University of California, Davis International Agricultural Development M.S. Capstone Project

Efficiency Indicators of Smallholder Farming Systems in the Central Highlands of Vietnam and Northeast Cambodia

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Abstract

The agricultural sectors of the Central Highlands of Vietnam and Ratanakiri Province in northeast Cambodia are undergoing rapid transitions out of traditional, subsistence-oriented production systems and towards increased intensification and market-orientation. In addition to sharing a border, both regions share common biophysical characteristics including soil and agroclimatic conditions, yet Vietnam's agricultural sector is more intensified and benefits from improved infrastructure, more mature markets for cash crops, and steadily increasing demand for higher-value products such as meat, fish, and dairy. These regions therefore represent a gradient of alternative agricultural practices from low-intensity (as measured by input usage) systems common to Ratanakiri, to relatively intensive systems including specialty crops, e.g. pepper, aquaculture and animal systems in the Central Highlands. In both regions, smallholder agriculturists are faced with tremendous uncertainty about which alternative land use practices will result in favorable livelihood outcomes. In the Central Highlands, old, unproductive coffee trees abound, and new markets mean difficult choices about what to invest in next. In Ratanakiri, increased land pressure from the continued development of Economic Land Concessions and associated immigration has resulted in most smallholders transitioning out of swidden systems and into permanent systems of primarily cash crops. Here, we characterize several alternative crop and livestock production systems in the region in terms of their 1) economic and 2) energy efficiencies in the hope that more precise efficiency metrics will aid in the decision making process for agricultural stakeholders and policy makers in the region.

Contents

Acknowledgements	4
List of Tables:	5
List of Figures:	6
1. Introduction	7
2. Study Region and Methodology	12
2.1 Study Region	12
2.2 Household Surveys	14
2.3 Systems modeled	16
2.3.1 Individual systems	17
2.3.2 Household-level systems	22
2.5 Modeling methodology	22
2.5.1 Economic performance	22
2.5.2 Energy Performance	26
3. Results	29
3.1 Summary of household surveys	29
3.2 Labor	31
3.3 Economic performance	33
3.4 Energy inputs and outputs	37
3.5 Returns to land and energy efficiency	38
4. Discussion	39
5. Conclusions	42
References	44
Appendix 1: Household Survey	48
Appendix 2: Land Use System Models	60
Appendix 2.1: Cassava monocrop, Ratanakiri, Cambodia	60
Appendix 2.2: Coffee monocrop, Central Highlands, Vietnam	66
Appendix 2.3: Pepper monocrop, Central Highlands, Vietnam	72
Appendix 2.4: Pond aquaculture, Central Highlands, Vietnam	78
Appendix 2.5: Intensive pigs, Central Highlands, Vietnam	84

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List of Tables:

Table 1. Number of households surveyed in each of the study locations in Cambodia and Vietnam	15
Table 2. Energy values for all inputs and outputs of the Vietnam Central Highlands and northe Cambodia crop and livestock systems modeled.	east 28
Table 3. Labor inputs over the full system lifecycle to crop and animal production systems in northeastern Cambodia and the Central Highlands of Vietnam	33
Table 4. Economic performance of 5 individual and two household-level agricultural production systems in northeastern Cambodia and the Central Highlands of Vietnam.	on 37

List of Figures:

- Figure 1. Study region locations for household surveys conducted August to Decembet, 2016. Household surveys were conducted in 3 provinces (A): Ratanakiri, Cambodia (RN), Dak Lak, Vietnam (DL), and Dak Nong, Vietnam (DN), and 5 districts (B): Kuon Mon, Ban Lung, and Lumphat, Ratanakiri, Cambodia, Ea Kar, Dak Lak Vietnam, and Krong No, Dak Nong, Vietnam.
- Figure 2. The number of plots (A), average plot size (B) and number of livestock species managed by households surveyed in the Central Highlands of Vietnam and Ratanakiri, Cambodia. 29
- Figure 3. The number of households managing of each of the crop and livestock species reported in the household surveys in the Central Highlands of Vietnam and Ratanakiri, Cambodia. 30
- Figure 4. Annual labor requirements of small-scale agricultural systems in the Central Highlands of Vietnam and Northeastern Cambodia 32
- Figure 5. Discounted net benefits and cumulative discounted net benefits of agricultural systems modeled. 35
- Figure 6. Cumulative energy inputs and outputs over the full lifecycle (20 years) of agricultural systems in northeastern Cambodia and the Central Highlands of Vietnam. 38
- Figure 7. Average annual returns to land and energy output/input ratio of smallholder agricultural systems in the Central Highlands of Vietnam and Northeastern Cambodia. 39

1. Introduction

The commonalities between the Central Highlands region of Vietnam and the northeastern Cambodian province of Ratanakiri extend far beyond their shared border. Biophysically, both regions are comprised of undulating plateaus of basaltic soils bordered by the Annamite range in the north, and are characterized by a monsoonal climate with an extended dry season. Both regions were covered primarily in dense tropical forest prior to the expansion of smallholder agricultural production in the Central Highlands, and the introduction of large-scale economic land concessions in Ratanakiri (Hor et al., 2014). The ethnographic history of both regions has also followed a similar trajectory, characterized by a high concentration of ethnic minority groups for whom assimilation into the social and economic systems of their respective countries has been met with resistance. Today, agriculture remains the primary economic engine of both regions, and health and economic outcomes are generally worse relative to national indicators (Ridell, 2006; D'haeze, et al., 2005). Despite these similarities, policy changes and market reforms since the 1970s have contributed to substantial differences in the current state of the agricultural sectors of the Central Highlands and Ratanakiri.

Prior to the reunification of Vietnam in 1975, agricultural production in the Central Highlands was dominated by subsistence-oriented, shifting cultivation (McElwee, 2001). Following the development of "New Economic Zones", over a million ethnic Vietnamese (Kinh) were settled in the region from more densely populated regions (Dang et al., 2001), and eventually slash and burn (i.e. swidden) agriculture was banned outright, resulting in the rapid adoption of sedentary smallholder systems at the expense of a vast portion of the region's forested area (Salemink, 2003). The introduction of Robusta coffee, followed by the tremendous growth in its production of approximately 20% annually between 1993 and 2000, contributed to

a further influx of migrants to the region and a near doubling of the population of the two Central Highlands provinces that are the subject of this study – Dak Lak and Dak Nong – between 1990 and 2000 (D'haeze et al., 2005). Vietnam's relatively sudden and dramatic entry into the Robusta market, coupled with global trade liberalization and regulatory reforms during the 1990's, contributed to an oversupply of coffee globally and subsequent dramatic price declines (D'haeze et al., 2005). Marginal producers in the Central Highlands, especially those producing in more acidic soils, subsequently adopted a more diverse set of agricultural systems, including cash crops such as cassava and rubber, as well as more intensive, market-oriented animal systems (Frison et al., 2011).

In contrast to the Central Highlands, the transition out of swidden, substance-oriented cropping systems and into semi-permanent or permanent, market-oriented systems in Ratanakiri began only in the last 10 to 20 years (Fox et al., 2009). Today, many smallholder farmers in the region are producing cash crops such as cashew, cassava, and soybeans in permanent systems, while others are still producing rice and other crops for household consumption in swidden systems (Cambodia Census of Agriculture, 2015). Land use pressure on smallholder farmers in Ratanakiri has intensified in recent years following the introduction of the Economic Land Concession (ELC) program by the Cambodian government, in which corporations, usually foreign-owned, are awarded low-lost, long-term leases on large tracts of land in an attempt to boost economic output from natural resource extraction and agricultural production (Davis, et al., 2015). Employment opportunities associated with ELCs in the region have also contributed to increased immigration into Ratanakiri from other provinces, further constraining traditional land-use practices of ethnic minority agriculturalists in the region (Baird and Fox, 2015).

In both the Central Highlands and Ratanakiri, therefore, a combination of biophysical, political, and socio-economic variables have contributed to what is now a diverse agricultural region still largely dominated by increasingly market-oriented and intensive smallholder productions systems (Blrnholz et al. 2017). Despite the growth of more market-oriented agricultural sectors in both regions, poverty rates remain high and the collapse of coffee prices in the 1990s serves as a stark reminder of the risks associated with a homogenous agricultural sector, driving the push for more intensive agricultural systems to boost output, raise incomes, and increase food security (Blrnholz et al. 2017). At the same time, there is a concern that continued intensification, as measured by the increased use of agrochemical inputs and water, will result in negative ecological externalities such as those attributed to the intensification of coffee production in Vietnam, e.g. diminished soil fertility and loss of organic matter (Tran and Kajisa, 2006), water table depletion (Technoserve, 2013), and water body pollution attributed to agricultural runoff (Rahman and Thapa, 1999).

As is now commonplace in the agricultural policy and research domains, the tradeoffs inherent in the desire to intensify production while limiting negative ecological externalities has led to an ever increasing focus on "sustainable intensification" (SI), i.e. increasing agricultural output while minimizing the associated ecological footprint (Struik et al., 2014). While the motivations behind sustainable intensification of agriculture are rather obvious, definitions of both "sustainable" and "intensification" insofar as they relate to agriculture can vary considerably (Struik et al., 2014). Although not explicitly attempting to define SI, Keating et al. (2010) proposed the concept of "eco-efficient" agriculture, that is, increasing the quantity and quality of agricultural output while using less "land, water, nutrients, energy, labor, or capital." Similarly, Tittonel and Giller (2013) defined "ecological intensification" as increasing agricultural output while "reducing the use and need for external inputs, and capitalizing on ecological processes that support and regulate primary productivity in agro-ecosystems." Compounding the problem of lack of consistency across SI definitions is the fact that SI conceptual frameworks generally do not include specific indicators or metrics for the objective comparison of alterative agricultural systems, or guidance on, e.g., the relative weighting of different components of sustainability (ecological, economic, cultural, etc.). Further, there can exist an implicit suggestion in SI definitions that short-term goals of agriculturalists, such as income generation, should be balanced against long-term measures of ecological health (Spiertz, 2010). Such recommendations can be unrealistic in systems managed by agriculturalists with very high discount rates, reflecting an unwillingness to forego near-term consumption in exchange for future benefits.

Common to all SI definitions is some concept, either implicit or explicit, of *efficiency*. Indeed, efficiency is the very core of any definition of SI, as any production system that produces more with less, however the "inputs" to the system are defined, is more efficient than the equivalent system generating the same output with greater quantities of inputs. Unfortunately, while the concept of efficiency is easily stated, there is no single efficiency metric capable of objectively signaling which production systems represent a more "sustainable" alternative. In order to guide more meaningful, directed, stakeholder and policy discussions around the advancement of sustainable agriculture, it is necessary to characterize various agricultural production systems using objective efficiency metrics. While objective efficiency metrics are not in and of themselves answers to questions such as, "which systems and / or practices should we promote or avoid?," they can serve as concrete, measurable indicators of various aspirational

notions of "sustainability", and should therefore be front and center in policy discussions around agricultural development.

In view of the difficulties inherent in developing prescriptive agronomic practices around SI, we examined multiple smallholder agriculture systems in two neighboring, biophysically similar regions – Dak Lak and Dak Nong Provinces in the Central Highlands of Vietnam and Ratanakiri province, Cambodia – in which 1) there is a general desire on the part of agricultural research institutions and policy makers to increase the productivity and sustainability of local agricultural systems and 2) a range of crop and livestock systems are currently in place that reflect a gradient from more-to-less intensive in terms of labor, capital expenditures, and input usage. We conducted detailed interviews with agriculturalists in the region to gather data on all crop and livestock system inputs, outputs, and flows among crop and livestock systems managed by a given household, for the full life of the system, i.e. from initial planting to conversion to another system, or reversion to fallow or forested area. Using these data, we applied 1) price and 2) energy value-weights to the inputs and outputs to derive various measures of economic and energy efficiency.

Specifically, we examined the following research questions:

- How do alternative crop and animal production systems in the Central Highlands of Vietnam and Ratanakiri province, Cambodia, compare in terms of their economic and energy efficiency?
- 2) In view of the goal inherent to SI of promoting systems that are more efficient, how do more and less intensive systems, as measured by total inputs including labor, capital expenditures and agrochemicals, compare in terms of their economic and energy efficiency? Similarly, are systems that are more integrated, as indicated by the recycling of inputs from one system

component to another (e.g. residual crop biomass or animal manure), more economically or energy efficient than others?

- 3) Are the energy and economic efficiency of a given system correlated? If so, is the correlation positive or negative? In general, does economic efficiency come at the expense of energy efficiency or vice versa?
- 4) What are the policy implications of examining agricultural systems in the region though an energy rather than an economic efficiency lens? If integrated systems are, in fact more efficient, should they be promoted? If so, what are the tradeoffs associated with their promotion?

2. Study Region and Methodology

2.1 Study Region

The study region was comprised of three provinces: 1) Dak Lak and 2) Dak Nong Provinces in the Central Highlands region of Vietnam, and 3) Ratanakiri Province in northeast Cambodia (Figure 1). The study region was selected due to the relative similarity of biophysical variables, e.g. soils, elevation, and rainfall patterns, and distinct differences in specific socioeconomic and policy variables. Both the Central Highlands of Vietnam and Ratanakiri Province, Cambodia, have tropical monsoonal climates characterized by a rainy season from approximately May to November, and a dry season from approximately December to April. Soils across the study region are also fairly similar, comprised primarily basaltic soils, as well as Ferralsols (red soils) and others, across a series of undulating plateaus between approximately 300 to 900 m altitude. Rainfall across the study region ranges from approximately 1,900 to 2,200 mm yr⁻¹ with average daily temperatures of approximately 23 to 25°C. The topography of Vietnam's central highlands and northeast Cambodia is fairly flat, with occasional rolling hills of moderate slope.



