of a recent ADB road project in Cambodia.[14]

33. As an example, the derivation of fuel cost savings for motorbikes at Year 3 (after road rehabilitation) is presented in Table 3. The cost savings for other vehicle operating costs components (lubricating oil, tire, brake, and other parts) and (where applicable) the time cost savings were computed similarly. The sum of vehicle operating cost and time cost savings represent the total cost savings per year for motorcycle. Similar exercises were performed for all vehicle types to compute the total road benefits. Annex 1 presents the derivation of cost savings for different components and vehicle types.

34. As an example, the derivation of fuel cost savings for motorbikes is presented in Table 5, and is estimated to be $613 per year (bottom line in Table 3). Cost savings for other vehicle operating costs components and the time cost savings were computed similarly, and are documented in Annex 1. The sum of vehicle operating cost and time cost savings represent the total cost savings for motorcycle. Similar exercises were performed for other vehicle types.

35. For time savings, it depends on several factors: road length, travel speed, and the value of time for passengers. Travel speeds in the without-project scenario is based on interviewees' assessment and range from 15 to 35 km/hour, depending on vehicle types. In the with-project scenario, speed is on average 5 km/hour higher.

36. Although the subproject will be effectively starting in 2018 (year 1), partial, incremental benefits from road will begin to flow only in 2019 (year 2). Year 1 will be the road's reconstruction year. Full benefits from road will only occur from 2023 (year 6) onward.

**Table3:Fuel Consumption Cost for Motorbikes (Financial Value, $)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Fuel price | US$/liter | 0.945 | 0.945 | 0.000 | 0.859 | 0.859 | 0.000 |

[14] ADB. 2016. *Report and Recommendation of the President to the Board of Directors: Proposed Loan for Additional Financing Kingdom of Cambodia: Provincial Roads Improvement Project*. Manila. In the spreadsheet model, the original set of data is juxtaposed with the set used in this economic analysis.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Fuel consumption | liter/km | 0.027 | 0.030 | 0.003 | 0.027 | 0.030 | 0.003 |
| **Fuel cost (A)** | **US$/km** | **0.026** | **0.028** | **0.026** | **0.023** | **0.026** | **0.000** |
| **Travel distance per trip (B)** | **km/trip** | **2.74** | **2.74** | **0.00** | **2.74** | **2.74** | **0.00** |
| Number of vehicle in villages[a] | vehicle | 674 | 674 | 0 | 674 | 674 | 0 |
| Number of trip per vehicle per year | trip/vehicle | 135 | 135 | 0 | 135 | 135 | 0 |
| **Number of trip per year (C)** | trip | 90,990 | 90,990 | 0 | 90,990 | 90,990 | 0 |
| **Total distance travel per annum (D=B*C)** | **km** | **249,677** | **249,677** | **0** | **249,677** | **249,677** | **0** |
| **Fuel consumption cost (E=A*D)** | **US$** | **6,427** | **7,040** | **613** | **5,843** | **6,400** | **557** |

W/O = without-project; W/ = with-project; Dif. = difference
[a] 674 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

### b. Agricultural benefits

37. The support in agricultural and value chain development to the communes will help farmers to (i) increase rice yield to some extent, due to application of improved cultivation practices introduced by the subproject; and (ii) diversify farm production to lotus, vegetables, native-breed chickens, fish, and frog.

38. From experiences, increased yield and production would depress local farm-gate prices. As such, some slight reduction in farm-gate prices is expected in the with-project scenario as compared with the without-project scenario, unless well-coordinated and market-demand-driven planning of agricultural production could be instituted among the beneficiary households. In the EA, it is assumed that there will be no such coordination, and farm-gate prices are slightly lower in the with-project scenario. The downward adjustments are based on interviewed farmers' price estimates for bountiful harvests.

39. While farm-gate prices of agricultural produce will decline, the beneficiary households will increase productivity and cut farm production costs by optimizing and rationalizing the use of agro-chemicals and inputs. Farming is highly mechanized in the subproject area, which is experiencing labor shortage due to rural to urban migration of the workforce and attractiveness of factory jobs. The rehabilitated road would allow for efficient mobility of agricultural machines (such as walking tractors, tractors, harvesters). This would reduce costs for O&M of agricultural machines and service fees, as rental are charged at hourly rates. The cost for produce transportation will likewise be lowered. The reduction in farm-gate prices of agricultural produce will thus be offset by increased productivity and reduced farm production and transportation costs.

40. Membership of Cambodia in the World Trade Organization and the Association for Southeast Asian Nations has allowed Cambodia to expand export markets for its agricultural produce and products, but also has required that it opens its domestic markets for the same. Given the openness of Cambodia to globalization, markets for agricultural outputs and inputs have been very competitive nationwide. Agricultural inputs (including fertilizers, seeds, propagative materials, breeds, and agricultural machines) and agricultural mechanization services are readily available through local markets and are of reasonable quality. Agricultural inputs have not been taxed. No taxes have been imposed on agricultural land, farm outputs and farm incomes.

41. The subproject's beneficiary households will not export their products directly. Additionally, movement of goods within and outside the subproject's area is free and in response to market signals, generally unhindered. There have been no official trade barriers. In reality, of course, there are hidden and unexplained costs due to rent seeking activities.

42. The subproject investment is aimed at improving farm productivity and diversification of the commune with 1,518 households. It is expected to improve the beneficiary households' livelihoods and living conditions. There are about four (4) LIGs with 107 members in the four villages of the commune. Totally, all the 1,518 households operate on 1,249hectares (ha) of land mainly devoted to rice cultivation (26% for wet season rice and 74% for dry season rice). Cultivation and farming activities are severely restricted in most parts during the monsoon season because of floods.

43. The subproject will enable farmers to improve rice yield and diversify agricultural produce. The without-project scenario was based on information collected during field visits. The range of data gathered include (i) farm budgets for the most commonly grown crops and livestock; and (ii) cultivation area by farming seasons.

44. All together eight crops and livestock budgets were incorporated in the EFA. These include the ones that local farmers are already practicing or can practice, and that the subproject will promote. These include production of: (i) wet season paddy rice; (ii) dry season paddy rice; (iii) lotus; (iv) cucumber; (v) morning glory; (vi) native-breed chickens; and (vii) fishes and frogs. Data for these farm enterprise budgets were gathered from several key farmers (the key informants) in the subproject's target communes. Average statistics (e.g., mean yields, mean costs of inputs) were used in the EFA model.

45. Table 4 summarizes estimates on the number of wet season rice area that will be converted to improved practices introduced by the subproject. For the with-project scenario, parameterization on the adoption rates of various crop and livestock improved practices was based on the TSSD experience.

46. Historically, beneficiary farming households rarely converted all their farmland to new practices. Their willingness to convert farmland to new practices is always constrained by financial resources that are needed for high-priced inputs; risk-aversion; lack of markets; weak value chains; lack of storage facility or processing center; and attractive off-farm alternative livelihoods; and preference for leisure and rural-urban migration/rural exodus.

47. For the without-project scenario, farmers are assumed to continue with existing practices. For the with-project scenario, farmer's adoption rate varies by crop and livestock. Although the subproject will effectively start in year 1, partial, incremental benefits will begin to flow in only in year 2 as the agricultural extension service and value chain support activities would take effect. Full benefits of the subproject's interventions in agriculture and value chain development will only occur from Year 5. The gradual transition is shown in Column B of Table 4. In the case of wet season rice, only 21% (67.2ha) of the existing wet season rice area will be cultivated using improved practices. This 67.2 ha is the basis for the computation of incremental benefits of wet season rice cultivation.

**Table4: Wet Season Rice Cultivation Area Under New Practices**

| | Without project | With project | | |
|---|---|---|---|---|
| | Existing practice (ha) (A) | Adoption rate (%) (B) | Existing practice (ha) (C=A*(1-B)) | Improved practice (ha) (D=A*B) |
| Year 1 | 320.0 | 0% | 320.0 | 0.0 |
| Year 2 | 320.0 | 7% | 297.6 | 22.4 |
| Year 3 | 320.0 | 14% | 275.2 | 44.8 |
| Year 4 | 320.0 | 21% | 252.8 | 67.2 |
| Year 5 - 20 | 320.0 | 21% | 252.8 | 67.2 |

ha = hectare.
Source: PPTA consultant, based on TSSD experience and Agro-Ecosystem Analyses of both communes by the General Department of Agriculture of Ministry of Agriculture, Forestry and Fisheries.

48. Table 5 presents the per-hectare budgets for wet season rice, in the without- and with-project scenarios. The data were collected during the March-April 2017 field works, in KR but converted to $. The per-hectare or per enterprise budgets for other crops and livestock are presented in Annex 3.

**Table 5: Wet Season Rice Budget**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/O | W/ | Dif. | W/O | W/ | Dif. |
| Wet season rice | ha | 1.0 | 1.0 | 0.0 | 1.0 | 1.0 | 0.0 |
| Cycle | month | 6.0 | 6.0 | 0.0 | 6.0 | 6.0 | 0.0 |
| **Revenue** | | | | | | | |
| Produce | kg | 1,800.0 | 2,000.0 | 200.0 | 1,800.0 | 2,000.0 | 200.0 |
| Produce price | US$/kg | 0.20 | 0.20 | 0.00 | 0.22 | 0.22 | 0.00 |
| **Total revenue** | US$ | **357.9** | **392.7** | **34.8** | **404.8** | **449.7** | **45.0** |
| **Costs** | | | | | | | |
| Planting material | US$ | 28.2 | 28.2 | 0.0 | 25.9 | 25.9 | 0.0 |
| Land preparation | US$ | 74.6 | 69.6 | -5.0 | 68.6 | 64.0 | -4.6 |
| Insecticide | US$ | 7.5 | 8.0 | 0.6 | 6.9 | 7.4 | 0.5 |
| Herbicide | US$ | 19.9 | 3.1 | -16.8 | 18.3 | 2.9 | -15.4 |
| Fertilizer | US$ | 39.1 | 46.3 | 7.1 | 36.0 | 42.6 | 6.6 |
| Watering | US$ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Hired labor | US$ | 19.9 | 37.3 | 17.4 | 0.0 | 30.9 | 30.9 |
| Harvesting (machine) | US$ | 69.6 | 64.6 | -5.0 | 64.0 | 59.5 | -4.6 |
| Produce transport | US$ | 4.2 | 20.9 | 16.7 | 3.9 | 19.2 | 15.4 |
| **Total costs (excl. interest payment)** | US$ | **262.9** | **278.0** | **15.1** | **223.6** | **252.3** | **28.7** |
| **Net (excl. interest payment)** | US$ | **95.0** | **114.8** | **19.7** | **181.2** | **197.4** | **16.2** |

W/O = without-project; W/ = with-project; Dif. = difference
Source: PPTA consultant, based on TSSD experience and Agro-Ecosystem Analyses of both communes by the General Department of Agriculture of the Ministry of Agriculture, Forestry and Fisheries.

49. In the financial analysis, the total incremental farm income from wet season rice cultivation is computed by multiplying the incremental area under new practices (67.2 ha, Column D of Table 4) by the per-hectare, incremental net income of $19.7/ha, the difference between the without-project and with-project income (last line in Table 5). The total incremental income from wet season rice cultivation is thus $1,324.4. The incremental farm incomes for other crops and livestock are computed similarly. The summation of the incremental represents the total incremental farm income brought about by the project.

50. The incremental farm incomes for other crops, chickens, and aquaculture are computed similarly. The summation of the incremental represents the total incremental farm income brought about by the project. All line items in Table 5are in financial terms. In the economic analysis, all these items are converted to economic values by applying commodity specific conversion factors. The without- and with-project resources flows are computed following the steps outlined above except that the costs and benefits are now expressed in economic values. The difference

represents the project's incremental benefits. The analysis results are presented in the next section.

## H. Economic and Financial Analysis Results

### 1. Financial Analysis Results

51. Table 6 summarizes the subproject's incremental vehicle operating costs and time costs savings accrued to road users, while Table 7 summarizes the subproject's incremental farm income accrued to the beneficiary households of LIG and agriculture value chain development. The derivation of the estimates are documented in in Annex 1 (for road benefits), and Annexes 2 and 3 (for farm benefits).

52. In the economic analysis, these benefit streams, which are in financial terms, are converted to economic values, and are compared against the subproject's investment costs, also expressed in economic values.

**Table 6: Road Subproject Incremental Vehicle Operating Costs and Time Costs Savings(Financial Value, '000 US$)**

| Project year | Motorbike | Locally made truck | Light truck | Van | Sedan | Motor tricycle | Power tiller | Tractor | Mid-sized truck | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2 | 0.99 | 0.05 | 0.17 | 0.03 | 0.04 | 0.06 | 3.80 | 0.03 | 0.16 | 5.31 |
| 3 | 1.99 | 0.14 | 0.39 | 0.09 | 0.09 | 0.16 | 7.59 | 0.08 | 0.32 | 10.85 |
| 4 | 2.02 | 0.14 | 0.39 | 0.09 | 0.09 | 0.16 | 7.64 | 0.08 | 0.35 | 10.95 |
| 5 | 2.04 | 0.18 | 0.45 | 0.11 | 0.10 | 0.19 | 7.64 | 0.11 | 0.35 | 11.18 |
| 6 | 2.07 | 0.18 | 0.45 | 0.11 | 0.10 | 0.19 | 7.75 | 0.11 | 0.35 | 11.31 |
| 7 | 2.09 | 0.23 | 0.50 | 0.13 | 0.11 | 0.23 | 7.75 | 0.14 | 0.35 | 11.53 |
| 8 | 2.12 | 0.23 | 0.50 | 0.13 | 0.11 | 0.23 | 7.85 | 0.14 | 0.35 | 11.67 |
| 9 | 2.14 | 0.27 | 0.56 | 0.16 | 0.13 | 0.27 | 7.85 | 0.16 | 0.38 | 11.92 |
| 10 | 2.17 | 0.27 | 0.56 | 0.16 | 0.13 | 0.27 | 7.96 | 0.16 | 0.38 | 12.05 |
| 11 | 2.19 | 0.32 | 0.61 | 0.18 | 0.14 | 0.31 | 7.96 | 0.19 | 0.38 | 12.28 |
| 12 | 2.22 | 0.32 | 0.61 | 0.18 | 0.14 | 0.31 | 8.06 | 0.19 | 0.38 | 12.41 |
| 13 | 2.25 | 0.36 | 0.67 | 0.20 | 0.15 | 0.35 | 8.06 | 0.22 | 0.38 | 12.64 |
| 14 | 2.27 | 0.36 | 0.67 | 0.20 | 0.15 | 0.35 | 8.17 | 0.22 | 0.38 | 12.77 |
| 15 | 2.30 | 0.41 | 0.73 | 0.22 | 0.16 | 0.39 | 8.17 | 0.24 | 0.38 | 13.00 |
| 16 | 2.33 | 0.41 | 0.73 | 0.22 | 0.16 | 0.39 | 8.27 | 0.24 | 0.41 | 13.16 |
| 17 | 2.36 | 0.46 | 0.78 | 0.24 | 0.17 | 0.43 | 8.27 | 0.27 | 0.41 | 13.39 |
| 18 | 2.38 | 0.46 | 0.78 | 0.24 | 0.17 | 0.43 | 8.38 | 0.27 | 0.41 | 13.52 |
| 19 | 2.41 | 0.50 | 0.84 | 0.27 | 0.18 | 0.47 | 8.38 | 0.30 | 0.41 | 13.76 |
| 20 | 2.44 | 0.50 | 0.84 | 0.27 | 0.18 | 0.47 | 8.48 | 0.30 | 0.41 | 13.89 |

Source: PPTA consultant.