Figure 1. Study region locations for household surveys conducted from August to December, 2016. Household surveys were conducted in 3 provinces (A): Ratanakiri, Cambodia (RN), Dak Lak, Vietnam (DL), and Dak Nong, Vietnam (DN), and 5 districts (B): Kuon Mon, Ban Lung, and Lumphat, Ratanakiri, Cambodia, Ea Kar, Dak Lak Vietnam, and Krong No, Dak Nong, Vietnam.

Agricultural area makes up a sizable portion of overall land cover in the three provinces; as of 2015, Dak Lak and Dak Nong provinces were comprised of 48% agricultural and 40% forested, and 55% agricultural and 36% forested land, respectively (General Statistics Office of Vietnam, 2017). Forest remains a greater proportion of land cover in Ratanakiri, Cambodia relative to the Central Highlands provinces; agricultural land accounted for approximately 26% of total land area in Ratanakiri in 2011, while forest accounted for approximately 71% of total land area (Hor et al., 2014). Agricultural production is more diverse and more intensive in the Central Highlands of Vietnam than in Ratanakiri. While in Ratanakiri, smallholder famers have only recently transitioned out of subsistence-oriented, swidden systems into commerciallyoriented, permanent production systems (Hor et al., 2014), farming systems in the Central Highlands have a history of permanent, commercially-oriented coffee production dating back several decades. In addition to coffee, relatively mature markets exist for livestock, including pigs and cows, broiler and laying hens, and aquaculture products, as well as other industrial crops such as cassava. Other crops produced in the region include rice, maize, soybean, sugarcane, cashew cacao, and, more recently, pepper. Animal ownership is less common in Ratanakiri and is generally limited to household consumption. The somewhat low-diversity crop mix is comprised primarily comprised of commercial crops such as cassava, cashew, and soybeans, and rice for household consumption.

2.2 Household Surveys

We conducted a total of 32 household surveys across the three provinces in the study region between August and December 2016 (Table 1). We conducted the Vietnam surveys in 2 districts and 2 communes, and the Cambodia surveys in 4 districts (Table 1). In all survey locations, we coordinated with local government and agricultural extension agents in order to ensure that the households surveyed represented a reasonable cross-section of the agricultural practices of the region, such as a gradient of cropping and / or livestock systems, field sizes, and input use, as well as a gradient of more to less wealthy households. Specifically, we conducted interviews in 4 villages (from 4 districts) in Ratanakiri selected for their relative levels of commercialization and market orientation. Survey questions included general demographic,

ethnographic and socioeconomic variables, and focused on crop or livestock system input and output flows and activities at the plot level, including chemical and organic inputs, yields, and any integration or recycling of outputs from one system component (e.g. a plot or livestock herd) as inputs to another. The complete survey is included in Appendix 1.

Country	Province	District	Households	Total
Vietnam	Dak Lak	Ea Tih	9	19
	Dak Nong	Krong No	10	
Cambodia	Ratanakiri	Lumphat	4	13
		Ban Lung	4	
		Kuon Mom	1	
		O Yadav	4	

Table 1. Number of households surveyed in each of the study locations in Cambodia and Vietnam

For all activities, we asked respondents to recall the amounts of labor and labor types (family or hired) required to complete each task. Further, we asked respondents to recall all activities and input/output flows associated with each plot for the full history of the plot, from the establishment or purchase of the plot to present day. For all system inputs and outputs, we asked respondents to recall prices for each product for the current year and for as many seasons as they could recall. In addition to agronomic and animal husbandry activities and associated costs, we asked respondents to provide information on all capital costs associated with the establishment of each cropping system or livestock herd. All surveys were conducted in an interview format in the local language, i.e. Vietnamese or Khmer, and translated into English via an interpreter.

2.3 Systems modeled

We modelled a selection of commercially-oriented systems representing a gradient from low-to-high intensity in terms of input use and capital and operating costs, in order to compare the efficiency of agricultural practices representative of typical production systems in the region. In total, we modeled 7 distinct production systems: 5 "individual" or discreet systems in which only a single product is generated, and 2 "household-level" models in which a household managing multiple cropping and animal/aquaculture systems was characterized. Household-level models were generated by aggregating the individual production systems models. For consistency, all production systems modelled were assigned a 20-year system lifecycle. The choice of system lifecycle was based on survey respondents' characterization of the typical production lifecycle of perennial tree crops in the region, especially coffee. While in practice certain systems may ultimately have longer or shorter lifecycles, the majority of non-coffee (and to a lesser extent, cashew) cash crop and livestock systems in the region, e.g. cassava, pepper, and intensive pig systems, data was generally not available to allow for the assignment of unique lifecycle values on a per-system basis.

Wherever possible, labor type (household or hired labor) inputs were assumed to be the average reported labor, in person-days per year (PD yr⁻¹), required to complete the specific task. In a few instances, labor data were insufficient or unavailable. In such cases, specific assumptions about the required labor were made, generally based on reported labor for similar tasks, expert knowledge of the specific production system and practices, or a combination thereof. We detail specific assumptions about labor inputs which deviate from assuming average reported PD yr⁻¹ required in the individual model descriptions that follow. We also assumed commercialization activities, including marketing and farm management, totaled 30 PD yr⁻¹ in all

models, as data for these activities was generally unavailable. For all models, we included all system outputs including marketed products and those consumed by the household, as well as residual biomass products such as animal waste that may be recycled as an input in the same or a separate system.

2.3.1 Individual systems

The lowest intensity system modeled was a 1 ha cassava system typical of the agronomic practices in Ratanakiri, Cambodia. Cassava production in Ratanakiri is characterized by very low or no agrochemical input use, no irrigation, and low economic value. On the high end of the intensity spectrum were two animal production systems in Vietnam: pond aquaculture and meat pigs, as well as a small (0.27 ha) pepper plot. A coffee system typical of those that dominate the Central Highlands was modelled to represent a middle-intensity, "status quo" system. In all Vietnamese systems modeled, certain capital costs were consistent across models, including a well and water pump, electrical hookup, irrigation equipment including pipes and hoses, a backpack sprayer, motorbike, tarps, shovels, and gunny sacks. Additional detail on system dynamics, including inputs and outputs through time, and capital unique to that system is provided below. See Appendix 2 for the complete model for every system included in the study.

Cassava

We assumed land used for the cassava plot had previously been in forest, as was typical for many of the households surveyed. None of the households surveyed reported any fertilizer usage or irrigation in their cassava systems. We therefore assumed that the only chemical inputs into the system were a combination herbicide and hormone treatment which the majority of

cassava growing households reported using. We assumed the plot used the Green Malaya variety, having average yields of 8,500 kg ha⁻¹ yr⁻¹ of dried, chopped cassava in the first year. This was higher than the average reported yield $(6,383 \pm 3,644 \text{ kg ha}^{-1} \text{ yr}^{-1}, n = 20)$ across all surveys for all years of the system, but represents a conservative estimate of yields in year 1 after opening new land from forest. We assumed a yield decline of 133.45 kg ha⁻¹ yr⁻¹, based on studies conducted on typical cassava yield declines in the region (Howler and Aye, 2014). We assumed a planting density of 10,000 stems ha⁻¹ using stems saved from the previous year's harvest, as was consistently reported in all surveys. Unique capital costs for the cassava system included knives used for harvesting.

Coffee

Average reported coffee yields varied considerably $(3,030 \pm 788 \text{ kg ha}^{-1} \text{ yr}^{-1}, \text{ n} = 10)$, reflecting the variation in tree age, soil types, agronomic practices, and varieties used by those coffee-producing households surveyed. We assumed the coffee plot was previously in coffee production but with older, less productive trees. We assumed the plot was planted with the TR4 variety of Robusta coffee; a relatively modern and higher-yielding variety released by the Western Highlands Agriculture and Forestry Science Institute (WASI) that several interviewees reported recently as a replacement for aging trees. Based on yield values reported by survey participants currently growing the TR4 variety, as well as discussions with local extension professionals and WASI staff, we assumed coffee bean yields of 500 kg ha⁻¹ in year 2, 1,500 kg ha⁻¹ in year 3, 2,500 kg ha⁻¹ in year 4, a mature yield of 3,500 kg ha⁻¹ in years 5 to 15, and a 10% yearly yield decline in years 16 to 20. We assumed the coffee system used only 15-15-15 NPK chemical fertilizer applied at a rate of 2,500 kg ha⁻¹ yr⁻¹, based on the average reported chemical

fertilizer usage from the surveys (2,492 ha⁻¹ yr⁻¹ kg \pm 1,829 kg ha⁻¹ yr⁻¹, n = 10). We also assumed the use of additional chemical inputs in quantities typical of those households surveyed, including a pesticide, and an herbicide. Unique capital costs included a coffee mill and dryer, and a weed trimmer.

Pepper

We modelled a pepper plot of the average size reported from all pepper growing survey respondents: 0.27 ha \pm 0.11 ha. Respondents producing pepper reported a more complex and labor and capital intensive system establishment process than the other cropping systems modeled, including the planting of "pole" trees that provide shade to growing pepper vines and allow them to climb, and vine training to allow the pepper plants to climb the pole trees in a way that allows for easier harvesting and a more manageable crop. In general, crop management practices were more varied in pepper relative to coffee and cassava and included a broader range of input combination, e.g. chemical fertilizers, compost, and animal manure. We were therefore unable to rely on average reported inputs for several key variables including fertilizer, and therefore assumed a production system that was representative of several pepper producing households surveyed. The plot as modeled included an initial application 4500 kg⁻¹ ha⁻¹ of animal manure and 80 kg⁻¹ ha⁻¹ of 15-15-15 NPK during planting, as well as an application of 2000 kg⁻¹ ha⁻¹ yr⁻¹ of 15-15-15 NPK fertilizer and 4000 kg⁻¹ ha⁻¹ yr⁻¹ of animal manure. We assumed a planting density of 1,111 pole trees ha⁻¹, or 300 pole trees for the 0.27 ha plot, onto which a total of 4 vines were planted and trained. We assumed a peak pepper yield of 5000 kg ha⁻¹ for years 7 to 15 based on typical reported yields of several systems that had been in production for 3 or more years. We assumed a 10% yr⁻¹ yield decline in years 15-20.

Aquaculture

All aquaculture systems surveyed, including those that were exclusively used for household consumption, and those primarily purposed for commercial production included a grass plot from which all or a portion of the fish feed was generated. In general, those households with commercially-oriented aquaculture systems fed their fish using a combination of grass, industrial feed, and occasionally household food scraps or other organic matter e.g. animal manure, or crop by-products such as rice husks. Commercial aquaculture systems were generally multi-trophic comprising between 4 and 6 fish species, one or more of which fed primarily on fish waste and algae, e.g. catfish, and some which fed directly on feed inputs, e.g. grass carp, common carp, and / or tilapia. Species-specific price and yield data was not available as all survey respondents reported purchasing pre-mixed quantities of fish fry comprising multiple species, and receiving payment on a per-kilogram basis for all species harvested. Our aquaculture model therefore assumes a mixed-trophic system with a pond size of 0.5 ha with a depth of 2 m (typical of those commercially-oriented aquaculture systems surveyed), and an accompanying grass plot of 0.1 ha. In general, much less data was available on commerciallyoriented aquaculture systems, as only 3 households surveyed managed such systems. Our aquaculture model is therefore based on data acquired from these three households and attempts to use very conservative yield estimates. We assumed a 4-month production cycle in which 250 kg of fry are purchased and fed 100 kg day⁻¹ of grass for the first two months and 100 kg day⁻¹ of grass and 25 kg day⁻¹ of industrial animal feed for months 3 and 4. We assumed a fish yield of 2300 kg per production cycle, implying an average feed conversion ratio across all species of 5.14. We assumed a very conservative VA06 hybrid grass yield of 100 kg ha⁻¹ yr⁻¹. Additional

system inputs included an anti-viral medication and pond cleaning chemicals applied yearly, and a small amount of NPK applied to the grass plot. Unique capital costs included pond construction materials including a spillway.

Pigs

Commercially-oriented pig systems in the Central Highlands of Vietnam utilize "exotic" species which are distinct from those commonly produced for household consumption in the region. They are higher yielding, and are generally sold as whole piglets at either 1 month of age, if sold to a fattening operation, or at 4 months of age if sold for direct consumption. Here, we model a pig production system comprising an initial 5 wet sows, with the heard size reaching 11 wet sows by year 5 (the largest number of wet sows owned by any household surveyed) selling piglets at 4 months old. We assumed wet sows were impregnated via an insemination service. at an average rate of 2.5 pregnancies yr⁻¹ with an average birthrate of 10 piglets pregnancy⁻¹ sow⁻¹ based on survey data and expert interviews. We also assumed a 10% mortality rate of piglets. Based on survey data and expert interviews, we assumed an average sale weight of 50 kg piglet⁻¹. We assumed a feeding rate of 0.5 kg day⁻¹ of industrial feed concentrate for < 1 month old piglets, 1 kg day⁻¹ for piglets between 1 and 2 months old, 3 kg day⁻¹ for piglets between 2 and 4 months old, and the survey average of 3.75 kg day⁻¹ for wet sows. Additional inputs included multiple vaccinations for piglets and wet sows, deworming medication, and antiviral medication. Unique capital costs included the materials for the construction of the pig sty.

2.3.2 Household-level systems

In order to characterize the impacts to economic and energy efficiency of integrated agricultural practices, i.e. the use of outputs of one or more of the foregoing individual systems as an input for another, we modeled two multi-component households: 1) an integrated household in which pig dung and coffee pulp are used as the primary ingredients for compost, and 2) a non-integrated household in which no outputs are recycled. Both household-level systems included a 1.0 ha coffee plot, 0.27 ha pepper plot, an intensive meat pig operation, and an intensive pond aquaculture system, as detailed above. Such multi-component, high-intensity systems are fairly typical for higher income households in Dak Lak. In the "non-integrated" system, the individual system components were combined and redundant capital costs were removed. In the "integrated" system, 3000 kg ha⁻¹ yr⁻¹ of compost was applied to the coffee plot, displacing 1500 kg ha⁻¹ yr⁻¹ (60%) of the NPK fertilizer. We assumed all other inputs and outputs of the individual systems comprising the household models were unchanged.

2.5 Modeling methodology

We compared the performance of the systems modelled using 1) economic and 2) energy metrics. In both modeling frameworks, a matrix of the yearly inputs and outputs to each system were multiplied by a corresponding set of value-weights to derive either an economic or energy budget for the full lifecycle of the system.

2.5.1 Economic performance

For all individual systems, we used the Land Use System (LUS) modeling framework to generate multiple economic performance metrics of the crop and livestock systems analyzed

(Kragten et al., 2001). For all LUS models, we multiplied the full 20-year time series of system inputs and outputs by a per-unit estimated price for the corresponding year to calculate annual revenues and costs. Using the annual revenues and costs, we calculated the net present value (NPV) of each individual system as follows:

$$NPV = \sum_{i=0}^{n} \frac{B_t - C_t}{(1+i)^t}$$

where *n* is the number of years of the system, *t* is the current year of the system, B_t is the revenues in year *t*, C_t is the costs in year *t*, and *i* is the discount rate. Using the NPV calculation, we calculated returns to land (RL) on a per-hectare basis as

$$RL = \frac{NPV}{S}$$

where S is the size, in ha, of the system, and returns to family labor (RFL), as

$$RFL = \frac{NPV}{L}$$

where L is sum of all family labor, in person-days, for all years of the system.

Price Scenarios

All models assumed a retrospective price scenario using nominal prices. Therefore, the final year of each system (year 20) represents a price scenario for 2016, while the first year of each system represents a price scenario in the year 1997. The majority of input prices for 2016 were calculated based on the relevant average values collected from the household surveys. In certain instances, assumptions were made where survey averages were either unavailable or highly variable.

Chemical Fertilizer: No chemical fertilizers were used in the Cambodian cassava system. NPK was bar far the most commonly used chemical fertilizer used by those households surveyed. Historical Vietnam NPK prices for the region were not directly available. In order to approximate a time-series of NPK fertilizer prices, a linear model was built regressing historical urea prices from the years 1991-2001 (FAOSTAT, 2016) onto historical Black Sea bulk urea prices (World Bank, 2017) for the same years. Vietnam producer prices for 2002-2016 were predicted using the resulting linear model. The predicted 2014 Urea price was approximately \$0.55/kg, representing a 43% premium of the average producer prices reported in the same year from household survey data collected in the same region (Hands and Minds, 2014). We therefore estimated regional urea prices for the full time series by multiplying each value by 0.57. Using the previously collected survey data, we determined that urea sold for a 5.31% premium over NPK in 2014. We therefore generated an NPK price time series by multiplying the estimated regional Urea values by 0.957.

Pesticides: Time-series for other agrochemicals were generally unavailable. We therefore estimated the pesticide input prices, included all herbicides, fungicides, and insecticides, by assuming they tracked the NPK time-series at the same margin as the average reported survey prices. For example, the average reported herbicide per-liter cost from all surveys was 18.18 times greater than the average reported per-kilogram price of NPK fertilizer. We therefore multiplied the NPK price time-series by 18.18 to generate a full herbicide price time-series.

Other inputs: Due to a lack of reliable historical data, we assumed that all other inputs prices were stable through the time-series. To generate historical prices, we converted average

reported survey values to nominal historical values by multiplying them by their corresponding consumer price indices (CPI) values for Cambodia (FRED, 2017) and Vietnam (Vietnam General Statistics Office, 2016). Inputs assumed to be stable included animal feed, all medicines and cleaning supplies, all planting materials (seeds and seedlings), and all capital expenditures. We assumed compost price was 50% of the predicted NPK price for the time series. We obtained historical Vietnamese gasoline prices for 11 years between 1995 and 2016 (World Bank, 2016). To generate a complete gasoline time-series, we performed linear interpolation to derive missing values. We assumed gasoline prices were consistent in Vietnam and Cambodia. We generated a time series of manure prices by converting values reported by Thi et al. (2004) into nominal values using the Vietnamese CPI time series.

Wages: We used rural agricultural labor values reported in real 2010 \$USD for the years 1993 1998, and 2002 as a basis for an estimated time series of Vietnamese wages (Wiggins and Keats, 2014). First, we converted the real 2010 \$USD for 1993, 1998, 2002 into nominal values, and fit a linear model to the nominal 1993, 1998, 2002 values and the average day labor wage rate from the household surveys for 2016. The linear model was then used to estimate a full time series of regional agricultural day wages for 1997-2016. Historical rural wages for Cambodia were unavailable. To estimate a Cambodian wage time-series, we used the average yearly increase in rural wages from all Southeast Asian countries from 2000 to 2010 of 5.3% (Wiggins and Keats, 2014). To estimate a full time series of Cambodia wage rates, we assumed a steady increase from of 5.3% from year 1 through 20 of the system, using the average reported daily wage rate from the surveys as a 2016 baseline. Family labor was valued at the market wage rate,

representing the opportunity cost of family labor applied to a household's agricultural production.

Output prices: With the exception of the aquaculture system, we used historical farmgate prices from the years 1987 to 2015 (FAOSTAT, 2016) and average reported survey prices as output price estimates for all marketed products. We assumed coffee pulp had the same price value as animal manure.

Discount rate: We based the discount rate on Interest Rates for short- and medium-term financing for private sector borrowers in Vietnam as reported by the World Bank (2016). The Lending Interest rate for Vietnam in 2014 was 8.7%. As agriculturalists typically have higher cost of capital, and therefore higher discount rates, than private sector borrowers, we assumed a discount rate of 10% for all systems modelled.

2.5.2 Energy Performance

We used the same yearly system input/output (I/O) matrix from all models, described above as a basis for generating an energy performance metric for each system. First, we multiplied the I/O matrix by a corresponding set of energy values for each input and output, in mega joules (MJ), to derive yearly energy input and output values for the lifecycle of each system (Pimentel, 1980). To derive a single, Energy Return on Investment (EROI) value, we divided the cumulative sum of energy outputs from all years by the cumulative sum of energy inputs from all years. The resulting value is representative of the amount of the energy output by the system over the full 20-year period for each unit of energy input. As an example, a system

with an EROI value of 2 would output 2 units of energy for every 1 unit of energy input by humans, including labor, agrochemical and organic inputs, animal feed, and the like. Individual energy values for all system inputs are shown in Table 2. We assumed that all capital expenditures, e.g. building materials, did not have energy values as they were generated in separate production processes that did not cross a plot or animal system boundary as molded here.

Item	Unit	Energy Value (MJ)	Source
Inputs			
Human labor	Person-day	17.25	Pimentel and Pimentel, 2008
NPK	kg	15.75	Pimentel and Pimentel, 2008
Urea	kg	32.35	Pimentel and Pimentel, 2008
Animal manure	kg	6.71	Pimentel, 2009
Compost	kg	6.71	Assumed same energy content as manure
Lime	kg	1.32	Pimentel and Pimentel, 2008
Trichoderma	kg	0.59	Assumed energy content of mushroom
Herbicide	liter	41.87	Pimentel and Pimentel, 2008
Pesticide	liter	41.87	Pimentel and Pimentel, 2008
Gasoline	liter	32.2	Hofstrand, 2008
Electricity	kwh	10.78	Pimentel, 2009
Cassava stems	num	0.19	Pimentel and Pimentel, 2008
Animal feed (fish, pig)	kg	7.7	Pimentel and Pimentel, 2008
Pepper seedlings	num	0.19	Assumed same energy content as cassava stems
Coffee seedlings	num	0.19	Assumed same energy content as cassava stems
Grass seed	kg	87.93	Pimentel and Pimentel, 2008
Fish fry	kg	186.57	Pimentel and Pimentel, 2008
Backhoe	machine hour	161	Assumed consumption of 5 gal gasoline hr ⁻¹
Weed trimmer	machine hour	161	Assumed consumption of 0.5 gal gasoline day ⁻¹
Antiviral spray	liter	140.91	Pimentel and Pimentel, 2008*
Deworming medicine	liter	140.91	Assumed same energy content for all medicines
Vaccine	liter	140.91	Assumed same energy content for all medicines
Outputs			
Cassava (dried, chopped)	kg	15.9	Pimentel and Pimentel, 2008
Coffee beans	kg	16.75	Calculated based Nogaim et al., 2013
Coffee pulp	kg	6.71	Assumed same energy content as manure
Pepper berries	kg	19.05	USDA Nutrient Database, 2017
Pork	kg	9.81	Pimentel and Pimentel, 2008
Grass	kg	7.18	Pimentel and Pimentel, 2008
Fish	ko	140 91	Pimentel and Pimentel 2008

Table 2. Energy values for all inputs and outputs of the Vietnam Central Highlands and northeast Cambodia crop and livestock systems modeled.

* Energy content was assumed to be the same as "medicine" used in aquaculture systems as described by Pimentel and Pimentel, 2008.

Finally, we compared the relative energy and economic performance of all seven systems

modelled – 5 individual systems and 2 household-level systems – by plotting their respective

returns to land against their EROI values. We selected returns to land as the economic metric for comparison due to the consistency in units (\$USD ha⁻¹) across systems of different scale.

3. Results

3.1 Summary of household surveys

The average amount of land managed by households interviewed was greater in Ratanakiri than in the Central Highlands (Figure 2). In Ratanakiri, the average household owned 4.2 ha with an average plot size of 1.2 ha, while in the Central Highlands, the average household owned 1.9 ha with an average plot size of 0.7 ha (Figure 2). In contrast, livestock ownership was much more prevalent in the Central Highlands, with the average household managing 2.3 livestock herds compared to 1.4 herds in Ratanakiri (Figure 2).



Figure 2. The number of plots (A), average plot size (B) and number of livestock species managed by households surveyed in the Central Highlands of Vietnam and Ratanakiri, Cambodia.

In general, the diversity of crops and livestock species managed by the Central Highlands households was greater than the Ratanakiri households (Figure 3). In Ratanakiri, the primary crops produced were cashew, rice, and cassava, while in the Central Highlands, the majority of households grew coffee and between 1 and 3 additional crops (Figure 3). Livestock ownership, especially market-oriented production, as well as aquaculture, was much more common in the Central Highlands than in Ratanakiri (Figure 3).



Figure 3. The number of households managing of each of the crop and livestock species reported in the household surveys in the Central Highlands of Vietnam and Ratanakiri, Cambodia.

3.2 Labor

On a per-hectare basis, aquaculture and pepper had the highest initial labor inputs associated with establishing the production systems (Figure 4, Table 3). For pepper, this is driven primarily by the establishment of the pole trees on which the pepper vines climb, and training the pepper vines in the first two years of the production system. For aquaculture, a considerable amount of labor is required in the construction of the fish ponds and associated infrastructure. Coffee and pepper labor inputs both increase after the first few years of production as the plants begin to yield, increasing the amount of harvesting and processing labor in the system. With the exception of pepper, harvest and processing labor on a per-hectare basis is similar across all systems (Table 3). Pepper harvesting was substantially more labor intensive than the other cropping systems modelled (Table 3). Pig labor increases after initially low labor inputs in response to the daily feeding, watering, and cleaning requirements associated with managing pigs (Figure 4). Operational labor requirements for cassava were very low, reflecting the lack of intensive production, in terms of irrigation, fertilizer applications, etc. (Table 4), associated with cassava production of those households surveyed. No household harvest and processing labor was required for the pig system, as the standard practice by those households surveyed was to pay a service for a driver to purchase and pickup piglets at individuals' farms.



Figure 4. Annual labor requirements of small-scale agricultural systems in the Central Highlands of Vietnam and Northeastern Cambodia

Based on household survey data, the labor associated with making compost and managing the compost operation in the integrated household model was assumed to be 10 PD yr⁻¹, starting with the first coffee harvest in year 3 of the system. In total, the compost operation added an additional 180 PD of operational labor to the integrated household-level model, relative to the integrated model.

System	Category	PD	PD/ha
Coggovo	Establishment	53.00	53.00
	Operations	1,554.00	1,554.00
Cassava	Harvest/processing	1,911.25	1,911.25
	Total	3,518.25	3,518.25
	Establishment	127.80	127.80
Coffee	Operations	3,667.00	3,667.00
Conte	Harvest/processing	1,172.79	1,172.79
	Total	4,967.59	4,967.59
	Establishment	63.29	234.41
Penner	Operations	1,136.98	4,211.04
геррег	Harvest/processing	1,371.93	5,081.22
	Total	2,572.20	9,526.67
	Establishment	225.00	375.00
Aausculture	Operations	2,370.00	3,950.00
Aquaculture	Harvest/processing	700.00	1,166.67
	Total	3,295.00	5,491.67
Pigs	Establishment	6.00	-
	Operations	4,430.32	-
	Harvest/processing	0.00	-
	Total	4,436.32	-

Table 3. Labor inputs over the full system lifecycle to crop and animal production systems in northeastern Cambodia and the Central Highlands of Vietnam

3.3 Economic performance

The NPV of the two animal systems, as well as the pepper system, were considerably higher than the coffee and cassava systems (Figure 5, Table 4). Cash flows in both the pepper and coffee systems were negative until year 3 due to a lack of yields in the first two years after planting (Figure 5). Unlike pepper, however, there were several years of negative cash flow even after the mature yields were reached due a drop in coffee prices to an average of \$0.23 kg⁻¹ in years 5-10 of the system (the average coffee price over the 20-year system life was \$0.90 kg⁻¹)

(Figure 5). In general, pepper prices were more stable and significantly higher (average of \$3.56 kg⁻¹ over the 20-year system life), resulting in positive cash flows once mature yields were realized, despite the lower absolute yield of pepper relative to coffee. The negative cash flows in the cassava system were driven by steadily declining yields through the life of the system. Cassava in Ratanakiri generated positive cash flows for only a short period of time, despite the relatively low establishment costs. Both animal systems had high and stable cash flows in the majority of years modeled, resulting in higher NPVs than both coffee and cassava (Figure 5).