**Table 7: Road Subproject Incremental Farm Income[a] (Financial Value, '000 US$)**

| Project year | Wet season rice | Dry season rice | Lotus | Vegetables | Chicken | Aquaculture | Total benefits |
|---|---|---|---|---|---|---|---|
| 1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 2 | 0.44 | 1.02 | 1.95 | 0.06 | 2.64 | 7.41 | 13.52 |
| 3 | 0.88 | 2.04 | 3.89 | 0.12 | 5.28 | 8.49 | 20.72 |
| 4 | 1.32 | 3.07 | 5.84 | 0.19 | 7.92 | 9.57 | 27.91 |
| 5 | 1.32 | 3.07 | 7.78 | 0.25 | 10.57 | 10.65 | 33.64 |
| 6 | 1.32 | 3.07 | 7.78 | 0.25 | 10.57 | 10.65 | 33.64 |
| 7 | 1.32 | 3.07 | 7.78 | 0.25 | 10.57 | 10.65 | 33.64 |
| 8 | 1.32 | 3.07 | 7.78 | 0.25 | 10.57 | 10.65 | 33.64 |
| 9 | 1.32 | 3.07 | 7.78 | 0.25 | 10.57 | 10.65 | 33.64 |
| 10 | 1.32 | 3.07 | 7.78 | 0.25 | 10.57 | 10.65 | 33.64 |
| 11 | 1.32 | 3.07 | 7.78 | 0.25 | 10.57 | 10.65 | 33.64 |
| 12 | 1.32 | 3.07 | 7.78 | 0.25 | 10.57 | 10.65 | 33.64 |
| 13 | 1.32 | 3.07 | 7.78 | 0.25 | 10.57 | 10.65 | 33.64 |
| 14 | 1.32 | 3.07 | 7.78 | 0.25 | 10.57 | 10.65 | 33.64 |
| 15 | 1.32 | 3.07 | 7.78 | 0.25 | 10.57 | 10.65 | 33.64 |
| 16 | 1.32 | 3.07 | 7.78 | 0.25 | 10.57 | 10.65 | 33.64 |
| 17 | 1.32 | 3.07 | 7.78 | 0.25 | 10.57 | 10.65 | 33.64 |
| 18 | 1.32 | 3.07 | 7.78 | 0.25 | 10.57 | 10.65 | 33.64 |
| 19 | 1.32 | 3.07 | 7.78 | 0.25 | 10.57 | 10.65 | 33.64 |
| 20 | 1.32 | 3.07 | 7.78 | 0.25 | 10.57 | 10.65 | 33.64 |

[a] Farm income is due to support to LIGs and agriculture value chain development (item 4 in Table 2).
Source: PPTA consultant.

53. Table 8 presents the financial analysis for the overall project.

**Table 8: Road Subproject Financial Analysis ('000 US$)**

| Project year | Capital cost | O&M | LIGs support | Other support cost | Project Management | Total costs | Road Benefit | Farm Benefits | Total benefits | Net Benefit |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | (93.7) | 0.0 | (5.0) | (9.9) | (2.6) | (111.1) | 0.0 | 0.0 | 0.0 | (111.1) |
| 2 | (81.0) | 0.0 | (8.6) | (7.8) | (3.5) | (100.9) | 5.3 | 13.5 | 18.8 | (82.1) |
| 3 | 0.0 | (2.4) | (8.9) | (7.4) | (3.8) | (22.5) | 10.8 | 20.7 | 31.6 | 9.1 |
| 4 | 0.0 | (2.4) | (8.3) | (7.2) | (3.4) | (21.3) | 11.0 | 27.9 | 38.9 | 17.6 |
| 5 | 0.0 | (2.4) | (7.0) | (6.8) | (3.3) | (19.5) | 11.2 | 33.6 | 44.8 | 25.3 |
| 6 | 0.0 | (2.4) | (0.2) | (0.7) | (0.4) | (3.7) | 11.3 | 33.6 | 45.0 | 41.2 |
| 7 | 0.0 | (2.4) | 0.0 | 0.0 | 0.0 | (2.4) | 11.5 | 33.6 | 45.2 | 42.7 |
| 8 | 0.0 | (2.4) | 0.0 | 0.0 | 0.0 | (2.4) | 11.7 | 33.6 | 45.3 | 42.9 |
| 9 | 0.0 | (2.4) | 0.0 | 0.0 | 0.0 | (2.4) | 11.9 | 33.6 | 45.6 | 43.1 |
| 10 | 0.0 | (2.4) | 0.0 | 0.0 | 0.0 | (2.4) | 12.1 | 33.6 | 45.7 | 43.3 |
| 11 | 0.0 | (2.4) | 0.0 | 0.0 | 0.0 | (2.4) | 12.3 | 33.6 | 45.9 | 43.5 |
| 12 | 0.0 | (2.4) | 0.0 | 0.0 | 0.0 | (2.4) | 12.4 | 33.6 | 46.1 | 43.6 |
| 13 | 0.0 | (2.4) | 0.0 | 0.0 | 0.0 | (2.4) | 12.6 | 33.6 | 46.3 | 43.8 |
| 14 | 0.0 | (2.4) | 0.0 | 0.0 | 0.0 | (2.4) | 12.8 | 33.6 | 46.4 | 44.0 |
| 15 | 0.0 | (2.4) | 0.0 | 0.0 | 0.0 | (2.4) | 13.0 | 33.6 | 46.6 | 44.2 |
| 16 | 0.0 | (2.4) | 0.0 | 0.0 | 0.0 | (2.4) | 13.2 | 33.6 | 46.8 | 44.4 |
| 17 | 0.0 | (2.4) | 0.0 | 0.0 | 0.0 | (2.4) | 13.4 | 33.6 | 47.0 | 44.6 |
| 18 | 0.0 | (2.4) | 0.0 | 0.0 | 0.0 | (2.4) | 13.5 | 33.6 | 47.2 | 44.7 |
| 19 | 0.0 | (2.4) | 0.0 | 0.0 | 0.0 | (2.4) | 13.8 | 33.6 | 47.4 | 45.0 |
| 20.0 | 0.0 | (2.4) | 0.0 | 0.0 | 0.0 | (2.4) | 13.9 | 33.6 | 47.5 | 45.1 |
| FNPV = | (172.4) | (39.5) | (36.9) | (38.8) | (16.4) | (304.1) | 205.3 | 542.0 | 747.3 | 443.1 |
| FIRR = | | | | | | | | | | 14.6% |

FIRR = Financial internal rate of return; FNPV = financial net present value; O&M = operation and maintenance.
Source: PPTA consultant.

### 2. Economic Analysis Results

54. Economic analysis demonstrates that the subproject is feasible at the cut-off discount rate (or cost of capital) of 12% (Table 9). At the 12% economic discount rate the base-case NPV is $482,700. The base-case EIRR is 16.7.%.

**Table 9: Road Subproject Economic Analysis (’000 US$)**

| Project year | Capital cost | O&M | LIGs support | Other support cost | Project Management | Total costs | Road Benefit | Farm Benefits | Total benefits | Net Benefit |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | (86.2) | 0.0 | (4.4) | (9.0) | (2.4) | (102.0) | 0.0 | 0.0 | 0.0 | (102.0) |
| 2 | (75.0) | 0.0 | (7.7) | (7.0) | (3.1) | (92.8) | 4.6 | 14.1 | 18.8 | (74.0) |
| 3 | 0.0 | (2.3) | (8.0) | (6.6) | (3.4) | (20.2) | 9.4 | 22.5 | 31.9 | 11.7 |
| 4 | 0.0 | (2.3) | (7.5) | (6.4) | (3.0) | (19.2) | 9.5 | 30.8 | 40.3 | 21.1 |
| 5 | 0.0 | (2.3) | (6.3) | (6.1) | (3.0) | (17.6) | 9.7 | 36.2 | 45.9 | 28.3 |
| 6 | 0.0 | (2.3) | (0.2) | (0.7) | (0.4) | (3.4) | 9.8 | 36.2 | 46.0 | 42.6 |
| 7 | 0.0 | (2.3) | 0.0 | 0.0 | 0.0 | (2.3) | 10.0 | 36.2 | 46.2 | 43.9 |
| 8 | 0.0 | (2.3) | 0.0 | 0.0 | 0.0 | (2.3) | 10.1 | 36.2 | 46.3 | 44.0 |
| 9 | 0.0 | (2.3) | 0.0 | 0.0 | 0.0 | (2.3) | 10.3 | 36.2 | 46.5 | 44.2 |
| 10 | 0.0 | (2.3) | 0.0 | 0.0 | 0.0 | (2.3) | 10.5 | 36.2 | 46.6 | 44.4 |
| 11 | 0.0 | (2.3) | 0.0 | 0.0 | 0.0 | (2.3) | 10.6 | 36.2 | 46.8 | 44.6 |
| 12 | 0.0 | (2.3) | 0.0 | 0.0 | 0.0 | (2.3) | 10.8 | 36.2 | 46.9 | 44.7 |
| 13 | 0.0 | (2.3) | 0.0 | 0.0 | 0.0 | (2.3) | 11.0 | 36.2 | 47.1 | 44.9 |
| 14 | 0.0 | (2.3) | 0.0 | 0.0 | 0.0 | (2.3) | 11.1 | 36.2 | 47.2 | 45.0 |
| 15 | 0.0 | (2.3) | 0.0 | 0.0 | 0.0 | (2.3) | 11.3 | 36.2 | 47.4 | 45.2 |
| 16 | 0.0 | (2.3) | 0.0 | 0.0 | 0.0 | (2.3) | 11.4 | 36.2 | 47.6 | 45.3 |
| 17 | 0.0 | (2.3) | 0.0 | 0.0 | 0.0 | (2.3) | 11.6 | 36.2 | 47.7 | 45.5 |
| 18 | 0.0 | (2.3) | 0.0 | 0.0 | 0.0 | (2.3) | 11.7 | 36.2 | 47.9 | 45.6 |
| 19 | 0.0 | (2.3) | 0.0 | 0.0 | 0.0 | (2.3) | 11.9 | 36.2 | 48.1 | 45.8 |
| 20.0 | 0.0 | (2.3) | 0.0 | 0.0 | 0.0 | (2.3) | 12.0 | 36.2 | 48.2 | 45.9 |
| ENPV = | (159.1) | (36.6) | (33.2) | (34.8) | (14.8) | (278.4) | 178.0 | 583.1 | 761.1 | 482.7 |
| EIRR = | | | | | | | | | | 16.7% |

EIRR = economic internal rate of return; ENPV = economic net present value; O&M = operation and maintenance.
Source: PPTA consultant.

### 3. Sensitivity Analysis Results

55. Sensitivity tests of the economic analysis were performed on five variables that could potentially affect the economic performance of the subproject. The five variables are:

(i) 10%increase in capital cost;
(ii) 10%increase in recurrent cost;
(iii) 10% decrease in benefits;
(iv) 20% decrease in benefits; and
(v) one-year delay in benefits.

56. The sensitivity tests show that the most sensitive variables are the 20% reduction in benefits followed by the one-year delay in benefits (Table 10). While the one-year delay in benefits will reduce the ENPV to $25,800, the reduction in benefits by 20% will result in the decline of the ENPV to $5,2000. Accordingly, the subproject’s EIRR will be down to 13.9% when the benefits were delayed by one year, and to 12.4% as the benefits were reduced by 20%. The subproject is highly sensitive to these two variables.

**Table 10: Sensitivity Analysis**

| Case | ENPV ('000 US$) | EIRR | SI (ENPV) | SV (ENPV) |
|---|---|---|---|---|
| 0. Base case | 59.20 | 16.7% | | |
| 1. Capital costs + 10% | 45.53 | 15.4% | 3.6 | 28% |
| 2. Recurrent costs + 10% | 52.87 | 16.2% | 3.6 | 28% |
| 3. Benefits decrease - 10% | 32.20 | 14.6% | 4.6 | 22% |
| 4. Benefits decrease - 20% | 5.19 | 12.4% | 4.6 | 22% |
| 5. Benefits delay - 1 year | 25.81 | 13.9% | 4.6 | 56% |

EIRR = economic internal rate of return; ENPV = economic net present value; SI = sensitivity indicator (the ratio that compares percentage change in ENPV with percentage change in a variable); SV = switching value (the percentage change in a variable sufficient to reduce ENPV to zero)
Source: PPTA consultant.

### 1. Distribution Analysis

57. Table 11 presents the distribution analysis. Based on a poverty household ratio of 37.6% in the subproject communes, the poverty impact ratio is 34.2%, that is, at least 34.2% of the projects' benefits accrues to the poorest and poor households (ID1 and ID2 categories). The subproject is likely to have a greater impact on poverty reduction since the LIGs and agricultural value chain development support are targeting poor households.

Table 11: Road Subproject Distribution Analysis

| | Financial | Economic | Externality | Allocation of Benefits and Costs | | | Total |
|---|---|---|---|---|---|---|---|
| | | | | GoI | Labor | Beneficiary | |
| **Project Benefits** | | | | | | | |
| Access road | 58,124 | 51,537 | -6,587 | -5,795 | 0 | 57,332 | 51,537 |
| Agricultural extension services | 192,361 | 207,077 | 14,717 | 14,717 | 0 | 192,361 | 207,077 |
| **Total Benefits** | **250,484** | **258,614** | **8,130** | **8,922** | **0** | **249,692** | **258,614** |
| **Project Costs** | | | | | | | |
| **Investment Costs** | | | | | | | |
| Local | 82,350 | 75,980 | -6,371 | 75,980 | 0 | 0 | 75,980 |
| Foreign | 32,940 | 30,392 | -2,548 | 30,392 | 0 | 0 | 30,392 |
| Unskilled | 32,940 | 30,392 | -2,548 | 32,940 | -2,548 | 0 | 30,392 |
| **O&M Costs** | | | | | | | |
| Local | 14,051 | 13,006 | -1,045 | 13,006 | 0 | 0 | 13,006 |
| Foreign | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unskilled | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Others** | | | | | | | |
| Local | 33,375 | 29,950 | -3,425 | 29,950 | 0 | 0 | 29,950 |
| Foreign | 17,115 | 15,373 | -1,742 | 15,373 | 0 | 0 | 15,373 |
| Unskilled | 17,610 | 15,788 | -1,822 | 17,610 | -1,822 | 0 | 15,788 |
| **Total Project Costs** | 230,382 | 210,880 | -19,502 | 215,250 | -4,370 | 0 | 210,880 |
| **Net Benefits** | 20,102 | 47,734 | 27,632 | -206,328 | 4,370 | 249,692 | 47,734 |
| **Poverty Impact Analysis** | | | | | | | |
| Proportion of the poor[a] | | | | 37.6% | 0.0% | 37.6% | |
| Net Benefits for the Poor | | | | -77,573 | 0 | 93,877 | 16,304 |
| Poverty impact ratio | | | | | | | **34.2%** |

[a] Include the poorest and poor households (ID1 and ID2 category).
Source: PPTA consultant.

### 4. Sustainability Analysis

58. TSSD-AF will construct 175 km of rural roads, and the management of rural road falls under the responsibility of Ministry of Rural Development (MRD).

59. With DRR-design and the use of DRR-resilient materials, TSSD-AF rural infrastructure are likely to have a longer economic life than the ones built using conventional standards.[15] To further extend their economic life, TSSD-AF will finance O&M in the initial years (year 3 to 5). In the project cost budgeting, routine O&M provision is equivalent to 10% of the total budget for civil works.

60. Annual maintenance requirement for rural roads varies by the type of pavement. Concrete road is considered maintenance free by MRD. For paved roads with double bituminous surface treatment, O&M requirement is around $1,000/km per year. For laterite roads, it is around $1,300/km. Assuming an average annual O&M requirement of $1,250/km, TSSD-AF calls for an incremental O&M budget of $219,000 per year (in real terms) at project completion.

61. Providing adequate and timely funding for rural infrastructure O&M is a chronic problem in many countries, including Cambodia. MRD's allocated budgeted for rural road maintenance has increased steadily, from $8.2 million in 2010 to $11.4 million in 2014 (Table 12). For 2017, the budget is expected to be around $12.0 million. At this trend, by project completion MRD should have sufficient budget to provide for the incremental O&M of $219,000 (less than 2% of the expected $12.0 million 2017 budget) to keep the TSSD-AF roads in functioning conditions. Similar to the subproject irrigation schemes, the road infrastructure will be registered in the national asset inventory. Once registered, under the project loan agreement, MRD will provide counterpart funds for O&M. With these arrangements, the road component is considered to be likely sustainable.

**Table 12: MEF Budget on Rural Road O&M**

| Year | Cambodian Riels (million) | Exchange rate | US$ (million) | Distance (km) | |
|---|---|---|---|---|---|
| | | | | Routine | Periodic |
| 2010 | 33,000 | 4,055 | 8.14 | 525 | 643 |
| 2011 | 37,000 | 4,035 | 9.17 | 1,104 | 519 |
| 2012 | 40,000 | 4,033 | 9.92 | 1,192 | 570 |
| 2013 | 46,000 | 4,027 | 11.42 | 973 | 528 |
| 2014 | 46,000 | 4,038 | 11.39 | 456 | 386 |

MEF = Ministry of Economy and Finance
Source: Ministry of Economy and Finance (MEF) statistics prepared by PPTA consultant

[15] In the engineer consultant's opinion, provided the DRR-resilient infrastructure are properly built, and specifically for road subprojects, the cargo vehicles are not overloaded, they can have an economic life of over 10 years with limited maintenance.

# Annex 1 – Vehicle Operating Cost and Time Cost

## Table A1-1: Fuel Consumption Cost for Motorbikes (Financial Value, US$)

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Fuel price | US$/litre | 0.945 | 0.945 | 0.000 | 0.859 | 0.859 | 0.000 |
| Fuel consumption | litre/km | 0.027 | 0.030 | 0.003 | 0.027 | 0.030 | 0.003 |
| **Fuel cost (A)** | **US$/km** | **0.026** | **0.028** | **0.026** | **0.023** | **0.026** | **0.000** |
| **Travel distance per trip (B)** | **km/trip** | **2.74** | **2.74** | **0.00** | **2.74** | **2.74** | **0.00** |
| Number of vehicle in villages[a] | vehicle | 674 | 674 | 0 | 674 | 674 | 0 |
| Number of trip per vehicle per year | trip/vehicle | 135 | 135 | 0 | 135 | 135 | 0 |
| **Number of trip per year (C)** | trip | 90,990 | 90,990 | 0 | 90,990 | 90,990 | 0 |
| **Total distance travel per annum (D=B*C)** | **km** | **249,677** | **249,677** | **0** | **249,677** | **249,677** | **0** |
| **Fuel consumption cost (E=A*D)** | **US$** | **6,427** | **7,040** | **613** | **5,843** | **6,400** | **557** |

W/O = without-project; W/ = with-project; Dif. = difference
[a] 674 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

## Table A1-2: Lubricating Oil and Filter Cost for Motorbikes (Financial Value, US$)

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 579.27 | 579.27 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 674 | 674 | 0 | 674 | 674 | 0 |
| Number of trip per vehicle per year | trip/vehicle | 135 | 135 | 0 | 390,429 | 390,429 | 0 |
| Number of trip per year (B) | trip | 90,990 | 90,990 | 0 | 90,990 | 90,990 | 0 |
| **Total distance travel per annum (C=A*B)** | **km** | **249,677** | **249,677** | **0** | **249,677** | **249,677** | **0** |
| Change frequency (D) | km/change | 639.0 | 700.0 | 60.9 | 639.1 | 639.1 | 0.0 |
| **Changes (E=C/D)** | change | 390.7 | 356.7 | -34.0 | 390.6 | 356.7 | -34.0 |
| **Cost per change (F)** | US$/change | 4.23 | 4.23 | 0.0 | 3.8 | 3.8 | 0.00 |
| **Lubricating oil and filter cost (G=E*F)** | **US$** | **1,651** | **1,507** | **-144** | **1,501** | **1,370** | **-130.6** |

W/O = without-project; W/ = with-project; Dif. = difference
[a] 674 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

## Table A1-3: Tyre Cost for Motorbikes(Financial Value, US$)

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 36.50 | 36.50 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 674 | 674 | 0 | 674 | 674 | 0 |
| Number of trip per vehicle per year | trip/vehicle | 135 | 135 | 0 | 24,601 | 24,601 | 0 |
| Number of trip per year (B) | trip | 90,990 | 90,990 | 0 | 90,990 | 90,990 | 0 |
| **Total distance travel per annum (C=A*B)** | **km** | **249,677** | **249,677** | **0** | **249,677** | **249,677** | **0** |
| Change frequency (D) | km/change | 22,824 | 25,000 | 2,176 | 22,824 | 22,824 | 0.0 |
| **Changes (E=C/D)** | change | 10.9 | 10.0 | -1.0 | 10.9 | 10.0 | -1.0 |
| **Cost per change (F)** | US$/change | 50.00 | 50.00 | 0.0 | 35.6 | 35.6 | 0.0 |
| **Tyre cost (E=A*D)** | **US$** | **547** | **499** | **-48** | **389** | **355** | **-33.9** |

W/O = without-project; W/ = with-project; Dif. = difference
[a] 674 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

## Table A1-4: Brake and Other Spare Parts Cost for Motorbikes(Financial Value, US$)

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 6.21 | 6.21 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 674 | 674 | 0 | 674 | 674 | 0 |
| Number of trip per vehicle per year | trip/vehicle | 135 | 135 | 0 | 4,188 | 4,188 | 0 |
| Number of trip per year (B) | trip | 90,990 | 90,990 | 0 | 90,990 | 90,990 | 0 |
| **Total distance travel per annum (C=A*B)** | **km** | 249,677 | 249,677 | 0 | 249,677 | 249,677 | 0 |
| Change frequency (D) | km/change | 6,847 | 7,500 | 652 | 6,847 | 6,847 | 0.0 |

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| **Changes (E=C/D)** | change | 36.5 | 33.3 | -3.2 | 36.46 | 33.29 | -3.2 |
| **Cost per change (F)** | US$/change | 54.9 | 54.9 | 0.0 | 36.45 | 36.45 | 0.0 |
| **Brakes and spare parts cost (E=A*D)** | **US$** | 2,003 | 1,829 | -174 | 1,329 | 1,214 | -115.7 |

W/O = without-project; W/ = with-project; Dif. = difference
[a] 674 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

## Table A1-5: Time Cost for Motorbikes (Financial Value, US$)

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 674 | 674 | 0 | 674 | 674 | 0 |
| Number of trip per vehicle per year | trip/vehicle | 135 | 135 | 0 | 0 | 0 | 0 |
| Number of trip per year (B) | trip | 90,990 | 90,990 | 0 | 90,990 | 90,990 | 0 |
| **Total distance travel per annum (C=A*B)** | **km** | **249,677** | **249,677** | **0** | **249,677** | **249,677** | **0** |
| Speed (D) | km/hr | **35** | **30** | **-5.0** | **35** | **30** | **-5.0** |
| Passenger (E) | person/trip | **1.0** | **1.0** | **0.0** | **1.0** | **1.0** | **0.0** |
| Wage (F) | US$/hour | **0.81** | **0.78** | **0.3** | **0.67** | **0.64** | **0.3** |
| **Time cost (G=C/D*E*F)** | **US$** | **5,763** | **6,465** | **702** | **4,772** | **5,353** | **581.2** |

W/O = without-project; W/ = with-project; Dif. = difference
[a] 674 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

## Table A1-6: Depreciation Cost for Motorbikes (Financial Value, US$)

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Number of vehicle in villages[a] (A) | vehicle | 674 | 674 | 0.0 | 674 | 674 | 0.00 |
| Deprecation (B) | US$/year | 155 | 157 | 1.6 | 118 | 119 | 1.2 |
| **Depreciation cost (C=A*B)** | **US$** | **104,470** | **105,515** | **1,045** | **79,473** | **80,268** | **794.73** |

W/O = without-project; W/ = with-project; Dif. = difference
[a] 674 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

## Table A1-7: Fuel Consumption Cost for Locally Made Trucks (Financial Value, US$)

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Fuel price | US$/litre | 0.671 | 0.671 | 0.000 | 0.610 | 0.610 | 0.000 |
| Fuel consumption | litre/km | 0.168 | 0.210 | 0.042 | 0.168 | 0.210 | 0.042 |
| **Fuel cost (A)** | **US$/km** | **0.113** | **0.141** | **0.000** | **0.103** | **0.128** | **0.000** |
| **Travel distance per trip (B)** | **km/trip** | **2.74** | **2.74** | **0.00** | **2.74** | **2.74** | **0.00** |
| Number of vehicle in villages[a] | vehicle | 3 | 3 | 0.0 | 3 | 3 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 200 | 200 | 0.0 | 200 | 200 | 0.0 |
| **Number of trip per year (C)** | trip | 600 | 600 | 0.0 | 600 | 600 | 0.0 |
| **Total distance travel per annum (D=B*C)** | **km** | **1,646** | **1,646** | **0.0** | **1,646** | **1,646** | **0.0** |
| **Fuel consumption cost (E=A*D)** | **US$** | **186** | **232** | **46** | **169** | **211** | **42** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]3 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-8: Lubricating Oil and Filter Cost for Locally Made Trucks (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 579.27 | 579.27 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 674 | 674 | 0 | 674 | 674 | 0 |
| Number of trip per vehicle per year | trip/vehicle | 135 | 135 | 0 | 390,429 | 390,429 | 0 |
| Number of trip per year (B) | trip | 90,990 | 90,990 | 0 | 90,990 | 90,990 | 0 |
| **Total distance travel per annum (C=A*B)** | **km** | **249,677** | **249,677** | **0** | **249,677** | **249,677** | **0** |
| Change frequency (D) | km/change | 639.0 | 700.0 | 60.9 | 639.1 | 639.1 | 0.0 |
| **Changes (E=C/D)** | change | 390.7 | 356.7 | -34.0 | 390.6 | 356.7 | -34.0 |
| **Cost per change (F)** | US$/change | 4.23 | 4.23 | 0.0 | 3.8 | 3.8 | 0.00 |
| **Lubricating oil and filter cost (G=E*F)** | **US$** | **1,651** | **1,507** | **-144** | **1,501** | **1,370** | **-130.6** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]3 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-9: Tyre Cost for Locally Made Trucks (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.70 | 0.70 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 3 | 3 | 0.0 | 3 | 3 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 200 | 200 | 0.0 | 2 | 2 | 0.0 |
| Number of trip per year (B) | trip | 600 | 600 | 0.0 | 600 | 600 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **1,646** | **1,646** | **0.0** | **1,646** | **1,646** | **0.0** |
| Change frequency (D) | km/change | 2,804 | 3,500 | 696 | 2,804 | 2,804 | 0.0 |
| **Changes (E=C/D)** | change | 0.6 | 0.5 | -0.1 | 0.6 | 0.5 | -0.1 |
| **Cost per change (F)** | US$/change | 55.0 | 55.0 | 0.0 | 50.0 | 50.0 | 0.0 |
| **Tyre cost (E=A*D)** | **US$** | **32** | **26** | **-6** | **29** | **24** | **-6** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]3 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-10: Brake and Other Spare Parts Cost for Locally Made Trucks (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 3 | 3 | 0.0 | 3 | 3 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 200 | 200 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 600 | 600 | 0.0 | 600 | 600 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **1,646** | **1,646** | **0.0** | **1,646** | **1,646** | **0.0** |
| Change frequency (D) | km/change | 15,224 | 19,000 | 3,776 | 15,224 | 15,224 | 0.0 |
| **Changes (E=C/D)** | change | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 | 0.0 |
| **Cost per change (F)** | US$/change | 45.0 | 45.0 | 0.0 | 29.9 | 29.9 | 0.0 |
| **Brakes and spare parts cost (E=A*D)** | **US$** | **5** | **4** | **-1** | **3** | **3** | **-1** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]3 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-11: Time Cost for Locally Made Trucks (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 3 | 3 | 0.0 | 3 | 3 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 200 | 200 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 600 | 600 | 0.0 | 600 | 600 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **1,646** | **1,646** | **0.0** | **1,646** | **1,646** | **0.0** |
| Speed (D) | km/hr | 35 | 30 | -5.0 | 35 | 30 | -5.0 |
| Passenger (E) | person/trip | 20.0 | 20.0 | 0.0 | 20.0 | 20.0 | 0.0 |

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Wage (F) | US$/hour | 0.81 | 0.78 | 0.0 | 0.67 | 0.64 | 0.0 |
| **Time cost (G=C/D*E*F)** | **US$** | **760** | **853** | **93** | **629** | **706** | **76.6** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]3 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-12: Depreciation Cost for Locally Made Trucks (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Number of vehicle in villages[a] (A) | vehicle | 3 | 3 | 0.0 | 3 | 3 | 0.00 |
| Deprecation (B) | US$/year | 240 | 242 | 2.4 | 172 | 174 | 1.7 |
| **Depreciation cost (C=A*B)** | **US$** | **720** | **727** | **7** | **516** | **521** | **5** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]3 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-13: Fuel Consumption Cost for Light Trucks (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Fuel price | US$/litre | 0.671 | 0.671 | 0.000 | 0.610 | 0.610 | 0.000 |
| Fuel consumption | litre/km | 0.132 | 0.165 | 0.033 | 0.132 | 0.165 | 0.033 |
| **Fuel cost (A)** | **US$/km** | **0.089** | **0.111** | **0.000** | **0.081** | **0.101** | **0.000** |
| **Travel distance per trip (B)** | **km/trip** | **2.74** | **2.74** | **0.00** | **2.74** | **2.74** | **0.00** |
| Number of vehicle in villages[a] | vehicle | 7 | 7 | 0.0 | 7 | 7 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 245 | 245 | 0.0 | 245 | 245 | 0.0 |
| **Number of trip per year (C)** | trip | 1,715 | 1,715 | 0.0 | 1,715 | 1,715 | 0.0 |
| **Total distance travel per annum (D=B*C)** | **km** | **4,706** | **4,706** | **0.0** | **4,706** | **4,706** | **0.0** |
| **Fuel consumption cost (E=A*D)** | **US$** | **418** | **521** | **104** | **380** | **474** | **94** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]7 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-14: Lubricating Oil and Filter Cost for Light Trucks (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 7 | 7 | 0.0 | 7 | 7 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 245 | 245 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 1,715 | 1,715 | 0.0 | 1,715 | 1,715 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **4,706** | **4,706** | **0.0** | **4,706** | **4,706** | **0.0** |
| Change frequency (D) | km/change | 2,804 | 3,500 | 696 | 2,804 | 2,804 | 0.0 |
| **Changes (E=C/D)** | change | 1.7 | 1.3 | -0.3 | 1.7 | 1.3 | -0.3 |
| **Cost per change (F)** | US$/change | 55.0 | 55.0 | 0.0 | 50.0 | 50.0 | 0.0 |
| **Lubricating oil and filter cost (G=E*F)** | **US$** | **92** | **74** | **-18** | **84** | **67** | **-17** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]7 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-15: Tire Cost for Light Trucks (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 7 | 7 | 0.0 | 7 | 7 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 245 | 245 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 1,715 | 1,715 | 0.0 | 1,715 | 1,715 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **4,706** | **4,706** | **0.0** | **4,706** | **4,706** | **0.0** |

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| | | | | 12,91 | | | 12,91 |
| Change frequency (D) | km/change | 52,083 | 65,000 | 7 | 52,083 | 65,000 | 6.8 |
| **Changes (E=C/D)** | change | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 | 0.0 |
| **Cost per change (F)** | US$/change | 320.0 | 320.0 | 0.0 | 227.7 | 227.7 | 0.0 |
| **Tyre cost (E=A*D)** | **US$** | **29** | **23** | **-6** | **21** | **16** | **-4** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]7 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

## Table A1-16: Brake and Other Spare Parts Cost for Light Trucks (Financial Value, US$)

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 7 | 7 | 0.0 | 7 | 7 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 245 | 245 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 1,715 | 1,715 | 0.0 | 1,715 | 1,715 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **4,706** | **4,706** | **0.0** | **4,706** | **4,706** | **0.0** |
| Change frequency (D) | km/change | 15,224 | 19,000 | 3,776 | 15,224 | 15,224 | 0.0 |
| **Changes (E=C/D)** | change | 0.3 | 0.2 | -0.1 | 0.3 | 0.2 | -0.1 |
| **Cost per change (F)** | US$/change | 160.0 | 160.0 | 0.0 | 106.2 | 106.2 | 0.0 |
| **Brakes and spare parts cost (E=A*D)** | **US$** | **49** | **40** | **-10** | **33** | **26** | **-7** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]7 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