Figure 5. Discounted net benefits and cumulative discounted net benefits of agricultural systems modeled.

Aquaculture and pig systems benefit from the fact that they are not dependent on soil fertility to maintain yields. Whereas yields declined in the plant-based systems modeled after some period of optimal productivity, despite the continued use of chemical fertilizer, fish and pig yields remain stable through time, resulting in ever increasing cumulative discounted cash flows throughout the system life-cycle (Figure 5).

The pig system had the highest returns to land, due to the small amount of space required for an intensive pig production system (Table 4). Pepper, aquaculture, and both household-level systems had returns to land of over \$35,000 ha⁻¹, while cassava and coffee had very low returns to land of \$543.73 ha⁻¹ and \$-2,262.55 ha⁻¹, respectively (Table 4). Despite the very high returns to land, returns to family labor were lower in the pig system than in the aquaculture system, which had the highest returns to labor of all systems modeled (Table 4). Returns to family labor were similar in the pig and both household systems. Despite the higher NPV and returns to land, returns to family labor in the integrated household were lower than the non-integrated household due to the labor required for the compost operation (Table 4). Only the pepper and aquaculture systems had greater returns to family labor than the average market rate over the lifecycle of the system as modeled (Table 4). Returns to family labor were nearly double the average market wage rate in the aquaculture system, reflecting the relatively low labor requirements associated with the system relative to the other systems modeled (Table 4). Returns to family labor in the pig, integrated household, and non-integrated household were similar, with returns to family labor of approximately half that of the market wage rate (Table 4).
System	Location	System size (ha)	NPV (\$USD)	Returns to land (\$USD/ha)	Returns to family labor (\$USD/PD)	Returns to family labor / market wage rate
Cassava	Cambodia	1.00	543.73	543.73	0.21	0.07
Coffee	Vietnam	1.00	-2,262.55	-2,262.55	-0.68	-0.17
Pepper	Vietnam	0.27	15,386.51	56,987.07	5.98	1.46
Aquaculture	Vietnam	0.60	26,564.92	44,274.86	8.01	1.96
Pigs	Vietnam	0.10	10,065.37	100,653.66	2.16	0.53
Integrated household	Vietnam	1.97	72,530.98	36,817.76	2.35	0.57
Non-integrated household	Vietnam	1.97	69,527.96	35,293.38	2.54	0.62

Table 4. Economic performance of 5 individual and 2 household-level agricultural production systems in northeastern Cambodia and the Central Highlands of Vietnam.

3.4 Energy inputs and outputs

Aquaculture was the most intensive system modeled in terms of energy inputs and outputs (Figure 6). This is due primarily to the frequent turnover of fish stock (3 harvests per year) and large quantity of high-energy biomass output of the system. Pepper energy input and output values were very low, mainly due to the small system size, and low biomass yields relative to other systems modeled (Figure 6). The energy inputs to the cassava system were very low (114.4 GJ), reflecting the low input usage and relatively few management activities associated with managing the crop (Figure 6).



Figure 6. Cumulative energy inputs and outputs over the full lifecycle (20 years) of agricultural systems in northeastern Cambodia and the Central Highlands of Vietnam.

3.5 Returns to land and energy efficiency

With the exception of Cassava, all systems modeled had similar EROI values ranging between approximately 0.5 and 3.5 (Figure 7). The overall energy efficiency of a system was not positively correlated with a system's economic efficiency (Figure 7). The most energy intensive systems in terms of total inputs required over their system life, pigs and aquaculture, had high returns to land, but relatively low EROI values of 2.03 and 2.90, respectively (Figure 7). Cassava had the second lowest returns to land and was the most energy efficient (EROI of 20.10) of the systems modeled (Figure 7). The integrated household was slightly less energy efficient than the non-integrated household (EROI of 2.49 and 2.57, respectively), while having slightly higher returns to land than the non-integrated system (\$368 and \$353, respectively). In general, energy efficiency appeared to be negatively correlated with returns to land (Figure 7).



Figure 7. Average annual returns to land and energy output/input ratio of smallholder agricultural systems in the Central Highlands of Vietnam and Northeastern Cambodia.

4. Discussion

Central to the concept of the "sustainable intensification" (SI) of agriculture is the idea that *more* can (and should) be produced with *less* (Struik et al., 2014). Our results underline the importance of bolstering SI and similar concepts, e.g. "eco-efficiency", through the development of precise definitions of not only what is meant *more* and *less*, but specifically how *more* (outputs) and *less* (inputs) are measured. When comparing the relative sustainability, as indicated by some measure of the system's ecological efficiency (i.e. to what extent does it rely on external, chemical inputs, and / or what are the environmental externalities of that system), it is reasonable to view the production system through a mass-balance, or energy efficiency lens as we have done here. All other variables held constant, if a system produces the same output with fewer external inputs than an otherwise identical system, the energy efficiency of that system will be greater. However, as we have demonstrated here, the energy efficiency of an agricultural system is not necessarily a good predictor the economic performance of that same system.

Here, we define inputs and outputs to the production system modelled as all labor, chemical and organic inputs, and capital expenditures. When we applied energy value-weights to these inputs and outputs, the cassava system emerged as the clear winner as measured by EROI. When the cassava system is measured by economic efficiency, only the coffee system performed worse in terms of NPV, returns to land, and returns to labor. This stark contrast between energy and economic performance highlights the different conclusions that may be drawn when measuring a system's efficiency using different sets of value weights applied to input and output quantities. Our results indicate that, with the exception of cassava, there were no major differences in EROI, despite having vastly different economic performance. This was true not only for the individual systems modeled, but for the household-level models as well. In the integrated household model, the reductions in energy inputs realized from supplanting a substantial portion of NPK inputs with household-produced compost was more than canceled out by the increased human labor required to make and manage the compost system. It is also worth noting that the production of such a sizable quantity of compost may depend on having a rather intensive animal operation from which to gather manure. When viewed as a whole, therefore, our

results suggest that efforts to increase the adoption of intensive, high-value crop and livestock production systems may have result in better livelihood outcomes, e.g. from increased incomes, than efforts focused on increasing the level of system integration among household production systems.

While the differences among systems in terms of their economic performance are clear, our findings do, in fact, indicate that some level of integration may have positive economic outcomes. Specifically, the aquaculture system, in which a significant portion of the food produced for the fish is generated on-farm, is an integrated system that also performed very well in all measures of economic performance. These findings are in-line with previous research suggesting that agriculturalists in the Central Highlands region have benefited from increased incomes when diversifying away from coffee production and into animal fattening operations in which beef cows are fed primarily using household-grown fodder (Stür et al., 2013). In fact, the grass generated by the 0.1 ha plot in our aquaculture model, despite a pessimistic yield scenario, produced more than enough fodder to meet the input requirements of the fish ponds, suggesting that the same system may have been capable of supporting additional livestock, resulting in even greater economic output.

It is also worth noting that the systems modeled do not necessarily represent likely outcomes for all producers managing the crops and livestock systems discussed here. In all cases, we attempted to model an average case using historical price series across the relevant region. This fails to capture nuances in performance that are to be expected from producers in high-, or low-suitability regions, or alternative future price scenarios. For example, NPV of the coffee system as modeled becomes \$905.88 if a \$0.50 kg⁻¹ price floor is assumed, and \$4,637.43 if a \$0.75 kg⁻¹ is assumed, neither of which are particularly unlikely given that the price drops seen

in the 90s were primarily a response to very specific macroeconomic and policy environments. Similarly, the economic high-performers, i.e. pigs, pepper, and aquaculture, are modeled using historical price scenarios reflecting a setting in which far fewer farmers in the Central Highlands region were producing those products. It is not unreasonable to expect prices of those commodities to fall as more producers enter into these higher-value markets.

Finally, it should be stated that the efficiency metrics explored here are not in and of themselves indicators of sustainability. While we believe that the economic metrics in particular can provide important guidance for agricultural policy discussions in the region, they do not directly measure other important indicators of sustainable farming practices. For example, various soil quality parameters, including increases in available P, K, Ca, and Mg, may be improved by increased use of organic fertilizers, such as the compost discussed here, in Central Highlands coffee systems (Long et al., 2014). Similarly, integrative practices in the regions may reduce total water usage and improve nutritional outcomes of agriculturalists in the Central Highlands and Ratanakiri (Lancombe et al., 2016). Nor do our metrics capture ancillary benefits of integrated households such as possible hedging strategies against unfavorable price environments. The metrics presented here should therefore be considered part of a broader set of analytical tools towards the development of increasingly objective and adaptive measures of concepts such as sustainable intensification.

5. Conclusions

We have shown that more intensive production practices, e.g. intensive livestock, aquaculture, and specialty crop, e.g. pepper, production may result in improved economic outcomes for smallholder agriculturalists in the Central Highlands of Vietnam and Ratanakiri Province, Cambodia. We have also shown that there is perhaps less to be gained from viewing the same systems through the lens of energy, rather than economic efficiency. The study regions are currently undergoing dramatic and transitions towards increasing market-orientation and intensification of agricultural production, and farmers should be armed with as many decision making tools as possible when facing choices about which production systems to invest in. We have shown that low-intensity production of cassava, and the status-quo production of coffee in the Central Highlands may have lower returns to land, labor and lower NPVs than some of the less conventional, high-intensity systems modelled here. Policy discussions should therefore focus on means and associated costs of improving access to, and lowering the barriers to adoption of these higher-intensity systems.

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Smallholder Farm Household Survey: Energy and Economic Efficiency of Alternative Land Use Practices

General household information

Date (mm/dd/yyyy)					
Country					
Province					
District					
Sub Location					
Village					
Household ID*					
Name of household head					
Name of respondent					
Ethnicity/Gender of respondent					
Geogra	aphical location	on (House)			
Latitude		o	M	S	
Longitude		°	M	S	
Elevation [meters]					
Researcher name		Jai	mey Smith		
Interpreter name					
Language used in interview					

*Province, district, commune, # e.g. DL-EK-ET-01

HH Structure

Total HH #:

Position in HH	Age	Gender	Off-farm work? (Y/N)	Education (years)	Off-farm work type and frequency

Farm Structure

Total Land Owned (sq m)	
Total Land Cultivated (sq m)	
Number of plots Plots cultivated	
Amount of land rented (sq m) Price	
Total Number of Crops	
Aquaculture? (Y/N) No. of species	
Livestock? (Y/N) No. of species	
Intercrops? (Y/N) No. plots intercropped	
Home Garden? (Y/N)	

Notes:

Plot Structure and Utilization

Plot:	1	2	3	4	5	6	7	8	9	10	
		ī	ī	ī	1	1	r	r	r	r	
Area (sq m)											
Type of land (code)											
distance to home [m]											
ownership status (code)											
ownership by gender (cod	e)										
	_										
Main (long rain) season	utilization										
	crop										
Short rain season utilization											
	crop										

Type of land: 1 - not irrigated flat, 2 - not irrigated slope, 3- irrigated, 4-flooded regularly, 5-other Ownership status: 1-owned, 2-rented, 3-shared, 4-other. Ownership by gender: 1-male, 2-female, 3- jointly Utilization: 1-cropped, 2-fallow, 3-grazed, 4-not utilized by this household Crop: (See crop code table)

Managed Trees (outside of specific plots)

Trop turno (podo)	20		Ut	ilized for		Viold*	%	Price	
Tree type (code)	110.	food	feed	timber	fuel	other	rield	consumed	Price

*Determine most relevant unit for yield depending on tree type and utilization

Notes:

GPS Coordinates

Plot History and Land Preparation

HH ID:	
Plot No.:	
Area (sq m):	
Irrigated (Y/N)	Water Source:
	Dist. To Plot (m):

Waypoint	Latitude	Longitude

System History	Production method (Code)	If Intercrop		Years in production		lf inte	ercrop	Plans to change system?		Crop Spacing	
		Crop 1 (Code)	Crop 2 (Code)	Crop 1 (Code)	Crop 2 (Code)	Switch to MC? (Y/N)	When? (year of lifecycle)	When? (years from now)	To What?	Crop 1 (Code)	Crop 2 (Code)
Long Season											
Short Season											
				·		•	•	•	•	•	•

Production method: 1-monocrop, 2-intercrop, 3-rotation, 4-fallow

System Establishment (pre-planting)

Season (1-	Crop	Activity	Performed	No. of	Person-	lf	HL	Months	Machine/	Machine/ No. Times	Notes
short)	(code)	(code)	by (code)	labor type	days	Hrs.	\$/hr.	active	equipment	performed	

Activity: 1-Land clearing, 2-tilling, 3-Seed bed prep, 4-prepairing drainage 5-Irrigation set-up, 6-other **Performed by:** UF-unpaid family labor, UL-unpaid other labor, HL-Hired Labor

Crop Management

HH ID:

Plot No.:

Area (sq m):

Management

All crop management activities specific to current plot

Activity: 1-Irrigation, 2-Planting/sowing, 3-Nursery preparation, 4-Fertilizer application, 5-Pesticide application, 6-Fungicide application, 7-Manure application, 8-Weeding, 9-Other

Performed by: UF-unpaid family labor, UL-unpaid other labor, HL-Hired Labor

See 'Code' sheet for other activity and crop codes

Season	Crop	Activity	Months	Performed	No. Times	Person-	Person-	I	fHL	Input	Input	Input cost
2-short)	(code)	(code)	Months	By (code)*	performed	days/time	Total	Total Hrs. \$/hr. (co		(code)	quantity	input cost