## Table A1-17: Time Cost for Light Trucks (Financial Value, US$)

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 7 | 7 | 0.0 | 7 | 7 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 245 | 245 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 1,715 | 1,715 | 0.0 | 1,715 | 1,715 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | 4,706 | 4,706 | 0.0 | 4,706 | 4,706 | 0.0 |
| Speed (D) | km/hr | 40 | 35 | -5.0 | 40 | 30 | -10.0 |
| Passenger (E) | person/trip | 25.0 | 25.0 | 0.0 | 25.0 | 25.0 | 0.0 |
| Wage (F) | US$/hour | 0.81 | 0.78 | 0.0 | 0.67 | 0.64 | 0.0 |
| **Time cost (G=C/D*E*F)** | **US$** | 2,376 | 2,611 | 235 | 1,967 | 2,522 | 554.9 |

W/O = without-project; W/ = with-project; Dif. = difference
[a]7 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

## Table A1-18: Depreciation Cost for Light Trucks (Financial Value, US$)

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Number of vehicle in villages[a] (A) | vehicle | 7 | 7 | 0.0 | 7 | 7 | 0.00 |
| Deprecation (B) | US$/year | 1,235 | 1,247 | 12.3 | 939 | 949 | 9.4 |
| **Depreciation cost (C=A*B)** | **US$** | **8,645** | **8,731** | **86** | **6,576** | **6,642** | **66** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]7 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-19: Fuel Consumption Cost for Vans (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Fuel price | US$/litre | 0.945 | 0.945 | 0.000 | 0.859 | 0.859 | 0.000 |
| Fuel consumption | litre/km | 0.144 | 0.180 | 0.036 | 0.144 | 0.180 | 0.036 |
| **Fuel cost (A)** | **US$/km** | **0.136** | **0.170** | **0.000** | **0.124** | **0.155** | **0.000** |
| **Travel distance per trip (B)** | **km/trip** | **2.74** | **2.74** | **0.00** | **2.74** | **2.74** | **0.00** |
| Number of vehicle in villages[a] | vehicle | 4 | 4 | 0.0 | 4 | 4 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 91 | 91 | 0.0 | 91 | 91 | 0.0 |
| **Number of trip per year (C)** | trip | 364 | 364 | 0.0 | 364 | 364 | 0.0 |
| **Total distance travel per annum (D=B*C)** | **km** | **999** | **999** | **0.0** | **999** | **999** | **0.0** |
| **Fuel consumption cost (E=A*D)** | **US$** | **136** | **170** | **34** | **123** | **154** | **31** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]4 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-20: Lubricating Oil and Filter Cost for Vans (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 4 | 4 | 0.0 | 4 | 4 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 91 | 91 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 364 | 364 | 0.0 | 364 | 364 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **999** | **999** | **0.0** | **999** | **999** | **0.0** |
| Change frequency (D) | km/change | 2,800 | 3,500 | 700 | 2,800 | 2,800 | 0.0 |
| **Changes (E=C/D)** | change | 0.4 | 0.3 | -0.1 | 0.4 | 0.3 | -0.1 |
| **Cost per change (F)** | US$/change | 55.0 | 55.0 | 0.0 | 50.0 | 50.0 | 0.0 |
| **Lubricating oil and filter cost (G=E*F)** | **US$** | **20** | **16** | **-4** | **18** | **14** | **-4** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]4 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-21: Tire Cost for Vans (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 4 | 4 | 0.0 | 4 | 4 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 91 | 91 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 364 | 364 | 0.0 | 364 | 364 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **999** | **999** | **0.0** | **999** | **999** | **0.0** |
| Change frequency (D) | km/change | 51,996 | 65,000 | 13,004 | 51,996 | 65,000 | 13,005 |
| **Changes (E=C/D)** | change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Cost per change (F)** | US$/change | 280.0 | 280.0 | 0.0 | 199.3 | 199.3 | 0.0 |
| **Tyre cost (E=A*D)** | **US$** | **5** | **4** | **-1** | **4** | **3** | **-1** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]4 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-22: Brake and Other Spare Parts Cost for Vans (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 4 | 4 | 0.0 | 4 | 4 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 91 | 91 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 364 | 364 | 0.0 | 364 | 364 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **999** | **999** | **0.0** | **999** | **999** | **0.0** |
| Change frequency (D) | km/change | 15,199 | 19,000 | 3,801 | 15,199 | 15,199 | 0.0 |
| **Changes (E=C/D)** | change | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 | 0.0 |

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| **Cost per change (F)** | US$/change | 110.0 | 110.0 | 0.0 | 73.0 | 73.0 | 0.0 |
| **Brakes and spare parts cost (E=A*D)** | **US$** | **7** | **6** | **-1** | **5** | **4** | **-1** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]4 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

## Table A1-23: Time Cost for Vans (Financial Value, US$)

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 4 | 4 | 0.0 | 4 | 4 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 91 | 91 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 364 | 364 | 0.0 | 364 | 364 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **999** | **999** | **0.0** | **999** | **999** | **0.0** |
| Speed (D) | km/hr | 40 | 35 | -5.0 | 40 | 30 | -10.0 |
| Passenger (E) | person/trip | 15.0 | 15.0 | 0.0 | 15.0 | 15.0 | 0.0 |
| Wage (F) | US$/hour | 0.81 | 0.78 | 0.0 | 0.67 | 0.64 | 0.0 |
| **Time cost (G=C/D*E*F)** | **US$** | **303** | **333** | **30** | **251** | **321** | **70.7** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]4 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

## Table A1-24: Depreciation Cost for Vans (Financial Value, US$)

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Number of vehicle in villages[a] (A) | vehicle | 4 | 4 | 0.0 | 4 | 4 | 0.00 |
| Deprecation (B) | US$/year | 790 | 798 | 7.9 | 601 | 607 | 6.0 |
| **Depreciation cost (C=A*B)** | **US$** | **3,160** | **3,192** | **32** | **2,404** | **2,428** | **24** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]4 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

## Table A1-25:Fuel Consumption Cost for Sedans (Financial Value, US$)

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Fuel price | US$/litre | 0.945 | 0.945 | 0.000 | 0.859 | 0.859 | 0.000 |
| Fuel consumption | litre/km | 0.152 | 0.180 | 0.028 | 0.152 | 0.180 | 0.028 |
| **Fuel cost (A)** | **US$/km** | **0.143** | **0.170** | **0.000** | **0.130** | **0.155** | **0.000** |
| **Travel distance per trip (B)** | **km/trip** | **2.74** | **2.74** | **0.00** | **2.74** | **2.74** | **0.00** |
| Number of vehicle in villages[a] | vehicle | 8 | 8 | 0.0 | 8 | 8 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 51 | 51 | 0.0 | 51 | 51 | 0.0 |
| **Number of trip per year (C)** | trip | 408 | 408 | 0.0 | 408 | 408 | 0.0 |
| **Total distance travel per annum (D=B*C)** | **km** | **1,120** | **1,120** | **0.0** | **1,120** | **1,120** | **0.0** |
| **Fuel consumption cost (E=A*D)** | **US$** | **161** | **190** | **30** | **146** | **173** | **27** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]8 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

## Table A1-26: Lubricating Oil and Filter Cost for Sedans (Financial Value, US$)

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 8 | 8 | 0.0 | 8 | 8 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 51 | 51 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 408 | 408 | 0.0 | 408 | 408 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **1,120** | **1,120** | **0.0** | **1,120** | **1,120** | **0.0** |
| Change frequency (D) | km/change | 2,952 | 3,500 | 548 | 2,952 | 2,952 | 0.0 |

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| **Changes (E=C/D)** | change | 0.4 | 0.3 | -0.1 | 0.4 | 0.3 | -0.1 |
| **Cost per change (F)** | US$/change | 55.0 | 55.0 | 0.0 | 50.0 | 50.0 | 0.0 |
| **Lubricating oil and filter cost (G=E*F)** | **US$** | **21** | **18** | **-3** | **19** | **16** | **-3** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]8is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-27: Tire Cost for Sedans (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 8 | 8 | 0.0 | 8 | 8 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 51 | 51 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 408 | 408 | 0.0 | 408 | 408 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **1,120** | **1,120** | **0.0** | **1,120** | **1,120** | **0.0** |
| Change frequency (D) | km/change | 54,829 | 65,000 | 10,171 | 54,829 | 65,000 | 10,171 |
| **Changes (E=C/D)** | change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Cost per change (F)** | US$/change | 280.0 | 280.0 | 0.0 | 199.3 | 199.3 | 0.0 |
| **Tyre cost (E=A*D)** | **US$** | **6** | **5** | **-1** | **4** | **3** | **-1** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]8is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-28: Brake and Other Spare Parts Cost for Sedans (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 8 | 8 | 0.0 | 8 | 8 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 51 | 51 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 408 | 408 | 0.0 | 408 | 408 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **1,120** | **1,120** | **0.0** | **1,120** | **1,120** | **0.0** |
| Change frequency (D) | km/change | 16,027 | 19,000 | 2,973 | 16,027 | 16,027 | 0.0 |
| **Changes (E=C/D)** | change | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 | 0.0 |
| **Cost per change (F)** | US$/change | 110.0 | 110.0 | 0.0 | 73.0 | 73.0 | 0.0 |
| **Brakes and spare parts cost (E=A*D)** | **US$** | **8** | **6** | **-1** | **5** | **4** | **-1** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]8is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-29: Time Cost for Sedans (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 8 | 8 | 0.0 | 8 | 8 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 51 | 51 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 408 | 408 | 0.0 | 408 | 408 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **1,120** | **1,120** | **0.0** | **1,120** | **1,120** | **0.0** |
| Speed (D) | km/hr | 40 | 35 | -5.0 | 40 | 30 | -10.0 |
| Passenger (E) | person/trip | 2.0 | 2.0 | 0.0 | 2.0 | 2.0 | 0.0 |
| Wage (F) | US$/hour | 0.81 | 0.78 | 0.0 | 0.67 | 0.64 | 0.0 |
| **Time cost (G=C/D*E*F)** | **US$** | **45** | **50** | **4** | **37** | **48** | **10.6** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]8is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-30: Depreciation Cost for Sedans (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Number of vehicle in villages[a] (A) | vehicle | 8 | 8 | 0.0 | 8 | 8 | 0.00 |
| Deprecation (B) | US$/year | 780 | 788 | 7.8 | 593 | 599 | 5.9 |
| **Depreciation cost (C=A*B)** | **US$** | **6,240** | **6,302** | **62** | **4,747** | **4,794** | **47** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]8is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-31: Fuel Consumption Cost for Motor Tricycles (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Fuel price | US$/litre | 0.945 | 0.945 | 0.000 | 0.859 | 0.859 | 0.000 |
| Fuel consumption | litre/km | 0.052 | 0.060 | 0.008 | 0.052 | 0.060 | 0.008 |
| **Fuel cost (A)** | **US$/km** | **0.049** | **0.057** | **0.000** | **0.044** | **0.052** | **0.000** |
| **Travel distance per trip (B)** | **km/trip** | **2.74** | **2.74** | **0.00** | **2.74** | **2.74** | **0.00** |
| Number of vehicle in villages[a] | vehicle | 4 | 4 | 0.0 | 4 | 4 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 245 | 245 | 0.0 | 245 | 245 | 0.0 |
| **Number of trip per year (C)** | trip | 980 | 980 | 0.0 | 980 | 980 | 0.0 |
| **Total distance travel per annum (D=B*C)** | **km** | **2,689** | **2,689** | **0.0** | **2,689** | **2,689** | **0.0** |
| **Fuel consumption cost (E=A*D)** | **US$** | **131** | **152** | **21** | **119** | **139** | **19** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]4 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-32: Lubricating Oil and Filter Cost for Motor Tricycles (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 4 | 4 | 0.0 | 4 | 4 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 245 | 245 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 980 | 980 | 0.0 | 980 | 980 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **2,689** | **2,689** | **0.0** | **2,689** | **2,689** | **0.0** |
| Change frequency (D) | km/change | 862 | 1,000 | 138 | 862 | 862 | 0.0 |
| **Changes (E=C/D)** | change | 3.1 | 2.7 | -0.4 | 3.1 | 2.7 | -0.4 |
| **Cost per change (F)** | US$/change | 7.0 | 7.0 | 0.0 | 6.3 | 6.3 | 0.0 |
| **Lubricating oil and filter cost (G=E*F)** | **US$** | **22** | **19** | **-3** | **20** | **17** | **-3** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]4is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-33: Tire Cost for Motor Tricycles (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 4 | 4 | 0.0 | 4 | 4 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 245 | 245 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 980 | 980 | 0.0 | 980 | 980 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **2,689** | **2,689** | **0.0** | **2,689** | **2,689** | **0.0** |
| | | 21,545 | 25,000 | 3,455 | 21,545 | 25,000 | 3,454 |
| Change frequency (D) | km/change | | | | | | .6 |
| **Changes (E=C/D)** | change | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 | 0.0 |
| **Cost per change (F)** | US$/change | 127.5 | 127.5 | 0.0 | 90.7 | 90.7 | 0.0 |
| **Tyre cost (E=A*D)** | **US$** | **16** | **14** | **-2** | **11** | **10** | **-2** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]4is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-34: Brake and Other Spare Parts Cost for Motor Tricycles (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 4 | 4 | 0.0 | 4 | 4 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 245 | 245 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 980 | 980 | 0.0 | 980 | 980 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **2,689** | **2,689** | **0.0** | **2,689** | **2,689** | **0.0** |
| Change frequency (D) | km/change | 6,895 | 8,000 | 1,105 | 6,895 | 6,895 | 0.0 |
| **Changes (E=C/D)** | change | 0.4 | 0.3 | -0.1 | 0.4 | 0.3 | -0.1 |
| **Cost per change (F)** | US$/change | 80.0 | 80.0 | 0.0 | 53.1 | 53.1 | 0.0 |
| **Brakes and spare parts cost (E=A*D)** | **US$** | **31** | **27** | **-4** | **21** | **18** | **-3** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]4is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-35: Time Cost for Motor Tricycles (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 4 | 4 | 0.0 | 4 | 4 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 245 | 245 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 980 | 980 | 0.0 | 980 | 980 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **2,689** | **2,689** | **0.0** | **2,689** | **2,689** | **0.0** |
| Speed (D) | km/hr | 30 | 25 | -5.0 | 30 | 30 | 0.0 |
| Passenger (E) | person/trip | 12.0 | 12.0 | 0.0 | 12.0 | 12.0 | 0.0 |
| Wage (F) | US$/hour | 0.81 | 0.78 | 0.0 | 0.67 | 0.64 | 0.0 |
| **Time cost (G=C/D*E*F)** | **US$** | **869** | **1,003** | **134** | **720** | **692** | **-27.7** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]4is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-36: Depreciation Cost for Motor Tricycles (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Number of vehicle in villages[a] (A) | vehicle | 4 | 4 | 0.0 | 4 | 4 | 0.00 |
| Deprecation (B) | US$/year | 270 | 273 | 2.7 | 205 | 207 | 2.1 |
| **Depreciation cost (C=A*B)** | **US$** | **1,080** | **1,091** | **11** | **822** | **830** | **8** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]4is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-37: Fuel Consumption Cost for Power Tillers (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Fuel price | US$/litre | 0.671 | 0.671 | 0.000 | 0.610 | 0.610 | 0.000 |
| Fuel consumption | litre/km | 0.252 | 0.333 | 0.081 | 0.252 | 0.333 | 0.081 |
| **Fuel cost (A)** | **US$/km** | **0.169** | **0.224** | **0.000** | **0.154** | **0.203** | **0.000** |
| **Travel distance per trip (B)** | **km/trip** | **2.74** | **2.74** | **0.00** | **2.74** | **2.74** | **0.00** |
| Number of vehicle in villages[a] | vehicle | 145 | 145 | 0.0 | 145 | 145 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 100 | 100 | 0.0 | 100 | 100 | 0.0 |
| **Number of trip per year (C)** | trip | 14,500 | 14,500 | 0.0 | 14,500 | 14,500 | 0.0 |
| **Total distance travel per annum (D=B*C)** | **km** | **39,788** | **39,788** | **0.0** | **39,788** | **39,788** | **0.0** |
| **Fuel consumption cost (E=A*D)** | **US$** | **6,741** | **8,901** | **2,160** | **6,128** | **8,092** | **1,964** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]145is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-38: Lubricating Oil and Filter Cost for Power Tillers (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 145 | 145 | 0.0 | 145 | 145 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 100 | 100 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 14,500 | 14,500 | 0.0 | 14,500 | 14,500 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **39,788** | **39,788** | **0.0** | **39,788** | **39,788** | **0.0** |
| Change frequency (D) | km/change | 204 | 270 | 66 | 204 | 204 | 0.0 |
| **Changes (E=C/D)** | change | 194.6 | 147.4 | -47.2 | 194.6 | 147.4 | -47.2 |
| **Cost per change (F)** | US$/change | 7.0 | 7.0 | 0.0 | 6.3 | 6.3 | 0.0 |
| **Lubricating oil and filter cost (G=E*F)** | **US$** | **1,354** | **1,026** | **-329** | **1,231** | **932** | **-299** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]145is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-39: Tire Cost for Power Tillers (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 145 | 145 | 0.0 | 145 | 145 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 100 | 100 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 14,500 | 14,500 | 0.0 | 14,500 | 14,500 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **39,788** | **39,788** | **0.0** | **39,788** | **39,788** | **0.0** |
| | | 64,370 | 85,000 | 20,63 | 64,370 | 85,000 | 20,62 |
| Change frequency (D) | km/change | | | 0 | | | 9.5 |
| **Changes (E=C/D)** | change | 0.6 | 0.5 | -0.2 | 0.6 | 0.5 | -0.2 |
| **Cost per change (F)** | US$/change | 260.0 | 260.0 | 0.0 | 203.5 | 203.5 | 0.0 |
| **Tyre cost (E=A*D)** | **US$** | **161** | **122** | **-39** | **126** | **95** | **-31** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]145is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-40: Brake and Other Spare Parts Cost for Power Tillers (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 145 | 145 | 0.0 | 145 | 145 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 100 | 100 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 14,500 | 14,500 | 0.0 | 14,500 | 14,500 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **39,788** | **39,788** | **0.0** | **39,788** | **39,788** | **0.0** |
| Change frequency (D) | km/change | 18,932 | 25,000 | 6,068 | 18,932 | 18,932 | 0.0 |
| **Changes (E=C/D)** | change | 2.1 | 1.6 | -0.5 | 2.1 | 1.6 | -0.5 |
| **Cost per change (F)** | US$/change | 120.0 | 120.0 | 0.0 | 87.6 | 87.6 | 0.0 |
| **Brakes and spare parts cost (E=A*D)** | **US$** | **252** | **191** | **-61** | **184** | **139** | **-45** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]145is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-41: Time Cost for Power Tillers (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 145 | 145 | 0.0 | 145 | 145 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 100 | 100 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 14,500 | 14,500 | 0.0 | 14,500 | 14,500 | 0.0 |