Unique row per labor-type and activity

Harvest/storage/processing

Season	Crop	Activity	Months	Performed No. Times Person- If HL		fHL	Equipment	Service	Cost			
2-short)	(code)	(code)	WOITINS	By (code)*	performed	days/time	Total	Hrs.	rs. \$/hr.	Equipment	(Y/N)	COSI

*

Crop Products and Marketing

HH ID:
Plot No.:
Area (sq m):

All crop products specific to current plot

Product: 1-Grain, 2-Fruit, 3-leaves, 4-Seed, 5-Cob, 6-Whole plant, 7-all above-ground biomass

Buyer: 1-Sold at local market, 2-Trader/middle-men, 3-Co-op, 5-Broker, 6-Processor, 7-Wholesaler, 8-Retailer, 9-Other

See 'Code' sheet for other activity and cron codes

Crop Products Production				Sa	ales	Household food consumption	Live fee	estock eding	Kept as seed	Other (stored, gifts, donations, fuel, etc)	
Crop (code)	Product (code)	Total	Quantity	Price/kg	Total value	Buyer (code)	quantity	quant	Species	quantity	quantity

Marketing/sales activities

Prices

Crop (code)	Product (code)	Marketing activity	Distance travelled	Time spent on activity	Current price (expected)	2015 price	2014 price	2013 price	2012 price	2011 price	Notes

Crop Residues

HH ID:	
Plot No.:	
Area (sq m):	

All crop products specific to current plot

Residue: 1-Straw, 2-Stover, 3-Leaves, 4-Stalks, 5-Vines, 6-Whole plant, 7-Other
Buyer: 1-Sold at local market, 2-Trader/middle-men, 3-Co-op, 5-Broker, 6-Processor, 7-Wholesaler, 8-Retailer, 9-Other
Activity (labor): 1-Harvesting/gathering, 2-Bringing to animals/stall, 3-burning, 4-other

See 'Code' sheet for 'crop' and other codes

Residues			Left in field			Sale			Feed				Fuel	Other
Crop (code)	Residue	mulch,	grazing/ gathered	burnt,	share	Price	main buyer	stall-feeding, [%]		own graz	zing, [%]	bedding, share [%]	share [%]	share [%]
(0000)	(0000)	[/0]	[%]	[,0]	[/0]		(code)	Species	%	Species	%			

Labor – Residues

Notes:

Crop	Resi Activ	Residue Activity		Performed by (code)		Mantha	lf	Contill	
(code)	Activity	No. Times	Labor type	No. People	(total))	No.	\$/hr	COSTIL

ioles.		

Livestock Management and Sales

Species	
Breed*	
Total No. Animals	

Notes on breeding females:

*If specific breed is unknown, note specifics e.g. 'local', 'improved', etc.

List no., size, and purpose* of male/female animals in each age group

	Males		Females			Purchase			
Age class	No	Wt. range (kg)	No.	Wt. range (kg)	Purpose*	When	Weight (kg)	Cost	

* e.g. meat, breeding, milking, etc.

Livestock mgmt. (feeding schedule below)

	Location			Perfor	med by	(labor)	If HL					
Activity	On/off (if on, plot #)	Distance	Freq.	Туре	No.	Time req.	No.	Cost	Time req.	Input	Quantity or freq.	Cost

Livestock feeding

• • • • • •	Feeding schee	dule		Feed cost	Labor			
Age group	Feed type*	Amount	Freq.	(VND)	Туре	No.	Time req.	

*If from on-farm, note plot#

Sales

Time kept on farm	Age at sale	Weight at sale	Price (specify unit)	Sold to	Notes:

Dung Utilization

List dung utilization by species and age group

			Dung u	Dung utilization													
Species	Age	production	Use 1			Use 2	2		Use 3								
	group	(kg) – hote frequency	Use	se Amount (kg) Value		Use Amount (kg)		Value	Use	Amount (kg)	Value						

Labor associated with dung management

Species	Activity		Perfor	med by	(labor)	If HL			Input		Quantity	
Species	Activity	Freq.	Туре	No.	Time req.	No.	Cost	Time req.			or freq.	Cost

Notes on sales or other dung-related activities:

Aquaculture

Pond size (sq m)			Notes on pond establishment, etc.:
Total No. fish			r
(estimate)			
List fish species	Species	No	
-	_		

Fish purchase

Species	No	Wt. range (kg)	When purchased	Cost (VND)	Purchased from.	Distance travelled

Fish management

	Location	า		Perfor	med by	(labor)	If HL						
Activity	On/off (if on, plot #)	Distance	Freq.	Туре	No.	Time req.	No.	Cost	Time req.		Input	Quantity or freq.	Cost

Fish feeding

Creation	Feeding schee	dule		Food cost	Labor						
species	Feed type*	Amount	Freq.	reed cost	Туре	No.	Time req.				

*If from on-farm, note plot#

Sales

Time kept on	Age at sale	Weight at sale	Price (specify unit)	Sold to	Notes:
farm					

INPUT SUPPLIER AND VARIETY INFO

Input	Variety/type	Used in	Purchased	Price
		which plots	from?	

EQUIPMENT/MACHINE INFO

Machine/	Description	Used in	Purchased	Price
Equipment		which plots	from?	

Appendix 2: Land Use System Models

Appendix 2.1: Cassava monocrop, Ratanakiri, Cambodia

	CONTEXT AND POLICY SETTI	NG FOR LUS	ANALYSIS	7
System	Location	System le	ngth (years)	
Cassava monocrop	Ratanakiri, Cambodia	2	0 0	
I	5			-
Macroeconomic Context	Item	Units	Value	Notes
	Inflation rate	%	0.0504	
Conversions	Item	Units	Value	Notes
	KHR to USD		0.000250	Мау-17
	MJ to keal		238.845800	
	kcal to MJ		0.004187	
Policy Setting	Itam	Unite	Value	Notes
Foncy Setting	Discount Rate	Onits	0.1	INOICS
			0-1	
Agroecosystem Setting	Item	Units	Value	Notes
	Plot size	ha	1	
	Annual	months	Jan-dec	
Production System	Item	Units	Value	Notes
	Imgetion	type	none	
	Spanal Scale of LUS Operation/Evaluation	hectares	1 7	
	Previous land use	years	/ Formet	
	Stem spacing	meters	1	~10 000 stems per hectare
	Plot distance to home	meters	5000	
	Stems/ha	Stem	10000	
Variety & expected yield	Item	Units	Value	Notes
	Green Malay, Year 1	kilos/ha	8,500.00	
	Yearly yield decline after year 1	kilos/ha	133_45	Howler, 2014
	τ.	TT 1.	77.1	NT -
Socioeconomic Context	Item	Units	Value	Notes
	Household structure		Owned	
	Limits on capital	1	for small farmers	
	Market access		good	
	Contracts		none	
	Technology availability		low	
	Size of operational holding	hectares	3	
	Other (market) institutional factors?			
	Other (non-market) institutional factors?			
T 1	т.	TT 1.	37 1	NT /
Labor	Item	Units	Value	Notes
	Motorbike fuel effeciency	inicuers kilometerr /liter	36	Assumes 100 meter distance, visiting plot 100 days/year
	Opportunity cost of HH labor 2016	LISD/PD	5	Assumes too impgritter enterency Based on daily farm labor wave rates wathered during HH interviews
	Average wage increase/year	%	5.3	Wippens and Keats. 2014
	6 8 1			85
Input prices (2016)	Item	Units	Value	Notes
	Stems	USD/Stem	0.05	From household survey data
	Herbicide/hormone	USD /liter	11.25	From household survey data
	Gasoline	USD/liter	4.725	Assume same prices as Vietnam
Constant (2014)	The sec	TT. 1	¥74	Neter
Capital costs (2016)	Item Motorbita	Units USD/mataritit	Value	INOICS
	Татк	USD /tam	3 71	From household survey data
	Shovel	USD/shovel	5.00	From household survey data
	Knife	USD/knife	1.00	From household survey data
·				,
Energy values	Item	Units	Value	Notes
Inputs	Human Labor	MJ/PD	17.25	Pimentel and Pimentel, 2008
	Stems	MJ/stem	0.19	Pimentel and Pimentel, 2008
	Gasoline	MJ/fiter	32.20	Hofstrand, 2008
	Herbicide/hormone	MJ/hter	41.87	Pimentel, 2009
Outputs	Cassava	MJ/kg	15.90	Pimentel and Pimentel, 2008
NPK (assume 15-15-15)	Nutrient	Unite	Value	Notes
111 IX (assume 15-15-15)	N	MI/ko	70,764487	Conversions based on values from Pimentel (2008)
	Р	MJ/kg	16.861049	
	К	MJ/kg	17_384424	
	NPK	MJ/kg	15.751494	

Cassava monocrop: I	latanakiri,	Cambod	bi.									Ye	×										
Inputs/Outputs (I/O),	by Year	Unit	1	2	3	4	5	6	7	8	9	10	n	12	13	14	15	16	17	18	19	20	Total
System Establishment																							
Activities Land Preparation Land clearing																							
Hiredlahor		PD/ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
F amily labor		PD/ha	35.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	35.00
W ood removal Hiredlahor		PD/ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
IF arrily labor		PD/ha	18.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.00
Coop Management																							0.00
Activities																							
Hired khor		PD/ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Family labor		PD/ha	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	300.00
Weeding																							
Hiredlabor		PD/ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Herbicide/Hormone annlie:	tion	PD/ma	50.00	50.00	50.00	50.00	30.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	000.00
Hiredlabor		PD/ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Family labor		PD/ha	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	225	225	225	2.25	2.25	2.25	2.25	2.25	2.25	2.25	2.25	45.00
Inputs																							
Sterns		mm	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	10,000.00	200,000.00
Herbicide/hormone Gasoline (motorbike)		Laters Laters	5.00 18.92	5.00 18.92	5.00 18.92	5.00 18.92	5.00 18.92	5.00 18.92	5.00 18.92	5.00 18.92	5.00 18.92	5.00 18.92	5.00 18.92	5.00 18.92	5.00 18.92	5.00 18.92	5.00 18.92	5.00 18.92	5.00 18.92	5.00 18.92	5.00 18.92	5.00 18.92	100.00 378.34
Harvest and Processin	g#																						
	0																						
Activities																							
Hiredlabor		PD/ha	50.00	49.00	48.02	47.06	46.12	45.20	44.29	43.41	42.54	41.69	40.85	40.04	39.24	38.45	37.68	36.93	36.19	35.47	34.76	34.06	830.98
Family labor		PD/ha	50.00	49.00	48.02	47.06	46.12	45.20	44.29	43.41	42.54	41.69	40.85	40.04	39.24	38.45	37.68	36.93	36.19	35.47	34.76	34.06	830.98
Cutting																							
Hiredlahor		PD/ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Parnity labor Devices		PD/ha	10.00	9.80	9.60	9.41	9.22	9.04	8.86	8.68	8.51	8.94	81/	801	7.85	7.69	154	1. 99	7.24	7.09	6.95	6.81	166.20
Hiredlabor		PD/ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Family labor		PD/ha	5.00	4.90	4.80	4.71	4.61	4.52	4.43	4.34	4.25	417	4.09	4.00	3.92	3.85	3.77	3.69	3.62	3.55	3.48	3.41	83.10
Commercialization																							
Activities																							
Marketing																							
Family labor		PD/ha	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	200.00
Farm Management Farmily labor		PD/ha	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	400.00
Canital costs																							
*																							
Koines		6 1177	5.00									500											10.00
Motorbike			1.00									5.00											1.00
Shovels		ഷന	4.00									4.00											8.00
Harvest & Processing																							
Tarps		m .m	4.00																				4.00
Yields																							0.00
Cassava (dried, chopped)		kg/ha	8,500.00	8,366 .55	8,233.10	8,099.65	7, 966.2 0	7, 832 .75	7, 699.30	7,565.85	7 ,432.40	7 ,298.9 5	7 ,16 5.50	7,032.05	6,898.60	6,765.15	6,631.70	6,498.25	6,364.80	6,231.3 5	6,097.90	5, 964 .45	144,644_50
4	fatal Labor																						
Fa	mily labor	PD/ha	193 00	138.70	137 43	136 18	134 95	133 75	132.58	131 43	130 30	129 19	128 11	127.05	126.01	12499	123 99	123.01	122.05	121 11	12018	119 28	2,633.27
Н	fred Labor	PD/ha	50.00	49.00	48.02	47.06	46.12	45.20	44.29	43.41	42.54	41.69	40.85	40.04	39.24	38.45	37.68	36.93	36.19	35.47	34.76	34.06	830.98
ĩ	otal Labor	PD/ha	243.00	187.70	185.45	183.24	181.07	178.95	176.87	174.83	172.84	170.88	168.96	167.08	165.24	163.44	161.67	159.94	158.24	156.57	154.94	153.34	3,464.25
T-11+-/		ND 4-	7 464 25																				

Total Labor (system life)PD/ha3,464.25Total family labor (system life)PD/ha2,633.27

Cassava monocrop: Ratanal	ciri, Cambodia	L									Year	r									
Inputs/Outputs (I/O), by Year	Unit	1	2	3	4	5	6	7	8	9	10	n	12	13	14	15	16	Ø	18	19	20
System Establishment																					
Activities																					
Land Preparation																					
Land clearing																					
Himdlabor	USD/PD	178	1.88	1 98	2.09	2.21	2 33	246	2.60	2.75	290	3.06	3.73	3.47	3.61	3.81	4.07	4.25	4.48	4.74	500
Ra mile la hor		1.78	1.88	198	2.07	2.21	233	2.46	2.60	275	290	3.06	3.23	3.42	3.61	3.81	4.02	4.25	4.48	474	5.00
Wood mound	030,10	1.10	1.00	170	2.07	2.21	2.00	2.10	2.00	215	270	5.00	5.24	5.12	5.01	5.01	1.02	1.25	1.10		5.00
Himdlehor		1 78	1 88	1.92	2.00	2.21	2 22	2.46	2.60	2 75	2.00	2.06	2 72	2.42	2.61	2.91	402	4.75	4.48	4.74	5.00
Family labor	USD/PD	1.78	1.88	1.98	2.09	2.21	2.33	2.46	2.60	2.75	2.90	3.06	3.23	3.42	3.61	3.81	4.02	4.25	4.48	4.74	5.00
Crop Management																					
Activities																					
Plantes																					
Wardleber		1 70	1 88	1.02	2.00	2.21	3 77	246	2.40	3.75	2.00	7.04	7.97	7.47	7.61	7.01	4.02	4.75	4 48	474	5.00
Kanalahuk		1.70	1.00	1.00	2.09	2.21	2.33	2.40	2.00	275	2.00	3.00	3.23	3.42	3.01	3.01	4.02	4.25	4.40	474	5.00
Partievy factor	U3D/FD	1.70	1.00	1.70	2.09	2.21	2.33	2.40	2.00	215	2.50	5.00	3.23	3.42	5.01	5.01	4.02	4.23	4.40	4./4	0.00
weeding		1 70	1.00	1.00	2.00	2.21	9.77	24	2.00	0.75	2.00	7.07	7 07	7 49	2.0	7.01	4.02	4.96	4.40	474	5.00
Hored labor	USD/PD	1.78	1.66	198	2.09	2.21	2.55	2.46	2.60	2.15	2.90	3.06	5.25	5.42	3.61	3.81	4.02	4.20	4.48	4.74	5.00
Parnety labor	USD/PD	1.78	1.66	198	2.09	2.21	2.55	£40	2.60	2.15	290	3.06	3.23	3.42	3.61	3.81	4.02	4.20	4.46	4./4	00.0
Herbicide/Hormone application																					
Hared Labor	USD/PD	1.78	1.88	1.98	2.09	2.21	2.33	2.46	2.60	2.75	2.90	3.06	3.23	3.42	3.61	3.81	4.02	4.25	4.48	4.74	5.00
Ramaly labor	USD/PD	1.78	1.88	1.98	2.09	2.21	2.55	2.46	2.60	2.75	2.90	.3.06	5.25	5.42	5.61	3.81	4.02	4.20	4.48	4./4	5.00
Laputs																					
Sterrs	USD/kwh	0.05	0.05	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.08	0.08	0.09	0.09	0.09	0.10	0.10	0.11	0.12	0.12	0.13
Herbicide/hormone	USD/Later	4.94	5.59	5.56	5.52	5.50	5.71	5.73	6.03	6.54	6.81	7,76	8.74	9.20	9,49	9.96	10.21	10.68	10.80	10.90	11.25
Gasoline (motorbike)	USD/liter	0.47	0.47	0.54	0.61	0.62	0.63	0.71	0.79	0.90	1.01	0.98	0.94	1.05	1.15	1.25	1.35	1.39	1.43	1.43	1.43
Harvest and Processing																					
Activities																					
Harmest																					
Hindlahar		1 78	1 88	1 98	2.09	2.21	7 33	7.46	260	275	2.90	3.06	3.73	3.47	3.61	3.81	4.07	4.75	4.48	4.74	5.00
Ramily labor		1.78	1.88	1 98	2.09	2.21	2.33	2.46	2.60	275	2.00	3.06	3.73	3.42	3.61	3.81	4.02	4.25	4.48	474	5.00
Cutting	030/10	1.70	1.00	1.70	2.07	2.21	2.33	2.10	2.00	215	2.0	5.00	5.2.5	5.42	5.01	5.01	1.02	1.23	1.10	2/7	
Himdlahar	USD/ØD	1 78	1 82	1 92	2.00	2.21	2 22	2.46	2.60	3 75	2.00	2.06	2.72	3.49	3.61	7.81	402	4.25	4.48	4.74	5.00
Kamin la har		1.70	1.00	1.92	2.00	2.21	2.55	2.10	2.00	275	2.00	3.06	3.23	3.42	3.61	2.01	4.02	4.25	4.48	474	5.00
During	050,110	1.70	1.00	170	2.07	2.2.1	2.55	2.10	2.00	2.15	2.70	5.00	5.24	5.12	5.01	5.01	1.02	1.23	1.10		
Handlabor		1 78	1 88	1 92	2.00	2.21	2 22	246	260	275	2.00	3.06	2.72	3.42	3.61	3.81	402	4.25	4.48	4.74	5.00
Kamin la bar		1.70	1.00	1 92	2.00	2.21	2.55	2.46	2.60	2.75	200	3.06	3.23	3.42	3.61	3.01	4.02	4.25	4.48	474	5.00
A ALLINY KALINDI	030/10	1.70	1.00	170	2.07	12.2	2.33	2.10	2.00	213	2.00	5.00	3.23	5.42	5.01	5.01	7.02	τ.ω	7.70	1.11	
Commercialization																					
Activities																					
Marketing																					
Family labor	USD/PD	1.78	1.88	1.98	2.09	2.21	2.33	2.46	2.60	2.75	2.90	3.06	3.23	3.42	3.61	3.81	4.02	4.25	4.48	4.74	5.00
Farm Management																					
Family labor	USD/PD	1.78	1.88	1.98	2.09	2.21	2.33	2.46	2.60	2.75	2.90	3.06	3.23	3.42	3.61	3.81	4.02	4.25	4.48	4.74	5.00
Capital costs																					
Management																					
Kaima	LISD Annuit	0.44	0.50	0.40	0.40	0.40	0.51	0.51	0.54	6.52	0.61	0.40	0.78	0.65	0.24	0.66	0.01	0.05	0.04	0.07	1.00
Matashika	USD /mit	429.02	407.70	404.65	490.66	429.00	507.67	500.26	576.07	581.16	605.57	690.06	776.46	0.0Z 917.70	842.54	224.00	9/17.42	0.40.58	050.60	042.42	1000.00
Showek	USD /mait	220	2 49	947	2.45	2.45	2 54	255	2.6R	2 91	3.03	3.45	3.88	4.09	4.77	4.47	4.54	475	4.80	4.84	5.00
	Color unc	<i></i>	4.17	4.10	4.77	2.13	2.74	2.2.2	2.00	~/1	5.05	3.13	2.00	1.57	7.44	1.12	1.71	T. (J	7.00	LUT	2.00
Harvest & Processing																					
Tarps	USD/unit	0.00	1.60	1.59	1.57	1.57	1.63	1.63	1.72	1.86	1.94	2.21	2.49	2.62	2.71	2.84	2.91	3.05	3.08	3.11	3.21
Yields																					
Canaam (drived at a second	USD A.	012	0.10	0.10	0.14	010	0.20	014	0.95	0.94	0.17	0.17	0.10	0.10	014	0.00	0.17	0.16	0.12	0.15	0.11
Cassava (oneo, choppeo)	USD/Kg	0.13	0.19	u 19	0.10	0.18	0.20	0.10	0.20	0.26	0.17	0.17	u 18	0.10	0.14	0.20	0.17	U. 10	0.10	u15	0.11

ImageImageImageImageImageImageImageImageImageImageImageImageImageImageImageUnder StateSettime <t< th=""><th>Cassava monocrop: Ratanaki</th><th>ri. Cambodia</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th>Yea</th><th>-</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th></t<>	Cassava monocrop: Ratanaki	ri. Cambodia										Yea	-										
Selection: Selec	Inputs/Outputs (I/O), by Year	, – Unit	1	2	3	4	5	6	7	8	9	10	п	12	в	14	15	16	17	18	19	20	
Achieve Achieve <t< td=""><td>System Establishment</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>	System Establishment																						
List List <thlist< th=""> List List <thl< td=""><td>Activities</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></thl<></thlist<>	Activities																						
Long Mg/p 1/2<	Land Preparation																						
matrix μμγγ μ	Land cleaning		477.05	477.05	471 AF	47.05	47.05		477.05		17.05			477.05	477 OF	473 OF	473 AF		477.05		47.05		
monological monological <thmonological< th=""> <thmonological< th=""></thmonological<></thmonological<>	Riered Jahoor	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	175	
mathem μgrn μgrn <thμgrn< th=""> μgrn μgrn <</thμgrn<>	P army large	мј/го	1125	1125	1123	1120	1125	1125	1125	1125	1125	1125	1125	11.25	1123	11.23	11.23	11.25	11.25	11.25	17.23	112	
Induce Mgr0 1/2 <th1 2<<="" td=""><td>Hired Ishor</td><td>MI/PD</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.2</td></th1>	Hired Ishor	MI/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.2	
Sector Sector<	F amily labor	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	175	
Actional Material	Crop Management																						
Turne The state is a state state is a state is a state is a state state is a state state is	Activities																						
Instance M/P0 V72 V72 <th <="" td=""><td>Planting</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th>	<td>Planting</td> <td></td>	Planting																					
μαρλοία μβr0 μ2	Hiredlabor	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	175	
weak weak <th< td=""><td>.Kamily labor</td><td>MJ/PD</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>172</td></th<>	.Kamily labor	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	172	
Hardbar M/PD 172 <th172< th=""> 172 172 <</th172<>	Weeding																						
Back bole M/PD 17.2	Hiredlabor	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	175	
Data Data <th< td=""><td>Ramily labor</td><td>MJ/PD</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>175</td></th<>	Ramily labor	MJ/PD	17.25	17.25	17.25	17.25	17 .2 5	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	175	
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Herbicide/Hormone application																						
$ \begin{array}{c c c c c c c c c c c c c c c c c c c $	Hiredlahor	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	175	
Implementation Same Mighen Mighen <	It accody habour	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	11.25	17.25	17.25	17.25	17.25	17.25	17.25	1/2	
Sees. Marce Marce Marce Marce Marce Name Nam Name Name	Inputs																						
Heriskyhonene M/Are 4187	Sterns	MJ/kwh	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.1	
Generation M/Are S2.0 S2.0 <td>Herbicide/hormone</td> <td>MJ/liter</td> <td>41.87</td> <td>41.8</td>	Herbicide/hormone	MJ/liter	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.8	
Service Se	Gasoline (motorbike)	MJ/liter	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.1	
Activities Harves Har	Harvest and Processing																						
Nervi Binethole M/PD 172 <th172< th=""> <th173< th=""> 172 <th1< td=""><td>Activities</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></th1<></th173<></th172<>	Activities																						
Instable M/P 172 <th172< th=""> 172 172 <</th172<>	Harvest																						
Image: Section blace M/PD 1725 <th< td=""><td>Hiredlabor</td><td>MJ/PD</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>175</td></th<>	Hiredlabor	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	175	
articing Hardbore M/PO 17.25 17.2	Family labor	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	175	
Institute M/PD 17.25	Cutting																						
Inclusion Mg/PD T/25	Hiredlahor	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	172	
Jose MJ/PD 1725 <t< td=""><td>Family labor</td><td>мј/ро</td><td>17.25</td><td>1725</td><td>1725</td><td>1725</td><td>1725</td><td>1725</td><td>1725</td><td>1725</td><td>17.25</td><td>17.25</td><td>1725</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>175</td></t<>	Family labor	мј/ро	17.25	1725	1725	1725	1725	1725	1725	1725	17.25	17.25	1725	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	175	
matrix may res	Dryng Hinndlabor	ML/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17 25	17 25	17.25	17.25	175	
The range and magnetic mag	Ra svile la bor	MI/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.20	17.25	17.20	17.25	17.20	17.25	17.20	17.20	17.20	17.25	17.20	17.20	172	
Commercialization Activities Mixing M/PD 1725	T ATTRIY LATRIE.		1723	1725	1725	1723	1723	1723	1725	1723	1723	1723	1723	17.25	1725	17.25	17.25	17.23	17.25	17.23	17.23	1/3	
Activities Michains	Commercialization																						
Markeding Family labor: MJ/PD 17.25 17	Activities																						
Kandy Lalox MJ/PD 17.25	Marketing																						
Farm Management MJ/PD 17.25	Family labor	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	173	
Capital costs Management Kaives NA 0.00 <t< td=""><td>Farm Management Farmily labor</td><td>MJ/PD</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>17.25</td><td>172</td></t<>	Farm Management Farmily labor	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	172	
Management Knives NA 0.00	Capital costs																						
Management Knives NA 0.00 <	See and Second Second																						
Name NA UGU UGU <td>Management</td> <td></td> <td></td> <td>a a-</td> <td>0.00</td> <td></td> <td>0.0r</td> <td>0.05</td> <td>0.00</td> <td>0.00</td> <td>0.00</td> <td>0.00</td> <td>0.05</td> <td>a a-</td> <td>a a-</td> <td>o a-</td> <td>o a-</td> <td></td> <td></td> <td>a c -</td> <td>0.6-</td> <td>a -</td>	Management			a a-	0.00		0.0r	0.05	0.00	0.00	0.00	0.00	0.05	a a-	a a-	o a-	o a-			a c -	0.6-	a -	
Machinetice NR 0.00		NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
Harvest & Processing Taps NA 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0	BREATTING Showek	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
Harvest & Processing Tarps NA 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0	Latorial	14/1	0.00	0.00	0.00	0.00	0.00	00.0	0.00	0.00	0.00	0.00	00.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
Tarpa NA 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0	Harvest & Processing																						
Yields Cassava (dnied, chapped) MJ/kg 1590 1590 1590 1590 1590 1590 1590 1590	Tarps	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	
Cassava (dažed, chopped) MJ/kg 15.90	Yields																						
	Cassava (dried, chopped)	MJ/kg	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.90	15.9	