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| **Total distance travel per annum (C=A*B)** | **km** | **39,78 8** | **39,78 8** | **0.0** | **39,78 8** | **39,78 8** | **0.0** |
| Speed (D) | km/hr | 15 | 10 | -5.0 | 15 | 30 | 15.0 |
| Passenger (E) | person/trip | 2.0 | 2.0 | 0.0 | 2.0 | 2.0 | 0.0 |
| Wage (F) | US$/hour | 0.81 | 0.78 | 0.0 | 0.67 | 0.64 | 0.0 |
| **Time cost (G=C/D*E*F)** | **US$** | **4,286** | **6,181** | **1,89 6** | **3,549** | **1,706** | **- 1,842.5** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]145is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-42: Depreciation Cost for Power Tillers (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Number of vehicle in villages[a] (A) | vehicle | 145 | 145 | 0.0 | 145 | 145 | 0.00 |
| Deprecation (B) | US$/year | 233 | 235 | 2.3 | 195 | 197 | 1.9 |
| **Depreciation cost (C=A*B)** | **US$** | **33,713** | **34,050** | **337** | **28,211** | **28,493** | **282** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]145is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-43: Fuel Consumption Cost for Tractors (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Fuel price | US$/litre | 0.671 | 0.671 | 0.000 | 0.610 | 0.610 | 0.000 |
| Fuel consumption | litre/km | 0.303 | 0.400 | 0.097 | 0.303 | 0.400 | 0.097 |
| **Fuel cost (A)** | **US$/km** | **0.203** | **0.268** | **0.000** | **0.185** | **0.244** | **0.000** |
| **Travel distance per trip (B)** | **km/trip** | **2.74** | **2.74** | **0.00** | **2.74** | **2.74** | **0.00** |
| Number of vehicle in villages[a] | vehicle | 3 | 3 | 0.0 | 3 | 3 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 60 | 60 | 0.0 | 60 | 60 | 0.0 |
| **Number of trip per year (C)** | trip | 180 | 180 | 0.0 | 180 | 180 | 0.0 |
| **Total distance travel per annum (D=B*C)** | **km** | **494** | **494** | **0.0** | **494** | **494** | **0.0** |
| **Fuel consumption cost (E=A*D)** | **US$** | **100** | **133** | **32** | **91** | **121** | **29** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]3 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-44: Lubricating Oil and Filter Cost for Tractors (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 3 | 3 | 0.0 | 3 | 3 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 60 | 60 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 180 | 180 | 0.0 | 180 | 180 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **494** | **494** | **0.0** | **494** | **494** | **0.0** |
| Change frequency (D) | km/change | 227 | 300 | 73 | 227 | 227 | 0.0 |
| **Changes (E=C/D)** | change | 2.2 | 1.6 | -0.5 | 2.2 | 1.6 | -0.5 |
| **Cost per change (F)** | US$/change | 48.7 | 48.7 | 0.0 | 44.3 | 44.3 | 0.0 |
| **Lubricating oil and filter cost (G=E*F)** | **US$** | **106** | **80** | **-26** | **96** | **73** | **-23** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]3is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-45: Tire Cost for Tractors (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 3 | 3 | 0.0 | 3 | 3 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 60 | 60 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 180 | 180 | 0.0 | 180 | 180 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **494** | **494** | **0.0** | **494** | **494** | **0.0** |
| | | 64,370 | 85,000 | 20,63 | 64,370 | 85,000 | 20,62 |
| Change frequency (D) | km/change | | | 0 | | | 9.5 |
| **Changes (E=C/D)** | change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Cost per change (F)** | US$/change | 740.0 | 740.0 | 0.0 | 579.3 | 579.3 | 0.0 |
| **Tyre cost (E=A*D)** | **US$** | **6** | **4** | **-1** | **4** | **3** | **-1** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]3is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-46: Brake and Other Spare Parts Cost for Tractors (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 3 | 3 | 0.0 | 3 | 3 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 60 | 60 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 180 | 180 | 0.0 | 180 | 180 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **494** | **494** | **0.0** | **494** | **494** | **0.0** |
| Change frequency (D) | km/change | 18,932 | 25,000 | 6,068 | 18,932 | 18,932 | 0.0 |
| **Changes (E=C/D)** | change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Cost per change (F)** | US$/change | 200.0 | 200.0 | 0.0 | 146.0 | 146.0 | 0.0 |
| **Brakes and spare parts cost (E=A*D)** | **US$** | **5** | **4** | **-1** | **4** | **3** | **-1** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]3is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-47: Time Cost for Tractors (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 3 | 3 | 0.0 | 3 | 3 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 60 | 60 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 180 | 180 | 0.0 | 180 | 180 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **494** | **494** | **0.0** | **494** | **494** | **0.0** |
| Speed (D) | km/hr | 15 | 10 | -5.0 | 15 | 30 | 15.0 |
| Passenger (E) | person/trip | 1.0 | 1.0 | 0.0 | 1.0 | 1.0 | 0.0 |
| Wage (F) | US$/hour | 0.81 | 0.78 | 0.0 | 0.67 | 0.64 | 0.0 |
| **Time cost (G=C/D*E*F)** | **US$** | **27** | **38** | **12** | **22** | **11** | **-11.4** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]3is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-48: Depreciation Cost for Tractors (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Number of vehicle in villages[a] (A) | vehicle | 3 | 3 | 0.0 | 3 | 3 | 0.00 |
| Deprecation (B) | US$/year | 2,200 | 2,222 | 22.0 | 1,841 | 1,859 | 18.4 |
| **Depreciation cost (C=A*B)** | **US$** | **6,600** | **6,666** | **66** | **5,523** | **5,578** | **55** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]3is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-49: Fuel Consumption Cost for Mid-sized Trucks (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Fuel price | US$/litre | 0.671 | 0.671 | 0.000 | 0.610 | 0.610 | 0.000 |
| Fuel consumption | litre/km | 0.162 | 0.195 | 0.033 | 0.162 | 0.195 | 0.033 |
| **Fuel cost (A)** | **US$/km** | **0.109** | **0.131** | **0.000** | **0.099** | **0.119** | **0.000** |
| **Travel distance per trip (B)** | **km/trip** | **2.74** | **2.74** | **0.00** | **2.74** | **2.74** | **0.00** |
| Number of vehicle in villages[a] | vehicle | 10 | 10 | 0.0 | 10 | 10 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 80 | 80 | 0.0 | 80 | 80 | 0.0 |
| **Number of trip per year (C)** | trip | 800 | 800 | 0.0 | 800 | 800 | 0.0 |
| **Total distance travel per annum (D=B*C)** | **km** | **2,195** | **2,195** | **0.0** | **2,195** | **2,195** | **0.0** |
| **Fuel consumption cost (E=A*D)** | **US$** | **239** | **287** | **49** | **217** | **261** | **44** |

W/O = without-project; W/ = with-project; Dif. = difference
[a] 10 is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-50: Lubricating Oil and Filter Cost for Mid-sized Trucks (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 10 | 10 | 0.0 | 10 | 10 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 80 | 80 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 800 | 800 | 0.0 | 800 | 800 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **2,195** | **2,195** | **0.0** | **2,195** | **2,195** | **0.0** |
| Change frequency (D) | km/change | 2,909 | 3,500 | 591 | 2,909 | 2,909 | 0.0 |
| **Changes (E=C/D)** | change | 0.8 | 0.6 | -0.1 | 0.8 | 0.6 | -0.1 |
| **Cost per change (F)** | US$/change | 55.0 | 55.0 | 0.0 | 50.0 | 50.0 | 0.0 |
| **Lubricating oil and filter cost (G=E*F)** | **US$** | **42** | **34** | **-7** | **38** | **31** | **-6** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]10is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-51: Tire Cost for Mid-sized Trucks (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 10 | 10 | 0.0 | 10 | 10 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 80 | 80 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 800 | 800 | 0.0 | 800 | 800 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **2,195** | **2,195** | **0.0** | **2,195** | **2,195** | **0.0** |
| | | 54,023 | 65,000 | 10,97 | 54,023 | 65,000 | 10,97 |
| Change frequency (D) | km/change | | | 7 | | | 7.0 |
| **Changes (E=C/D)** | change | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Cost per change (F)** | US$/change | 720.0 | 720.0 | 0.0 | 512.4 | 512.4 | 0.0 |
| **Tyre cost (E=A*D)** | **US$** | **29** | **24** | **-5** | **21** | **17** | **-4** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]10is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-52: Brake and Other Spare Parts Cost for Mid-sized Trucks (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 10 | 10 | 0.0 | 10 | 10 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 80 | 80 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 800 | 800 | 0.0 | 800 | 800 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **2,195** | **2,195** | **0.0** | **2,195** | **2,195** | **0.0** |
| Change frequency (D) | km/change | 15,791 | 19,000 | 3,209 | 15,791 | 15,791 | 0.0 |

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| **Changes (E=C/D)** | change | 0.1 | 0.1 | 0.0 | 0.1 | 0.1 | 0.0 |
| **Cost per change (F)** | US$/change | 200.0 | 200.0 | 0.0 | 132.7 | 132.7 | 0.0 |
| **Brakes and spare parts cost (E=A*D)** | **US$** | **28** | **23** | **-5** | **18** | **15** | **-3** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]10is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-53: Time Cost for Mid-sized Trucks (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Travel distance per trip (A) | km/trip | 2.74 | 2.74 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of vehicle in villages[a] | vehicle | 10 | 10 | 0.0 | 10 | 10 | 0.0 |
| Number of trip per vehicle per year | trip/vehicle | 80 | 80 | 0.0 | 0 | 0 | 0.0 |
| Number of trip per year (B) | trip | 800 | 800 | 0.0 | 800 | 800 | 0.0 |
| **Total distance travel per annum (C=A*B)** | **km** | **2,195** | **2,195** | **0.0** | **2,195** | **2,195** | **0.0** |
| Speed (D) | km/hr | 40 | 35 | -5.0 | 40 | 30 | -10.0 |
| Passenger (E) | person/trip | 2.0 | 2.0 | 0.0 | 2.0 | 2.0 | 0.0 |
| Wage (F) | US$/hour | 0.81 | 0.78 | 0.0 | 0.67 | 0.64 | 0.0 |
| **Time cost (G=C/D*E*F)** | **US$** | **89** | **97** | **9** | **73** | **94** | **20.7** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]10is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

**Table A1-54: Depreciation Cost for Mid-sized Trucks (Financial Value, US$)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/ | W/O | Dif. | W/ | W/O | Dif. |
| Number of vehicle in villages[a] (A) | vehicle | 10 | 10 | 0.0 | 10 | 10 | 0.00 |
| Deprecation (B) | US$/year | 2,760 | 2,788 | 27.6 | 2,100 | 2,121 | 21.0 |
| **Depreciation cost (C=A*B)** | **US$** | **27,600** | **27,876** | **276** | **20,996** | **21,206** | **210** |

W/O = without-project; W/ = with-project; Dif. = difference
[a]10is the vehicle count for Year 3. Vehicle counts are adjusted yearly.
Source: PPTA consultant

Table A1-55 presents the vehicles counts and distance travelled assumptions used to compute the vehicle operating cost and time costs. Note that the total distance travelled (km, in Panal D) in A1-55 are identical to those reports in Tables A1-1 to A1-54.

**Table A1-55: Vehicle Counts and Total Distance Travelled by Vehicle Type**

| | Motorbike | Locally made truck | Light truck | Van | Sedan | Motor tri-cycle | Power tiller | Tractor | Mid-sized truck |
|---|---|---|---|---|---|---|---|---|---|
| **Vehicles (A)** | | | | | | | | | |
| Year 1 | 658 | 2 | 6 | 3 | 7 | 3 | 143 | 2 | 10 |
| Year 2 | 666 | 2 | 6 | 3 | 7 | 3 | 145 | 2 | 10 |
| Year 3 | 674 | 3 | 7 | 4 | 8 | 4 | 145 | 3 | 10 |
| Year 4 | 682 | 3 | 7 | 4 | 8 | 4 | 146 | 3 | 11 |
| Year 5 | 690 | 4 | 8 | 5 | 9 | 5 | 146 | 4 | 11 |
| Year 6 | 699 | 4 | 8 | 5 | 9 | 5 | 148 | 4 | 11 |
| Year 7 | 707 | 5 | 9 | 6 | 10 | 6 | 148 | 5 | 11 |
| Year 8 | 716 | 5 | 9 | 6 | 10 | 6 | 150 | 5 | 11 |
| Year 9 | 724 | 6 | 10 | 7 | 11 | 7 | 150 | 6 | 12 |
| Year 10 | 733 | 6 | 10 | 7 | 11 | 7 | 152 | 6 | 12 |
| Year 11 | 742 | 7 | 11 | 8 | 12 | 8 | 152 | 7 | 12 |
| Year 12 | 751 | 7 | 11 | 8 | 12 | 8 | 154 | 7 | 12 |
| Year 13 | 760 | 8 | 12 | 9 | 13 | 9 | 154 | 8 | 12 |
| Year 14 | 769 | 8 | 12 | 9 | 13 | 9 | 156 | 8 | 12 |
| Year 15 | 778 | 9 | 13 | 10 | 14 | 10 | 156 | 9 | 12 |
| Year 16 | 787 | 9 | 13 | 10 | 14 | 10 | 158 | 9 | 13 |

| | Motorbike | Locally made truck | Light truck | Van | Sedan | Motor tri-cycle | Power tiller | Tractor | Mid-sized truck |
|---|---|---|---|---|---|---|---|---|---|
| Year 17 | 797 | 10 | 14 | 11 | 15 | 11 | 158 | 10 | 13 |
| Year 18 | 806 | 10 | 14 | 11 | 15 | 11 | 160 | 10 | 13 |
| Year 19 | 816 | 11 | 15 | 12 | 16 | 12 | 160 | 11 | 13 |
| Year 20 | 826 | 11 | 15 | 12 | 16 | 12 | 162 | 11 | 13 |
| **Trip per vehicle (B)** | | | | | | | | | |
| | 135 | 200 | 245 | 91 | 51 | 245 | 100 | 60 | 80 |
| **Travel distance (average km round trip) (C)** | | | | | | | | | |
| | 2.744 | 2.744 | 2.744 | 2.744 | 2.744 | 2.744 | 2.744 | 2.744 | 2.744 |
| **Distance travelled (km) (D=A*B*C)** | | | | | | | | | |
| Year 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Year 2 | 246,713 | 1,098 | 4,034 | 749 | 980 | 2,017 | 39,788 | 329 | 2,195 |
| Year 3 | 249,677 | 1,646 | 4,706 | 999 | 1,120 | 2,689 | 39,788 | 494 | 2,195 |
| Year 4 | 252,640 | 1,646 | 4,706 | 999 | 1,120 | 2,689 | 40,062 | 494 | 2,415 |
| Year 5 | 255,604 | 2,195 | 5,378 | 1,249 | 1,259 | 3,361 | 40,062 | 659 | 2,415 |
| Year 6 | 258,938 | 2,195 | 5,378 | 1,249 | 1,259 | 3,361 | 40,611 | 659 | 2,415 |
| Year 7 | 261,901 | 2,744 | 6,051 | 1,498 | 1,399 | 4,034 | 40,611 | 823 | 2,415 |
| Year 8 | 265,235 | 2,744 | 6,051 | 1,498 | 1,399 | 4,034 | 41,160 | 823 | 2,415 |
| Year 9 | 268,199 | 3,293 | 6,723 | 1,748 | 1,539 | 4,706 | 41,160 | 988 | 2,634 |
| Year 10 | 271,533 | 3,293 | 6,723 | 1,748 | 1,539 | 4,706 | 41,709 | 988 | 2,634 |
| Year 11 | 274,866 | 3,842 | 7,395 | 1,998 | 1,679 | 5,378 | 41,709 | 1,152 | 2,634 |
| Year 12 | 278,200 | 3,842 | 7,395 | 1,998 | 1,679 | 5,378 | 42,258 | 1,152 | 2,634 |
| Year 13 | 281,534 | 4,390 | 8,067 | 2,247 | 1,819 | 6,051 | 42,258 | 1,317 | 2,634 |
| Year 14 | 284,868 | 4,390 | 8,067 | 2,247 | 1,819 | 6,051 | 42,806 | 1,317 | 2,634 |
| Year 15 | 288,202 | 4,939 | 8,740 | 2,497 | 1,959 | 6,723 | 42,806 | 1,482 | 2,634 |
| Year 16 | 291,536 | 4,939 | 8,740 | 2,497 | 1,959 | 6,723 | 43,355 | 1,482 | 2,854 |
| Year 17 | 295,241 | 5,488 | 9,412 | 2,747 | 2,099 | 7,395 | 43,355 | 1,646 | 2,854 |
| Year 18 | 298,575 | 5,488 | 9,412 | 2,747 | 2,099 | 7,395 | 43,904 | 1,646 | 2,854 |
| Year 19 | 302,279 | 6,037 | 10,084 | 2,996 | 2,239 | 8,067 | 43,904 | 1,811 | 2,854 |
| Year 20 | 305,983 | 6,037 | 10,084 | 2,996 | 2,239 | 8,067 | 44,453 | 1,811 | 2,854 |

Source: PPTA consultant

Tables A1-56 to A1-61 presents the different vehicle operating cost and time cost by vehicle types. Note that the cost savings at Year 3 are identical to those reported in Tables A1-1 to A1-54. Also note that summing the various vehicle operating cost and time cost component would yield the aggregate figures in Table 6 in the main text.

**Table A1-56: Fuel Cost Savings by Vehicle Type (Financial Value, $US)**

| | Motorbike | Locally made truck | Light truck | Van | Sedan | Motor tri-cycle | Power tiller | Tractor | Mid-sized truck |
|---|---|---|---|---|---|---|---|---|---|
| Year 1 | - | - | - | - | - | - | - | - | - |
| Year 2 | 303 | 15 | 44 | 13 | 13 | 8 | 2,893 | 11 | 24 |
| Year 3 | 613 | 46 | 104 | 34 | 30 | 21 | 5,787 | 32 | 49 |
| Year 4 | 620 | 46 | 104 | 34 | 30 | 21 | 5,827 | 32 | 53 |
| Year 5 | 627 | 61 | 118 | 42 | 34 | 26 | 5,827 | 43 | 53 |
| Year 6 | 635 | 61 | 118 | 42 | 34 | 26 | 5,906 | 43 | 53 |
| Year 7 | 643 | 77 | 133 | 51 | 37 | 32 | 5,906 | 54 | 53 |
| Year 8 | 651 | 77 | 133 | 51 | 37 | 32 | 5,986 | 54 | 53 |
| Year 9 | 658 | 92 | 148 | 59 | 41 | 37 | 5,986 | 64 | 58 |
| Year 10 | 666 | 92 | 148 | 59 | 41 | 37 | 6,066 | 64 | 58 |
| Year 11 | 675 | 108 | 163 | 68 | 45 | 42 | 6,066 | 75 | 58 |
| Year 12 | 683 | 108 | 163 | 68 | 45 | 42 | 6,146 | 75 | 58 |
| Year 13 | 691 | 123 | 178 | 76 | 48 | 47 | 6,146 | 86 | 58 |
| Year 14 | 699 | 123 | 178 | 76 | 48 | 47 | 6,226 | 86 | 58 |
| Year 15 | 707 | 138 | 192 | 85 | 52 | 53 | 6,226 | 97 | 58 |
| Year 16 | 715 | 138 | 192 | 85 | 52 | 53 | 6,305 | 97 | 63 |
| Year 17 | 725 | 154 | 207 | 93 | 56 | 58 | 6,305 | 107 | 63 |
| Year 18 | 733 | 154 | 207 | 93 | 56 | 58 | 6,385 | 107 | 63 |
| Year 19 | 742 | 169 | 222 | 102 | 60 | 63 | 6,385 | 118 | 63 |
| Year 20 | 751 | 169 | 222 | 102 | 60 | 63 | 6,465 | 118 | 63 |

Source: PPTA consultant

**Table A1-57: Lubricating Oil and Filter Cost Savings by Vehicle Type (Financial Value, $US)**

| | Motorbike | Locally made truck | Light truck | Van | Sedan | Motor tri-cycle | Power tiller | Tractor | Mid-sized truck |
|---|---|---|---|---|---|---|---|---|---|
| Year 1 | - | - | - | - | - | - | - | - | - |
| Year 2 | (71) | (2) | (8) | (1) | (1) | (1) | (164) | (9) | (4) |
| Year 3 | (144) | (6) | (18) | (4) | (3) | (4) | (329) | (26) | (7) |
| Year 4 | (145) | (6) | (18) | (4) | (3) | (4) | (331) | (26) | (8) |
| Year 5 | (147) | (9) | (21) | (5) | (4) | (5) | (331) | (34) | (8) |
| Year 6 | (149) | (9) | (21) | (5) | (4) | (5) | (336) | (34) | (8) |
| Year 7 | (151) | (11) | (24) | (6) | (4) | (5) | (336) | (43) | (8) |
| Year 8 | (153) | (11) | (24) | (6) | (4) | (5) | (340) | (43) | (8) |
| Year 9 | (154) | (13) | (26) | (7) | (4) | (6) | (340) | (51) | (8) |
| Year 10 | (156) | (13) | (26) | (7) | (4) | (6) | (345) | (51) | (8) |
| Year 11 | (158) | (15) | (29) | (8) | (5) | (7) | (345) | (60) | (8) |
| Year 12 | (160) | (15) | (29) | (8) | (5) | (7) | (349) | (60) | (8) |
| Year 13 | (162) | (17) | (31) | (9) | (5) | (8) | (349) | (69) | (8) |
| Year 14 | (164) | (17) | (31) | (9) | (5) | (8) | (354) | (69) | (8) |
| Year 15 | (166) | (19) | (34) | (10) | (6) | (9) | (354) | (77) | (8) |
| Year 16 | (168) | (19) | (34) | (10) | (6) | (9) | (358) | (77) | (9) |
| Year 17 | (170) | (21) | (37) | (11) | (6) | (10) | (358) | (86) | (9) |
| Year 18 | (172) | (21) | (37) | (11) | (6) | (10) | (363) | (86) | (9) |
| Year 19 | (174) | (24) | (39) | (12) | (7) | (11) | (363) | (94) | (9) |
| Year 20 | (176) | (24) | (39) | (12) | (7) | (11) | (367) | (94) | (9) |

Source: PPTA consultant

**Table A1-58: Tire Cost Savings by Vehicle Type (Financial Value, $US)**

| | Motorbike | Locally made truck | Light truck | Van | Sedan | Motor tri-cycle | Power tiller | Tractor | Mid-sized truck |
|---|---|---|---|---|---|---|---|---|---|
| Year 1 | - | - | - | - | - | - | - | - | - |
| Year 2 | (24) | (1) | (2) | (0) | (0) | (1) | (20) | (0) | (2) |
| Year 3 | (48) | (2) | (6) | (1) | (1) | (2) | (39) | (1) | (5) |
| Year 4 | (48) | (2) | (6) | (1) | (1) | (2) | (39) | (1) | (5) |
| Year 5 | (49) | (2) | (7) | (1) | (1) | (3) | (39) | (2) | (5) |
| Year 6 | (49) | (2) | (7) | (1) | (1) | (3) | (40) | (2) | (5) |
| Year 7 | (50) | (3) | (7) | (2) | (1) | (3) | (40) | (2) | (5) |
| Year 8 | (51) | (3) | (7) | (2) | (1) | (3) | (40) | (2) | (5) |
| Year 9 | (51) | (4) | (8) | (2) | (1) | (4) | (40) | (3) | (6) |
| Year 10 | (52) | (4) | (8) | (2) | (1) | (4) | (41) | (3) | (6) |
| Year 11 | (52) | (4) | (9) | (2) | (1) | (4) | (41) | (3) | (6) |
| Year 12 | (53) | (4) | (9) | (2) | (1) | (4) | (41) | (3) | (6) |
| Year 13 | (54) | (5) | (10) | (2) | (1) | (5) | (41) | (4) | (6) |
| Year 14 | (54) | (5) | (10) | (2) | (1) | (5) | (42) | (4) | (6) |
| Year 15 | (55) | (5) | (11) | (3) | (2) | (5) | (42) | (4) | (6) |
| Year 16 | (56) | (5) | (11) | (3) | (2) | (5) | (43) | (4) | (6) |
| Year 17 | (56) | (6) | (11) | (3) | (2) | (6) | (43) | (5) | (6) |
| Year 18 | (57) | (6) | (11) | (3) | (2) | (6) | (43) | (5) | (6) |
| Year 19 | (58) | (6) | (12) | (3) | (2) | (7) | (43) | (5) | (6) |
| Year 20 | (58) | (6) | (12) | (3) | (2) | (7) | (44) | (5) | (6) |

Source: PPTA consultant

**Table A1-59: Brakes and Spare Parts Cost Savings by Vehicle Type (Financial Value, $US)**

| | Motorbike | Locally made truck | Light truck | Van | Sedan | Motor tri-cycle | Power tiller | Tractor | Mid-sized truck |
|---|---|---|---|---|---|---|---|---|---|
| Year 1 | - | - | - | - | - | - | - | - | - |
| Year 2 | (86) | (0) | (4) | (1) | (1) | (2) | (31) | (0) | (2) |
| Year 3 | (174) | (1) | (10) | (1) | (1) | (4) | (61) | (1) | (5) |
| Year 4 | (176) | (1) | (10) | (1) | (1) | (4) | (62) | (1) | (5) |
| Year 5 | (178) | (1) | (11) | (2) | (1) | (5) | (62) | (2) | (5) |
| Year 6 | (181) | (1) | (11) | (2) | (1) | (5) | (62) | (2) | (5) |
| Year 7 | (183) | (2) | (13) | (2) | (2) | (6) | (62) | (2) | (5) |
| Year 8 | (185) | (2) | (13) | (2) | (2) | (6) | (63) | (2) | (5) |
| Year 9 | (187) | (2) | (14) | (3) | (2) | (8) | (63) | (3) | (6) |
| Year 10 | (190) | (2) | (14) | (3) | (2) | (8) | (64) | (3) | (6) |
| Year 11 | (192) | (2) | (15) | (3) | (2) | (9) | (64) | (3) | (6) |
| Year 12 | (194) | (2) | (15) | (3) | (2) | (9) | (65) | (3) | (6) |
| Year 13 | (197) | (3) | (17) | (3) | (2) | (10) | (65) | (3) | (6) |
| Year 14 | (199) | (3) | (17) | (3) | (2) | (10) | (66) | (3) | (6) |
| Year 15 | (201) | (3) | (18) | (4) | (2) | (11) | (66) | (4) | (6) |
| Year 16 | (204) | (3) | (18) | (4) | (2) | (11) | (67) | (4) | (6) |
| Year 17 | (206) | (3) | (20) | (4) | (2) | (12) | (67) | (4) | (6) |
| Year 18 | (208) | (3) | (20) | (4) | (2) | (12) | (68) | (4) | (6) |
| Year 19 | (211) | (4) | (21) | (4) | (2) | (13) | (68) | (5) | (6) |
| Year 20 | (214) | (4) | (21) | (4) | (2) | (13) | (68) | (5) | (6) |

Source: PPTA consultant

**Table A1-60: Time Cost Savings by Vehicle Type (Financial Value, $US)**

| | Motorbike | Locally made truck | Light truck | Van | Sedan | Motor tri-cycle | Power tiller | Tractor | Mid-sized truck |
|---|---|---|---|---|---|---|---|---|---|
| Year 1 | - | - | - | - | - | - | - | - | - |
| Year 2 | 347 | 31 | 101 | 11 | 2 | 50 | 948 | 4 | 4 |
| Year 3 | 702 | 93 | 235 | 30 | 4 | 134 | 1,896 | 12 | 9 |
| Year 4 | 710 | 93 | 235 | 30 | 4 | 134 | 1,909 | 12 | 10 |
| Year 5 | 719 | 123 | 269 | 37 | 5 | 167 | 1,909 | 16 | 10 |
| Year 6 | 728 | 123 | 269 | 37 | 5 | 167 | 1,935 | 16 | 10 |
| Year 7 | 736 | 154 | 302 | 45 | 6 | 201 | 1,935 | 20 | 10 |
| Year 8 | 746 | 154 | 302 | 45 | 6 | 201 | 1,961 | 20 | 10 |
| Year 9 | 754 | 185 | 336 | 52 | 6 | 234 | 1,961 | 24 | 11 |
| Year 10 | 763 | 185 | 336 | 52 | 6 | 234 | 1,987 | 24 | 11 |
| Year 11 | 773 | 216 | 369 | 60 | 7 | 267 | 1,987 | 27 | 11 |
| Year 12 | 782 | 216 | 369 | 60 | 7 | 267 | 2,013 | 27 | 11 |
| Year 13 | 791 | 247 | 403 | 67 | 7 | 301 | 2,013 | 31 | 11 |
| Year 14 | 801 | 247 | 403 | 67 | 7 | 301 | 2,039 | 31 | 11 |
| Year 15 | 810 | 278 | 436 | 75 | 8 | 334 | 2,039 | 35 | 11 |
| Year 16 | 820 | 278 | 436 | 75 | 8 | 334 | 2,066 | 35 | 11 |
| Year 17 | 830 | 309 | 470 | 82 | 8 | 368 | 2,066 | 39 | 11 |
| Year 18 | 839 | 309 | 470 | 82 | 8 | 368 | 2,092 | 39 | 11 |
| Year 19 | 850 | 339 | 504 | 90 | 9 | 401 | 2,092 | 43 | 11 |
| Year 20 | 860 | 339 | 504 | 90 | 9 | 401 | 2,118 | 43 | 11 |