Cassava monormo: Ratanakin	i. Cambodia										Yew											
Inputs/Outputs (I/O), by Year	Unit	1	2	3	4	5	6	7	8	9	10	n	12	ы	14	15	16	17	18	19	20	Total
System Establishment																						
Activities																						
Land Preparation																						
Land clearing																						
Hind labor	USD4	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.(62)
Wood Removal	1	62.19	0.00	000	0.00	0.00	000	0.00	0.00	000	0.00	0.00	000	0.00	0.00	000	0.00	0.00	000	0.00	U.U	02
Hindlabor	USD\$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.(
F amily labor	USD	31.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	319
Coop Management																						
Activities																						
Planting																						
Hired labor	USD4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.(
F amily labor	USD\$	26.65	28.14	29.72	31.38	33.14	34.99	36.95	39.02	41.20	43.51	45.94	48.51	51.23	54.10	57.12	60.32	63.70	67.26	71.03	75. 00	938
Weeding										0.00												
Hired labor Formity labor	USDS	0.00	0.00	000	0.00	0.00	000	0.00	0.00	000	0.00	0.00	000	0.00	109.19	0.00	0.00	0.00	124.52	0.00	150.00	197
Herbickle/Hormone application	0304			37.43	02.70	00.27	02.70	13.75	70.04	0410	07.01	/1.00	1.55	142.40	100.17	11420	120.04	12: 37	64.52	142.00	1.0.00	1,011
Hired labor	USD4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0. (
Familylabor	USD\$	4.00	4.22	4.46	4.71	4.97	5.25	5.54	5.85	618	6.53	6.89	7.28	7.68	8.11	8.57	9.05	9_55	10.09	10.65	11.25	140.
Innuts																						
Stems	USDS	500.00	525 20	551. 6 7	579.47	608.68	639.36	671.58	705.43	740.98	778.33	817.56	858.76	902.04	947.50	995.26	1.045.42	1.098.11	115345	1 211 59	1.272.65	16.60
Herbinde/hormone	USD4	24.70	27.97	27.82	27.60	27.51	28.55	28.65	30.15	32.69	34.06	38.82	43.68	46.00	47.45	49.78	51.04	53.41	53.98	54.49	56.25	784
Gasoline (motorbike)	USD \$	8.89	8.89	10.22	11.54	11.73	11.92	13.43	14.94	17.03	19.11	18.44	17.78	19 .77	21.75	23.65	25.54	26.29	27.05	27.05	27.05	362
Harvest and Processing																						
Activities																						
Harvest																						
Hired labor	USD\$	88.84	91.93	95.14	98.45	101.88	105.43	109.11	112.91	116.84	120.91	125.13	129.49	134.00	138.67	143.50	148.50	153.68	159.03	164.57	170.31	2,50
F amily lab or	USD \$	88.84	91.93	95.14	96.4 5	101.88	105.43	109.11	112.91	116.84	120.91	125.13	129.49	134.00	138.67	143.50	148.50	153.68	159.03	164.57	170.31	2,50
Cuting	TICTM	0.00	0.00	0.00	0.00	0.00	000	0.00	0.00	000	0.00	0.00	000	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	
Family khor	USD4	17.77	18 39	1903	19.69	20.38	21.09	21.82	22.58	23.37	24.18	25.03	2590	2680	27.73	2870	29.70	30.74	31.81	32.91	34.06	501
Drying	•																					
Hired labor	USD4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.(
F annity lab or	USD\$	8.88	9.19	9.51	9.85	10.19	10.54	10.91	11_29	11.68	12.09	12.51	12.95	13.40	13.87	14.35	14.85	15.37	15.90	16.46	17.03	250
Commercialization																						
Activities																						
Marketing																						
Family labor	USD\$	17.77	18.76	19.81	20.92	22.09	23.33	24.63	26.01	27.47	29.00	30.63	32.34	34.15	36.06	38.08	40.21	42.46	44.84	47.35	50.00	625
Fam Management																						
Family labor	USD\$	35.53	37_52	39.62	41.84	44.18	46.66	49.2 7	52.02	54.94	58.01	61.26	64.68	68.30	72.13	7616	80.43	84.93	89.68	94.70	100.00	1,251
Capital costs																						
Management																						
Knives	USD\$	2.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.2
Motorbike	USD\$	439.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	439.
Shovels	USD\$	8.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.11	0.00	0.00	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	20.
Harvest & Processing																						
Tarps	USD\$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	Q (
Yields																						
Cassava (dried, chopped)	USD \$	1,125.40	1,563.71	1,532.13	1,326.72	1,440.29	1,537.57	1,259.61	1,885.41	1,957.69	1,257.83	1,220.74	1,253.81	660.20	965.39	1,315.07	1,126.15	1,009.24	975.83	942.94	656.09	25,01
Annual Benefits																						
Total annual costs	USD4	1,419.33	918.44	961. 57	1,006.66	1,052.90	1,102.53	1,154.89	1,211.15	1,271.62	1,348.80	1,399.21	1,467.88	1,539.84	1,614.24	1,692.92	1,774.20	1,859.31	1,946.6 5	2,037.42	2,133.91	
Total Annual revenue	USD4	1,125.40	1,563.71	1,532.13	1,326.72	1,440.29	1,537.57	1,259.61	1,885.41	1,9 57. 69	1,257.83	1,220.74	1,253.81	660.20	965.39	1,315.07	1,126.15	1,009.24	975.83	942.94	656.09	
Annual net income	USD\$	-293.93	645.27	570.56	320.06	387,39	435.04	104.71	674.26	686.07	-90.97	-178.47	-214.07	-879.64	-648.85	-377.85	-648.05	-850.06	-970.82	-1,094.48	-1,477.82	
Annual discounted net benefits	USD	-295.93	560.01	4/154	240.47	204_59	2/013	59.11	.940.00	32006	-36_36	-05.81	-75.03	-28028	-18/.95	-99.50	-15514	-185.00	-192.0/	-19685	-241.64	
Economic Indicators																						

Net Present Value **1056**/stern 543.73

> Returns to and/SD\$/ha 543.73

Returns to family bliefd; 0.21 0.07

Returns to family labor/market wage rate

Cassava monocrop: Ratanakin	i, Cambodia	a									Ye	ar										
Inputs/Outputs (I/O), by Year	Unit	1	2	3	4	5	6	7	8	9	10	ш	12	в	14	15	16	17	18	19	20	Total
System Establishment																						
Activities																						
Land Preparation																						
Land clearing																						
Hiredlabor	мј	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Family labor	мј	603 .77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	603.77
Wood removal																						
Hiredlabor	мј	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Family labor	мј	310.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	0.00	0.00	310.51
Crop Management																						
Activities																						
Planting																						
Hurd labor	мј	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	000	0.00	0.00	0.00	0.00
Family labor	мј	258.76	258.76	258.76	258.76	258.76	258.76	258.76	258.76	258.76	258.76	258.76	258.76	258.76	258.76	258.76	258.76	258.76	258.76	258.76	258.76	1,811.30
Weeding																						
Hund labor	мј	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Family labor	мј	517.51	517.51	517.51	517.51	517.51	517.51	517.51	517.51	517.51	517_51	517.51	517_51	517.51	517.51	517.51	517.51	517.51	517.51	517.51	517.51	3,622.59
Herbicide/Hormone application																						
Hired labor	мј	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Family labor	мj	38.81	38.81	38.81	38.81	38.81	38.81	38.81	38.81	38.81	38.81	38.81	38.81	38.81	38.81	38.81	38.81	38.81	38.81	38.81	38.81	271.69
Inputs																						
Stems	м	1,876.67	1,876.67	1,876.67	1,876.67	1,876.67	1,876.67	1,876.67	1,876.67	1,876.67	1,876.67	1,876.67	1,876.67	1,876.67	1,876.67	1,876.67	1,876.67	1,876.67	1,876.67	1,876.67	1,876.67	13,136.67
Herbicide/hormone	мј	209.35	209.35	209.35	209.35	209.35	209.35	209.35	209.35	209.35	209.35	209.35	209.35	209.35	209.35	209.35	209.35	209.35	209.35	209.35	209.35	1,465.45
Gasoline (motorbike)	мј	609.13	609.13	609.13	609.13	609.13	609.13	609.13	609.13	609.13	609.13	609.13	609.13	609.13	609.13	609.13	609.13	609.13	609.13	609.13	609.13	4,263.93
Harvest and Processing																						
Activities																						
Hargest																						
Hirsd labor	м	862 52	845 27	828 37	811 80	795.56	779.65	764.06	748 78	733.80	719 13	704 74	690.65	676.84	663-30	ഒരങ	63703	624.29	611.81	599 57	587 58	5 687 23
F anniby labor:	M	862.52	845.27	828.37	811.80	795.56	779.65	764.06	748.78	733.80	719.13	704.74	690.65	676.84	663.30	650.03	637.03	624.29	611.81	599.57	587.58	5.687.23
Cuttine	~,																					
	м	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	000	0.00	0.00	0.00	0.00
F amily labor	M	172.50	169.05	165.67	162.36	159.11	155.93	152.81	149.76	146.76	143.83	140.95	138.13	135.37	132.66	130.01	127.41	124.86	122.36	119.91	117.52	1 137.45
Drving	,																					,
Hined labor	м	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Family labor	M	86.25	84.53	82.84	81.18	79.56	77.97	7641	74.88	73.38	71.91	70.47	69.06	67.68	66.33	65.00	63.70	62.43	61.18	59.96	58.76	568.72
	м	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Commercialization	-																					
Activities																						
Madatia																						
E ander lehene	м	172 50	172 50	172 50	172 50	172 50	172 50	172 50	172 50	172 50	172 50	172 50	172 50	172 50	172 50	172 50	17250	17250	17250	17250	17250	1 207 53
Family March	169	172_0	172.00	172.00	172.00	172.50	172.00	172.0	1/2.0	172_0	172.0	1/2_0	172.0	172_0	172_0	172_0	172.00	172.00	172.00	172.50	172.50	1,207.10
Family labor	мј	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	2,415.06
Consistent annota																						
Capital costs																						
Management																						
Knives	NA																					
Shovels	NA																					
Motorbike	NA																					
Harvest & Processing																						
Taps	NA																					
Yields																						
Cassava (dried, chopped)	мј	135,140.3 7	133,018.67	130,8%.%	128,775.26	126,653.56	124,531.85	122,410.15	120,288.45	118,166.74	116,045.04	113,923.33	111,801.63	109,679.93	107,558.22	105,436.52	103,314.81	101,193.11	99,071.41	96,949 .70	94,828.00	901,426.82
Annual Energy Balance																						
Total annual energy inouts	м	6 925 82	5 971 87	5 932 99	5 894 8R	5 857 54	5 820 94	5785 AR	5749 93	571549	568174	564866	561624	5 584 47	5 5 5 3 3 3	5 522 82	5 492 92	546362	5434.90	5 406 76	5 379 18	42 189 13
Total annual energy outputs	M	135 140 37	133,018 67	130,896 96	128,775.26	126.653 56	124,531 85	122,41015	12028845	118,166,74	11604504	113,923,33	111.801 63	109.679.93	107,558 22	105.436 52	103,314 81	101.193 11	99.071 41	96,949 70	94,828.00	901_426_82
Annual net energy output	м	128,214.55	127,046.80	124,963.98	122,880.38	120,796.02	118,710.91	116,625.07	114,538,51	112,451.25	110,363.30	108,274.68	106,185.39	104,095.46	102,004.89	99,913.70	97,821.89	95,729.49	93,636.51	91,542.95	89,448.82	859,237.70
Net energy input (system life)	мj	42,189,13																				
INCLEMENTSY OUTPUT (System life)	r M	701,420.62																				
ELU	•	21.31																				