Source: PPTA consultant

**Table A1-61 Vehicle Depreciation Cost Savings by Vehicle Type (Financial Value, $US)**

| | Motorbike | Locally made truck | Light truck | Van | Sedan | Motor tri-cycle | Power tiller | Tractor | Mid-sized truck |
|---|---|---|---|---|---|---|---|---|---|
| Year 1 | - | - | - | - | - | - | - | - | - |
| Year 2 | 516 | 2 | 37 | 12 | 27 | 4 | 169 | 22 | 138 |
| Year 3 | 1,045 | 7 | 86 | 32 | 62 | 11 | 337 | 66 | 276 |
| Year 4 | 1,057 | 7 | 86 | 32 | 62 | 11 | 339 | 66 | 304 |
| Year 5 | 1,070 | 10 | 99 | 40 | 70 | 14 | 339 | 88 | 304 |
| Year 6 | 1,083 | 10 | 99 | 40 | 70 | 14 | 344 | 88 | 304 |
| Year 7 | 1,096 | 12 | 111 | 47 | 78 | 16 | 344 | 110 | 304 |
| Year 8 | 1,110 | 12 | 111 | 47 | 78 | 16 | 349 | 110 | 304 |
| Year 9 | 1,122 | 14 | 124 | 55 | 86 | 19 | 349 | 132 | 331 |
| Year 10 | 1,136 | 14 | 124 | 55 | 86 | 19 | 353 | 132 | 331 |
| Year 11 | 1,150 | 17 | 136 | 63 | 94 | 22 | 353 | 154 | 331 |
| Year 12 | 1,164 | 17 | 136 | 63 | 94 | 22 | 358 | 154 | 331 |
| Year 13 | 1,178 | 19 | 148 | 71 | 101 | 24 | 358 | 176 | 331 |
| Year 14 | 1,192 | 19 | 148 | 71 | 101 | 24 | 363 | 176 | 331 |
| Year 15 | 1,206 | 22 | 161 | 79 | 109 | 27 | 363 | 198 | 331 |
| Year 16 | 1,220 | 22 | 161 | 79 | 109 | 27 | 367 | 198 | 359 |
| Year 17 | 1,235 | 24 | 173 | 87 | 117 | 30 | 367 | 220 | 359 |
| Year 18 | 1,249 | 24 | 173 | 87 | 117 | 30 | 372 | 220 | 359 |
| Year 19 | 1,265 | 26 | 185 | 95 | 125 | 32 | 372 | 242 | 359 |
| Year 20 | 1,280 | 26 | 185 | 95 | 125 | 32 | 377 | 242 | 359 |

Source: PPTA consultant

# Annex 2 – Crops and Livestock Budgets

## Table A2-1: Wet Season Crop Rice Budget (Per Hectare, $)

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/O | W/ | Dif. | W/O | W/ | Dif. |
| Wet season rice | ha | 1.0 | 1.0 | 0.0 | 1.0 | 1.0 | 0.0 |
| Cycle | month | 6.0 | 6.0 | 0.0 | 6.0 | 6.0 | 0.0 |
| **Revenue** | | | | | | | |
| Produce | kg | 1,800.0 | 2,000.0 | 200.0 | 1,800.0 | 2,000.0 | 200.0 |
| Produce price | US$/kg | 0.20 | 0.20 | 0.00 | 0.22 | 0.22 | 0.00 |
| **Total revenue** | US$ | **357.9** | **392.7** | **34.8** | **404.8** | **449.7** | **45.0** |
| **Costs** | | | | | | | |
| Planting material | US$ | 28.2 | 28.2 | 0.0 | 25.9 | 25.9 | 0.0 |
| Land preparation | US$ | 74.6 | 69.6 | -5.0 | 68.6 | 64.0 | -4.6 |
| Insecticide | US$ | 7.5 | 8.0 | 0.6 | 6.9 | 7.4 | 0.5 |
| Herbicide | US$ | 19.9 | 3.1 | -16.8 | 18.3 | 2.9 | -15.4 |
| Fertilizer | US$ | 39.1 | 46.3 | 7.1 | 36.0 | 42.6 | 6.6 |
| Watering | US$ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Hired labor | US$ | 19.9 | 37.3 | 17.4 | 0.0 | 30.9 | 30.9 |
| Harvesting (machine) | US$ | 69.6 | 64.6 | -5.0 | 64.0 | 59.5 | -4.6 |
| Produce transport | US$ | 4.2 | 20.9 | 16.7 | 3.9 | 19.2 | 15.4 |
| **Total costs (excl. interest payment)** | US$ | **262.9** | **278.0** | **15.1** | **223.6** | **252.3** | **28.7** |
| **Net (excl. interest payment)** | US$ | **95.0** | **114.8** | **19.7** | **181.2** | **197.4** | **16.2** |

W/O = without-project; W/ = with-project; Dif. = difference
Source: PPTA consultant, based on TSSD experience and Agro-Ecosystem Analyses of both communes by the General Department of Agriculture of the Ministry of Agriculture, Forestry and Fisheries.

## Table A2-2: Dry Season Crop Rice Budget (Per Hectare, $)

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/O | W/ | Dif. | W/O | W/ | Dif. |
| Dry season rice | ha | 1.0 | 1.0 | 0.0 | 1.0 | 1.0 | 0.0 |
| Cycle | month | 3.0 | 3.0 | 0.0 | 3.0 | 3.0 | 0.0 |
| **Revenue** | | | | | | | |
| Produce | kg | 4,380.0 | 4,500.0 | 120.0 | 4,380.0 | 4,500.0 | 120.0 |
| Produce price | US$/kg | 0.20 | 0.19 | 0.00 | 0.22 | 0.22 | 0.00 |
| **Total revenue** | US$ | **871.0** | **872.5** | **1.5** | **984.9** | **1,011.9** | **27.0** |
| **Costs** | | | | | | | |
| Planting material | US$ | 74.6 | 74.6 | 0.0 | 68.6 | 68.6 | 0.0 |
| Land preparation | US$ | 74.6 | 69.6 | -5.0 | 68.6 | 64.0 | -4.6 |
| Insecticide | US$ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Herbicide | US$ | 135.9 | 135.9 | 0.0 | 125.0 | 125.0 | 0.0 |
| Fertilizer | US$ | 23.2 | 23.2 | 0.0 | 21.3 | 21.3 | 0.0 |
| Watering | US$ | 23.2 | 23.2 | 0.0 | 21.3 | 21.3 | 0.0 |
| Hired labor | US$ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Harvesting (machine) | US$ | 69.6 | 64.6 | -5.0 | 64.0 | 59.5 | -4.6 |
| Produce transport | US$ | 43.5 | 39.1 | -4.4 | 40.1 | 36.0 | -4.0 |
| **Total costs (excl. interest payment)** | US$ | **444.6** | **430.2** | **-14.3** | **409.0** | **395.8** | **-13.2** |
| **Net (excl. interest payment)** | US$ | **426.4** | **442.2** | **15.8** | **575.9** | **616.1** | **40.2** |

W/O = without-project; W/ = with-project; Dif. = difference
Source: PPTA consultant, based on TSSD experience and Agro-Ecosystem Analyses of both communes by the General Department of Agriculture of the Ministry of Agriculture, Forestry and Fisheries.

**Table A2-3: Lotus Crop Budget (Per Hectare, $)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/O | W/ | Dif. | W/O | W/ | Dif. |
| Lotus | ha | 1.0 | 1.0 | 0.0 | 1.0 | 1.0 | 0.0 |
| Cycle | month | 3.0 | 3.0 | 0.0 | 3.0 | 3.0 | 0.0 |
| **Revenue** | | | | | | | |
| Produce | kg | 1,150.0 | 1,200.0 | 50.0 | 1,150.0 | 1,200.0 | 50.0 |
| Produce price | US$/kg | 1.62 | 1.55 | -0.06 | 1.49 | 1.43 | -0.06 |
| **Total revenue** | US$ | **1,858.1** | **1,864.3** | **6.2** | **1,709.4** | **1,715.1** | **5.7** |
| **Costs** | | | | | | | |
| Planting material | US$ | 671.1 | 671.1 | 0.0 | 617.4 | 617.4 | 0.0 |
| Land preparation | US$ | 74.6 | 69.6 | -5.0 | 68.6 | 64.0 | -4.6 |
| Insecticide | US$ | 34.8 | 34.8 | 0.0 | 32.0 | 32.0 | 0.0 |
| Herbicide | US$ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Fertilizer | US$ | 74.6 | 124.3 | 49.7 | 68.6 | 114.3 | 45.7 |
| Watering | US$ | 313.2 | 78.3 | -234.9 | 288.1 | 72.0 | -216.1 |
| Hired labor | US$ | 134.2 | 198.9 | 64.6 | 111.1 | 164.7 | 53.5 |
| Harvesting (machine) | US$ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Produce transport | US$ | 11.4 | 10.4 | -1.0 | 10.5 | 9.6 | -0.9 |
| **Total costs (excl. interest payment)** | US$ | **1,313.9** | **1,187.4** | **-126.5** | **1,196.5** | **1,074.1** | -122.3 |
| **Net (excl. interest payment)** | US$ | **544.1** | **676.9** | **132.7** | **512.9** | **641.0** | **128.1** |

W/O = without-project; W/ = with-project; Dif. = difference
Source: PPTA consultant, based on TSSD experience and Agro-Ecosystem Analyses of both communes by the General Department of Agriculture of the Ministry of Agriculture, Forestry and Fisheries.

**Table A2-4: Cucumber Crop Budget (Per Hectare, $)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/O | W/ | Dif. | W/O | W/ | Dif. |
| Cucumber | ha | 1.0 | 1.0 | 0.0 | 1.0 | 1.0 | 0.0 |
| Cycle | month | 1.5 | 1.5 | 0.0 | 1.5 | 1.5 | 0.0 |
| **Revenue** | | | | | | | |
| Produce | kg | 19,500.0 | 21,000.0 | 1,500.0 | 19,500.0 | 21,000.0 | 1,500.0 |
| Produce price | US$/kg | 0.30 | 0.28 | -0.02 | 0.27 | 0.26 | -0.02 |
| **Total revenue** | US$ | **5,816.6** | **5,846.4** | **29.8** | **5,351.2** | **5,378.7** | **27.4** |
| **Costs** | | | | | | | |
| Planting material | US$ | 182.8 | 182.8 | 0.0 | 168.2 | 168.2 | 0.0 |
| Land preparation | US$ | 149.1 | 139.2 | -9.9 | 137.2 | 128.1 | -9.1 |
| Insecticide | US$ | 2.2 | 0.7 | -1.5 | 2.1 | 0.7 | -1.4 |
| Herbicide | US$ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Fertilizer | US$ | 1,074.7 | 1,105.2 | 30.5 | 988.7 | 1,016.8 | 28.0 |
| Other material | US$ | 0.0 | 186.4 | 186.4 | 0.0 | 171.5 | 171.5 |
| Watering | US$ | 1,085.7 | 723.8 | -361.9 | 998.8 | 665.9 | -332.9 |
| Hired labor | US$ | 298.3 | 372.9 | 74.6 | 247.0 | 308.7 | 61.7 |
| Harvesting (machine) | US$ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Produce transport | US$ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total costs (excl. interest payment)** | US$ | **2,792.8** | **2,710.9** | **-81.9** | **2,541.9** | **2,459.8** | **-82.2** |
| **Net (excl. interest payment)** | US$ | **3,023.7** | **3,135.4** | **111.7** | **2,809.3** | **2,918.9** | **109.6** |

W/O = without-project; W/ = with-project; Dif. = difference
Source: PPTA consultant, based on TSSD experience and Agro-Ecosystem Analyses of both communes by the General Department of Agriculture of the Ministry of Agriculture, Forestry and Fisheries.

**Table A2-5: Morning Glory Crop Budget (Per Hectare, $)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/O | W/ | Dif. | W/O | W/ | Dif. |
| Morning glory | ha | 1.0 | 1.0 | 0.0 | 1.0 | 1.0 | 0.0 |
| Cycle | month | 1.0 | 1.0 | 0.0 | 1.0 | 1.0 | 0.0 |
| **Revenue** | | | | | | | |
| Produce | kg | 18,900.0 | 20,000.0 | 1,100.0 | 18,900.0 | 20,000.0 | 1,100.0 |
| Produce price | US$/kg | 0.24 | 0.22 | -0.01 | 0.22 | 0.21 | -0.01 |
| **Total revenue** | US$ | **4,463.1** | **4,474.3** | **11.2** | **4,106.0** | **4,116.3** | **10.3** |
| **Costs** | | | | | | | |
| Planting material | US$ | 994.3 | 994.3 | 0.0 | 914.7 | 914.7 | 0.0 |
| Land preparation | US$ | 149.1 | 139.2 | -9.9 | 137.2 | 128.1 | -9.1 |
| Insecticide | US$ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Herbicide | US$ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Fertilizer | US$ | 186.4 | 266.0 | 79.5 | 171.5 | 244.7 | 73.2 |
| Other material | US$ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Watering | US$ | 447.4 | 298.3 | -149.1 | 411.6 | 274.4 | -137.2 |
| Hired labor | US$ | 298.3 | 372.9 | 74.6 | 247.0 | 308.7 | 61.7 |
| Harvesting (machine) | US$ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Produce transport | US$ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| **Total costs (excl. interest payment)** | US$ | **2,075.6** | **2,070.6** | **-5.0** | **1,882.1** | **1,870.6** | **-11.4** |
| **Net (excl. interest payment)** | US$ | **2,387.5** | **2,403.7** | **16.2** | **2,224.0** | **2,245.7** | **21.7** |

W/O = without-project; W/ = with-project; Dif. = difference

Source: PPTA consultant, based on TSSD experience and Agro-Ecosystem Analyses of both communes by the General Department of Agriculture of the Ministry of Agriculture, Forestry and Fisheries.

**Table A2-6: Chicken Raising Livestock Budget (Per Head, $)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/O | W/ | Dif. | W/O | W/ | Dif. |
| Chicken | head | 1.0 | 1.0 | 0.0 | 1.0 | 1.0 | 0.0 |
| Cycle | month | 6.0 | 4.0 | -2.0 | 6.0 | 4.0 | -2.0 |
| **Revenue** | | | | | | | |
| Produce | kg | 0.80 | 1.30 | 0.50 | 0.80 | 1.30 | 0.50 |
| Produce's farmgate price | US$/kg | 3.98 | 3.48 | -0.50 | 3.66 | 3.20 | -0.46 |
| **Total revenue** | US$ | **3.18** | **4.52** | **1.34** | **2.93** | **4.16** | **1.23** |
| **Costs** | | | | | | | |
| Chic | US$ | 0.25 | 1.12 | 0.87 | 0.23 | 1.03 | 0.80 |
| Feed | US$ | 0.50 | 0.37 | -0.12 | 0.46 | 0.34 | -0.11 |
| Broken rice | US$ | 0.16 | 0.20 | 0.04 | 0.15 | 0.18 | 0.03 |
| Bran | US$ | 0.06 | 0.25 | 0.19 | 0.06 | 0.23 | 0.17 |
| Rice | US$ | 0.37 | 0.07 | -0.30 | 0.34 | 0.07 | -0.27 |
| Vaccines/animal medicines | US$ | 0.00 | 0.10 | 0.10 | 0.00 | 0.09 | 0.09 |
| Pen | US$ | 0.02 | 0.25 | 0.22 | 0.02 | 0.23 | 0.21 |
| Net | US$ | 0.00 | 0.05 | 0.05 | 0.00 | 0.05 | 0.05 |
| Palm/thatch roof | US$ | 0.00 | 0.02 | 0.02 | 0.00 | 0.02 | 0.02 |
| Tools | US$ | 0.00 | 0.02 | 0.02 | 0.00 | 0.02 | 0.02 |
| Produce transport | US$ | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total costs (excl. interest payment)** | US$ | **1.37** | **2.46** | **1.09** | **1.26** | **2.26** | **1.01** |
| **Net (excl. interest payment)** | US$ | **1.81** | **2.06** | **0.25** | **1.67** | **1.90** | **0.23** |

W/O = without-project; W/ = with-project; Dif. = difference

Source: PPTA consultant, based on TSSD experience and Agro-Ecosystem Analyses of both communes by the General Department of Agriculture of the Ministry of Agriculture, Forestry and Fisheries.

**Table A2-7: Fish Aquaculture Livestock Budget (Per Square Meter, $)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/O | W/ | Dif. | W/O | W/ | Dif. |
| Fish raising | sqm | 1.0 | 1.0 | 0.0 | 1.0 | 1.0 | 0.0 |
| Cycle | month | 6.0 | 6.0 | 0.0 | 6.0 | 6.0 | 0.0 |
| **Revenue** | | | | | | | |
| Produce | kg | 1.00 | 2.40 | 1.40 | 1.00 | 2.40 | 1.40 |
| Produce's farmgate price | US$/kg | 1.99 | 1.74 | -0.25 | 1.83 | 1.60 | -0.23 |
| **Total revenue** | US$ | **1.99** | **4.18** | **2.19** | **1.83** | **3.84** | **2.01** |
| **Costs** | | | | | | | |
| Fingerling | US$ | 0.07 | 0.15 | 0.07 | 0.07 | 0.14 | 0.07 |
| Feed | US$ | 0.00 | 0.99 | 0.99 | 0.00 | 0.91 | 0.91 |
| Fish medicine | US$ | 0.00 | 0.05 | 0.05 | 0.00 | 0.05 | 0.05 |
| Lime | US$ | 0.20 | 0.06 | -0.14 | 0.18 | 0.05 | -0.13 |
| Fertilizer | US$ | 0.12 | 0.00 | -0.11 | 0.11 | 0.00 | -0.11 |
| Pond | US$ | 0.09 | 0.05 | -0.04 | 0.08 | 0.05 | -0.03 |
| Net | US$ | 0.00 | 0.10 | 0.10 | 0.00 | 0.09 | 0.09 |
| Watering | US$ | 0.00 | 0.43 | 0.43 | 0.00 | 0.40 | 0.40 |
| Produce transport | US$ | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total costs (excl. interest payment)** | US$ | **0.48** | **1.84** | **1.36** | **0.44** | **1.69** | **1.25** |
| **Net (excl. interest payment)** | US$ | **1.51** | **2.34** | **0.83** | **1.39** | **2.15** | **0.76** |

W/O = without-project; W/ = with-project; Dif. = difference
Source: PPTA consultant, based on TSSD experience and Agro-Ecosystem Analyses of both communes by the General Department of Agriculture of the Ministry of Agriculture, Forestry and Fisheries.

**Table A2-8: Frog Aquaculture Livestock Budget (Per Square Meter, $)**

| | Unit | Financial | | | Economic | | |
|---|---|---|---|---|---|---|---|
| | | W/O | W/ | Dif. | W/O | W/ | Dif. |
| Frog raising | sqm | 1.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 |
| Cycle | month | 4.00 | 4.00 | 0.00 | 4.00 | 4.00 | 0.00 |
| **Revenue** | | | | | | | |
| Produce | kg | 12.00 | 20.00 | 8.00 | 12.00 | 20.00 | 8.00 |
| Produce's farmgate price | US$/kg | 2.49 | 1.99 | -0.50 | 2.29 | 1.83 | -0.46 |
| **Total revenue** | US$ | **29.83** | **39.77** | **9.94** | **29.83** | **39.77** | **9.94** |
| **Costs** | | | | | | | |
| Baby frog | US$ | 8.08 | 10.87 | 2.80 | 7.43 | 10.00 | 2.57 |
| Feed | US$ | 16.16 | 21.35 | 5.19 | 14.86 | 19.64 | 4.77 |
| Medicine | US$ | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Lime | US$ | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Fertilizer | US$ | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Containment | US$ | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Roof | US$ | 0.00 | 0.15 | 0.15 | 0.00 | 0.14 | 0.14 |
| Net | US$ | 0.06 | 0.06 | 0.00 | 0.05 | 0.05 | 0.00 |
| Watering | US$ | 0.87 | 0.43 | -0.43 | 0.80 | 0.40 | -0.40 |
| Produce transport | US$ | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total costs (excl. interest payment)** | US$ | **25.16** | **32.86** | **7.70** | **23.15** | **30.23** | **7.08** |
| **Net (excl. interest payment)** | US$ | **4.67** | **6.91** | **2.24** | **4.29** | **6.36** | **2.06** |

W/O = without-project; W/ = with-project; Dif. = difference
Source: PPTA consultant, based on TSSD experience and Agro-Ecosystem Analyses of both communes by the General Department of Agriculture of the Ministry of Agriculture, Forestry and Fisheries.

# Annex 3 – Cultivation Areas for Different Crops and Livestock

## Table A3-1: Wet Season Rice Cultivation Area

| | Irrigation area (ha) | Improved Practice Adoption rate (%) | Cultivation intensity (crop/HH) | Adopting Area (ha) | Incremental[a] ($/ha) | Incremental Income[b] (US$) |
|---|---|---|---|---|---|---|
| | (A) | (B) | (C) | (D=A*B*C) | (E) | (F=D*E) |
| Year 1 | 320.0 | 0% | 1.0 | 0 | 19.71 | 0.00 |
| Year 2 | 320.0 | 7% | 1.0 | 22 | 19.71 | 441.47 |
| Year 3 | 320.0 | 14% | 1.0 | 45 | 19.71 | 882.94 |
| Year 4 | 320.0 | 21% | 1.0 | 67 | 19.71 | 1,324.41 |
| Year 5 | 320.0 | 21% | 1.0 | 67 | 19.71 | 1,324.41 |
| Year 6 | 320.0 | 21% | 1.0 | 67 | 19.71 | 1,324.41 |
| Year 7+ | 320.0 | 21% | 1.0 | 67 | 19.71 | 1,324.41 |

HH = Household; ha = hectare; hd = head; sqm = square meter
[a]This is taken from the incremental financial income in Annex 2
[b] Annual incremental income for each crop and livestock are summed to produce the figures in Table 5 of the supplementary report
Source: PPTA consultant

## Table A3-2: Dry Season Rice Cultivation Area

| | Without project (ha) | | Adoption rate (%) | | Improved Practice Adoption rate (%) | | Incremental[a] ($/ha) | | Incremental Income[b] (US$) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | DS Rice | Lotus | DS Rice | Lotus | DS Rice | Lotus | DS Rice | Lotus | DS Rice | Lotus |
| | (A) | (B) | (C) | (D) | (E=A*C) | (F=A*D) | (G) | (H) | (I=E*G) | (J=F*H) |
| Year 1 | 922 | 7 | 0.0% | 0.0% | 0.0 | 0.0 | 15.8 | 132.7 | 0.0 | 0.0 |
| Year 2 | 922 | 7 | 7.0% | 1.6% | 64.5 | 14.7 | 15.8 | 132.7 | 1,021.9 | 1,945.9 |
| Year 3 | 922 | 7 | 14.0% | 3.2% | 129.1 | 29.3 | 15.8 | 132.7 | 2,043.8 | 3,891.8 |
| Year 4 | 922 | 7 | 21.0% | 4.8% | 193.6 | 44.0 | 15.8 | 132.7 | 3,065.8 | 5,837.7 |
| Year 5 | 922 | 7 | 21.0% | 6.4% | 193.6 | 58.6 | 15.8 | 132.7 | 3,065.8 | 7,783.6 |
| Year 6 | 922 | 7 | 21.0% | 6.4% | 193.6 | 58.6 | 15.8 | 132.7 | 3,065.8 | 7,783.6 |
| Year 7+ | 922 | 7 | 21.0% | 6.4% | 193.6 | 58.6 | 15.8 | 132.7 | 3,065.8 | 7,783.6 |

HH = Household; ha = hectare; hd = head; sqm = square meter
a This is taken from the incremental financial income in Annex 2

[b] Annual incremental income for each crop and livestock are summed to produce the figures in Table 5 of the supplementary report
Source: PPTA consultant

## Table A3-3: Cucumber Cultivation Area

| | Beneficiary household (HH) | Adoption rate (%) | Adopting Household (HH) | Cultivation intensity (ha/HH) | Improved practices (ha) | Incremental[a] ($/ha) | Incremental Income[b] (US$) |
|---|---|---|---|---|---|---|---|
| | (A) | (B) | (C=A*B) | (D) | (E=C*D) | (F) | (G=E*F) |
| Year 1 | 1,518 | 0.0% | 0.0 | 0.02 | 0.0 | 111.69 | 0.00 |
| Year 2 | 1,518 | 1.6% | 24.1 | 0.02 | 0.5 | 111.69 | 53.92 |
| Year 3 | 1,518 | 3.2% | 48.3 | 0.02 | 1.0 | 111.69 | 107.83 |
| Year 4 | 1,518 | 4.8% | 72.4 | 0.02 | 1.4 | 111.69 | 161.75 |
| Year 5 | 1,518 | 6.4% | 96.5 | 0.02 | 1.9 | 111.69 | 215.66 |
| Year 6 | 1,518 | 6.4% | 96.5 | 0.02 | 1.9 | 111.69 | 215.66 |
| Year 7+ | 1,518 | 6.4% | 96.5 | 0.02 | 1.9 | 111.69 | 215.66 |

HH = Household; ha = hectare; hd = head; sqm = square meter
[a]This is taken from the incremental financial income in Annex 2
[b] Annual incremental income for each crop and livestock are summed to produce the figures in Table 5 of the supplementary report
Source: PPTA consultant

## Table A3-4: Morning Glory Cultivation Area

| | Beneficiary household (HH) | Adoption rate (%) | Adopting Household (HH) | Cultivation intensity (ha/HH) | Improved practices (ha) | Incremental[a] ($/ha) | Incremental Income[b] (US$) |
|---|---|---|---|---|---|---|---|
| | (A) | (B) | (C=A*B) | (D) | (E=C*D) | (F) | (G=E*F) |
| Year 1 | 1,518 | 0.0% | 0.0 | 0.02 | 0.0 | 16.16 | 0.00 |
| Year 2 | 1,518 | 1.6% | 24.1 | 0.02 | 0.5 | 16.16 | 7.80 |

| | Beneficiary household (HH) | Adoption rate (%) | Adopting Household (HH) | Cultivation intensity (ha/HH) | Improved practices (ha) | Incremental[a] ($/ha) | Incremental Income[b] (US$) |
|---|---|---|---|---|---|---|---|
| | (A) | (B) | (C=A*B) | (D) | (E=C*D) | (F) | (G=E*F) |
| Year 3 | 1,518 | 3.2% | 48.3 | 0.02 | 1.0 | 16.16 | 15.60 |
| Year 4 | 1,518 | 4.8% | 72.4 | 0.02 | 1.4 | 16.16 | 23.40 |
| Year 5 | 1,518 | 6.4% | 96.5 | 0.02 | 1.9 | 16.16 | 31.20 |
| Year 6 | 1,518 | 6.4% | 96.5 | 0.02 | 1.9 | 16.16 | 31.20 |
| Year 7+ | 1,518 | 6.4% | 96.5 | 0.02 | 1.9 | 16.16 | 31.20 |

HH = Household; ha = hectare; hd = head; sqm = square meter
[a]This is taken from the incremental financial income in Annex 2
[b] Annual incremental income for each crop and livestock are summed to produce the figures in Table 5 of the supplementary report
Source: PPTA consultant

## Table A3-5: Chicken Farming Area

| | Beneficiary household (HH) | Adoption rate (%) | Adopting Household (HH) | Farming intensity (hd/HH) | Improved practices (hd) | Incremental[a] ($/hd) | Incremental Income[b] (US$) |
|---|---|---|---|---|---|---|---|
| | (A) | (B) | (C=A*B) | (D) | (E=C*D) | (F) | (G=E*F) |
| Year 1 | 1,518 | 0.0% | 0.0 | 100.0 | 0.0 | 0.25 | 0.00 |
| Year 2 | 1,518 | 7.0% | 106.3 | 100.0 | 10,626.0 | 0.25 | 2,641.31 |
| Year 3 | 1,518 | 14.0% | 212.5 | 100.0 | 21,252.0 | 0.25 | 5,282.62 |
| Year 4 | 1,518 | 21.0% | 318.8 | 100.0 | 31,878.0 | 0.25 | 7,923.94 |
| Year 5 | 1,518 | 28.0% | 425.0 | 100.0 | 42,504.0 | 0.25 | 10,565.25 |
| Year 6 | 1,518 | 28.0% | 425.0 | 100.0 | 42,504.0 | 0.25 | 10,565.25 |
| Year 7+ | 1,518 | 28.0% | 425.0 | 100.0 | 42,504.0 | 0.25 | 10,565.25 |

HH = Household; ha = hectare; hd = head; sqm = square meter
[a]This is taken from the incremental financial income in Annex 2
[b] Annual incremental income for each crop and livestock are summed to produce the figures in Table 5 of the supplementary report
Source: PPTA consultant

## Table A2-12: Fish Farming Area

| | Beneficiary household (HH) | Adoption rate (%) | Adopting Household (HH) | Farming intensity (sqm/HH) | Improved practice (sqm) | Incremental[a] ($/sqm) | Incremental Income[b] (US$) |
|---|---|---|---|---|---|---|---|
| | (A) | (B) | (C=A*B) | (D) | (E=C*D) | (F) | (G=E*F) |
| Year 1 | 1,518 | 0.0% | 0.0 | 225.0 | 0.0 | 0.83 | 0.00 |
| Year 2 | 1,518 | 0.2% | 2.8 | 225.0 | 8,275.0 | 0.83 | 6,847.55 |
| Year 3 | 1,518 | 0.4% | 5.6 | 225.0 | 8,900.1 | 0.83 | 7,364.77 |
| Year 4 | 1,518 | 0.5% | 8.3 | 225.0 | 9,525.1 | 0.83 | 7,881.98 |
| Year 5 | 1,518 | 0.7% | 11.1 | 225.0 | 10,150.1 | 0.83 | 8,399.19 |
| Year 6 | 1,518 | 0.7% | 11.1 | 225.0 | 10,150.1 | 0.83 | 8,399.19 |
| Year 7+ | 1,518 | 0.7% | 11.1 | 225.0 | 10,150.1 | 0.83 | 8,399.19 |

HH = Household; ha = hectare; hd = head; sqm = square meter
[a]This is taken from the incremental financial income in Annex 2
[b] Annual incremental income for each crop and livestock are summed to produce the figures in Table 5 of the supplementary report
Source: PPTA consultant

## Table A2-12: Frog Farming Area

| | Beneficiary household (HH) | Adoption rate (%) | Adopting Household (HH) | Farming intensity (sqm/HH) | Improved practice (sqm) | Incremental[a] ($/sqm) | Incremental Income[b] (US$) |
|---|---|---|---|---|---|---|---|
| | (A) | (B) | (C=A*B) | (D) | (E=C*D) | (F) | (G=E*F) |
| Year 1 | 1,518 | 0.0% | 0.0 | 100.0 | 0.0 | 2.77 | 0.00 |
| Year 2 | 1,518 | 0.1% | 2.0 | 100.0 | 203.4 | 2.77 | 563.77 |
| Year 3 | 1,518 | 0.3% | 4.1 | 100.0 | 406.8 | 2.77 | 1,127.54 |
| Year 4 | 1,518 | 0.4% | 6.1 | 100.0 | 610.2 | 2.77 | 1,691.31 |
| Year 5 | 1,518 | 0.5% | 8.1 | 100.0 | 813.6 | 2.77 | 2,255.08 |
| Year 6 | 1,518 | 0.5% | 8.1 | 100.0 | 813.6 | 2.77 | 2,255.08 |
| Year 7+ | 1,518 | 0.5% | 8.1 | 100.0 | 813.6 | 2.77 | 2,255.08 |

HH = Household; ha = hectare; hd = head; sqm = square meter

[a]This is taken from the incremental financial income in Annex 2
[b] Annual incremental income for each crop and livestockare summed to produce the figures in Table 5 of the supplementary report
Source: PPTA consultant