Appendix 2.2: Coffee monocrop, Central Highlands, Vietnam

	CONTEXT AND POLICY SET	TING FOR LU	S ANALYSIS	7
System	Location	System	Length (years)	
Coffee monocrop	CH, Vietnam	-	20	
	-			-
Macroeconomic Context	Item Inflation rate	Units	0 1037	Notes Meaning Rate 2006-2014
			0.1001	
Conversions	Item	Units	Value	Notes
	VND to USD Mito keal		238.845900	May, 2017
	heal to MJ		0.004187	
Po how Setting	Itam	Unito	Value	Notes
Toncy setting	Discount Rate	Cints	0.1	110105
	-			
Agroecosystem Setting	Item Plot size	Units ha	Value 1	Notes
	Perrenia	months	Jan-dec	
Production System	Item	Units	Value	Notes
	Land quality			
	Inigation Social Scale of LUS Occurring (Evaluation	type	well; with sprinkers	
	Timeframe of LUS Operation/Evaluation	years	25	
	Previous land use		Coffee	Lower performing variety (not TR4)
	Tree spacing	meters	3	~ 1000 seedlings per hectare
	Flot distance to home Seedlings/ha	sectings	1000	
	a'			
Variety & expected yield	Item TP4 Year 2	Units	Value	Notes Erron WASI
	TR4, Year 3	kilos/ha	1500	
	TR4, Year 4	kilos/ha	2500	
	TR4, Year 5+	kalos/ha.	3500	
Socioeconomic Context	Item	Units	Value	Notes
	Land tenure		Owned	
	Household structure		for small farmers	
	Market access		good	
	Contracts		none	
	Technology availability Strate forward backing	haveturau	high	
	Other (market) institutional factors?	HELLETES	5	
	Other (non-market) institutional factors?			
Labor	Item	Units	Value	Notes
20001	Service fee - excavator	USD/mh	11.73	From household survey data
	Kilimeters to-from-plot/year	kilimeters	500	Assumes 100 meter distance, visitng plot 100 days/year
	Motorbake toel efferency Opportunity cost of HH labor	latometers/later USD/PD	36 8.8	Assumes 100 mpg fuel efficiency Based on average daily farm labor wage rates gathered during HH interviews
	n /			
Input prices (2016)	Item	Units	Value	Notes
	Herbickle	USD/liter	8	From household survey data
	Pesticide	USD/liter	24	From household survey data
	Seedlings	USD/seedling	0.176	
	Gasoline Electricity (2016)	USD/htter USD/kwh	0.051524	From www.globalpetrolprices.com/Vietnam/gasoline_prices/ Average price per KWH in 2016: https://wrbs.com vn
	NPK	USD/kg	0.44	Average NPK prices from HH intervies
	NPK-to-Herbicide		1818	
	NPK-TO-PESTICICIE		5455	
Capital costs (2016)	Item	Units	Value	Notes
	Electric pump Electrical boolmo	USD/pamp USD/bashr-	1,760.00	From household survey data. From household survey data
	Well installation	USD/meter	12.32	From household survey data
	Sprinklers	USD/sprinkler	37.40	From household survey data.
	Pipes & Hoses	USD/all	308.00	From household survey data
	weeu immer Gunny sacks	USD/fmmmer USD/særk	88.00 0.88	r ram nouschold survey data. Fram household survey data.
	Motorbike	USD/motorbike	504.51	From household survey data.
	Taps	USD/tamp	0.56	From household survey data
	Snovel Coffice mill	USD/shovel USD/mill	5.00 220.00	From household survey data. From household survey data
	Coffee dryer	USD/dryer	132.00	From household survey data
	Backpark sprayer	USD/sprayer	264.00	From household survey data
Energy values	Item	Units	Value	Notes
Inputs	Human Labor	MJ/PD	17.25	Pimentel and Pimentel; 2008
	Secilings NPK	MJ/seedling	019	Assume same energy content as cassava stems See NPK belevy
	Herbinde	MJ/liter	4187	Firmentel, 2009
	Pesticide	MJ/liter	41.87	Pimentel, 2009
	Machine (backhoe)	MJ/hr	161.00	Assumes 5 galons gasoline per hour
	weea transmer Cow dang	MJ/day MI/k≫	161.00 6.71	Assumnes UD gallons gasoline per hour Pimentel, 2009
	Gasoline	MJ/liter	32.20	Hofstrand, 2008
0 · · ·	Electricity	MJ/kwh	10.78	Pimentel, 2009
Outputs	Cortee beans Coffee pulp	MJ/kg MJ/ke	1675 671	Calculated based on composition of coffee beans Assume the same as animal manure
NPK (assume 15-15-15)	Nutrient	Units	Value	Notes
	N	MT/0	·/////////////////////////////////////	I compressione based on values terms Reported WKR
	N P	MJ/kg MJ/kg	70.764487 16.861049	Conversions based on values from Pimentel, 2009
	N P K	MJ/kg MJ/kg MJ/kg	70.764487 16.861049 17.384424	Conversions based on values from Pimentel, 2009

Coffee Monocopy Cent	ral Highlands, Vie	tnam										Year										
Inputs/Outputs (1/O), by	Year Unit		2	э	4	5	6	7	8	,	10	н	12	B	ы	15	H	17	13	B	20	Tecal
System: Extabilishment																						
Activities																						
Land Preparation																						
Hand bloor	PD/ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Pannily follow Dimnism bolem	PD/ha Machine her/ha	40.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	44.4
Integration setup		31310	4.65	440	0.00	4,65	4.45	0,00	4.45	4,65	4.45	4,00	4.00	0.00	0.00	0,00	0,00	0.00	0.00	0,00	0.00	
Hand labor Dumle falser	PD/ha PD/ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0 5.0
Phone ing	,.													0.20	0.20	0.20		0.20		0.20		
Planting Hinti block	PD /ba	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Promity Indicar	PD/h	20.00	2.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.0
Manuar application Hand bloor	PD/ha	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Paumily hilbor	PD/ha	12.00	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.2
NPK application	PD /ba				0.00		0.00		0.00		0.00		0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Promiting Industor	PD/ha	12.00	1.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.2
Inputs																						
Cow dang	kg/ha	2,500.00	250.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,758.
Southings	secolings / ha	1,000.00	100.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,100.1
C 10																						
Carep Management																						
Activity a																						
Harsd Indexe	PD/m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Providy Industry Providence secondary times	PD/m	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	18.00	368.1
Hind blog	PD/ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Provide Industry Permission Providence	PD/m	0.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	228.0
Hand babor	PD/ha	0.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	76.0
1 ^a mmely Indexe	PD/ha	0.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	38.6
Harsd Index	PD/m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Passady habove	PD/ha	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	00.3	6.00	6.00	6.00	6.00	6.00	6.00	120.0
Harvel Indexe	PD/m	0.00	0.00	20.00	50.00	60.00	60.00	00.00	60.00	00.00	<i>a</i> 0.00	60.00	00.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	60.00	1,030
Pressilly Industry Pression	PD/m	0.00	0.00	0.00	30.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	67
1 Linut Inleas	PD/ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Passing habour Missofrom	PD/ha	0.00	0.00	10.00	15.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	345.1
Hand bloc	PD/ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
14monthly find reser	PD/h	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	200.0
Inputs																						-
NPK.	kg/ha	0.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00	47,500
Pers togailer	filmes / bas	0.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	152.0
Gasoline (motorbilite)	Lines / ha	13.89	13.89	13.89	13.89	13.89	13.89	13.89	13.89	13.89	13.90	13,90	13.90	13,90	13,90	13.90	13.90	13.90	13.90	13.90	13.99	277.
Gasoline (weat trimmer)	Erises	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	1,000.
Harvest and Presswang																						
Activities																						
Harant																						
Harry Indexe	PD/m	0.00	3.90	15.00	22.50	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	27.00	24.30	21.87	19.68	17.71	451.5
Pulping	PD/Hk	400	2.0	12.50	10.75	25.00	25.00	25.00	25100	25.00	25100	2510	25100	2100	2100	2100	22.30	20125	14.23	10.40	14.76	-
Harvel Indone	PD/M	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Device	PD/M	440	1.04						100		100			8.00	8,00	8.00	7.30	6.48	3.83	3.23	4.7.8	124
1 Liens I. Indexe	PD/h	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
There are a second and the second an	PD/M	440	1.30	100	/ 10	10.00	10100	10.00	10.00	1000	10100	1010	1010	10.05	1000	1000	000	a10	1.20	6.36	3.90	
Gasoline (mill)	Erises	0.00	5.20	20.00	30.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	36.00	32.40	29.16	26.24	23.62	6-0_4
Commercialization																						
Activities																						
Presidy Indocer	PD/m	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	208.8
Parm Maragement	PD 4-	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	
A many march	£10/m	2000	2000	20.00					.000		.000						2000					
Cagaital conta																						
Irrigation																						
Electric pranp Electrical book		1.00																				1.1
144-	and the second	108.00																				103.0
Sprinkler		2.00														1.00						2.0
		1.00														1100						~
Bachpack spensy		1.00									1.00											2.
Wood manage		1.00									1.00											2.0
Atotochike Gwony sucks		1.00				50.00					50.00					50.00					50.00	250.0
Targen		5.00		5.00					5.00					5.00					5.00			25.0
Showah		4.00	3.00								2.00									2.00		11.0
Harvest & Pacessing		1.00																				
Depus		1.00																				
X-LL																						
a nechadas					40.000	10 3	40.0			100-0-0-		45.000	10.1		10.1		10.351.55		10.05.17		0.467.53	
Coffine branes	kg/ha kg/ha	0.00	0.00	0,750.00 1,500.00	3,300.00	19,370.09 4,304.46	2,228.23	10,223.88 3,605.31	17,181.83 3,818.18	2,721.28	15,123.02 3,360.67	3,333.35	18,191.70 4,042.60	13,268.22 2,948.49	18,170.93 4,037.98	13,723.61 3,049.69	12,351.25	2,470.25	2,223.23	9,004.06 2,000.90	8,103.66 1,800.81	201,685. 53,670.
Page	hg/ha	0.00	0.00	5,250.00	12,250.00	15,065.62	7,798.79	12,618.57	13,363.64	9,524.49	11,762.35	11,666.73	14,149.10	10,319.73	14,132.95	10,673.92	9,006.53	8,645,98	7,781.29	7,003.16	6,302.84	137,915
18°.	utal Labor																					
Pas	alymbor PD/m	153.00	87.99	109.90	155.25	181.00	181.00	181.00	181.00	181.00	181.00	181.00	181.00	181.00	181.00	181 00	176.70	172.83	109.35	166.21	163.39	3,345
1 Ees	nd Labor PD/ha	0.00	7_90	39.00	76.50	94.00	94.00	94.00	94.00	94.00	94.00	94.00	94.00	94.00	94.00	94.00	91_00	88.30	85.87	83.68	81.71	1,587_
10	Ellipse Pl2/ba	15400	43.254	148.30	431.73	2/200	2/200	2/200	2/200	2/200	2/200	2/200	2/300	2/300	2/300	2/500	201.10	2001.1.2	A 63 22	2-3-3-0	11.64%	·•• 7.23.
Total Labor Total family labor	(system kfejPD/ha s (system kfeJD/ha	4,933.19 3,345.22																				

Coffee Monocrop: Centr	cal Highlands, Vietr	iam.										Yes	178								
Inputs/Outputs (I/O), by ?	Year Oak	1	2	3	4	5	•	7		,	10	н	12	ы	14	в	16	17	18	19	29
System Establishment																					
Activities																					
Land Preparation																					
Hard Inbor	USD /PD	0.94	1.00	1.54	1.89	2.23	1.07	2.98	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
1ª namby Inducer	USD /PD	0.84	1.00	1.54	1.89	2.23	1.07	2.98	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Degang holes Imigation setup	USD/machine.hr	3.44	3.69	3.84	377	3.76	3.90	4.03	4.34	4.70	5.05	5.46	6.73	7.20	7.84	9.30	10.15	10.82	11.26	11.36	11_73
H inst hiltor	USD/PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.06
Passady bib or	USD/PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.06
Photog																					
IT in ref. Indexe	USD /PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Panety babor Macance application	USD/PD	0.84	1.00	154	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.06
Hared bibor	USD /PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Panuly hiltor	USD /PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Hired labor	USD /PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.02	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Passady Infror	USD/PD	0.94	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Inputs																					
Cow dang	USD /kg	0.0025	0.0025	0.0028	0.0031	0.0034	0.0037	0.0041	0.0046	0.0050	0.0055	0.0061	0.0068	0.0075	0.0082	0.0091	0.0100	0.0111	0.0122	0.0135	0.01.49
Seedings	USD/seeding	0.18	0.1760	0.1943	0.2144	0.2366	0.2612	0.2883	0.3182	0.3511	0.3876	0.4278	0.4721	0.5211	0.5751	0.6347	0.7006	0.7732	0.8534	0.9419	1.0396
Citop Management																					
Activities																					
Hind bloc	USD /PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	302	3.97	4.32	467	5.01	5.36	571	606	6.40	675	7.10	8.06
Pamily hibor	USD /PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Persiliner application			4.00		4.00																0.00
Panaly labor	USD/PD	0.84	1.00	154	1.89	2.23	1.07	2.98	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Perticule application																					
Hand bib or Panily biby:-	USD /PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Hodnico de application	5407220	0.04	2.00		200		1.07	~~~								1.1	400	0.10	0.13		0.00
Hand bib or	USD /PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Promity Index a Burd triangeter	USD/PD	0.94	1.00	154	1.89	2.23	1.07	2.98	3.29	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.10	6.75	7.10	8.06
Hand bib or	USD/PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Panniky Indexe	USD/PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.02	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Hand bloc	USD/PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.06
Panniky Indoor	USD /PD	0.94	1.00	1.54	1.89	2.23	1.07	2.98	3.29	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.10	6.75	7.10	8.08
We obligg Hand block	USD /PD	0.84	1.00	154	1 85	2 23	1.07	2 93	3.28	30	3.97	4 32	4.67	5.01	536	5.71	6.06	6.40	475	7 10	8 08
Pannily Infror	USD /PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Inputs																					
Electricity (inightion)	USD /kuh	0.0151	0.01.62	0.0169	0.0166	0.0165	0.0171	0.0177	0.0191	0.0206	0.0222	0.0240	0.0296	0.0316	0.0344	0.0409	0.0446	0.0475	0.0495	0.0499	0.0515
NPK	USD /kg	0.18	0.16	0.13	0.19	0.18	0.18	0.23	0.277	0.32	0.32	0.452	0.63	0.35	0.40	0.55	0.53	0.45	0.45	0.38	0.44
Festilate Hadbicida	USD / How	3.22	2.86	2.32	3.44	3.28	3.24	4.15	4.50	5.79	5.87	7.64	11.39	6.42	7.22	9.93	28.82	8.27	7.78	6.89	8.00
Ganoline (motodolle)	USD / How	0.35	0.35	0.37	0.38	0.36	0.34	0.41	0.48	0.58	0.67	0.74	0.80	0.84	0.88	1.02	1.15	1.10	1.04	0.94	0.83
Gasoline (weed transity)	USD / Los	0.35	0.35	0.37	0.58	0.36	0.34	0.41	0.485	0_38	0.67	0.74	0.290	0.84	0.385	1.02	1.15	1.10	1.04	0.94	0.85
Harvest and Proceeding																					
Activities																					
Hacont																					
Hand hit or Paulie bilese	USD /PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.02	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Patping	0.007110	0.011	200	2.4	200	2.227	1.07	~~~~	10-140				427	3.01	100	2.71	4.00	0.10	0.75	1.10	0.00
Hanst lab or	USD /PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.02	3.97	4.32	4.67	5.01	536	5.71	6.06	6.40	6.75	7.10	8.08
Dening	030710	0.04	100	134	1.65	2.23	1.07	2.36	3_20	3.62	337	4.32	457	301	3.30	711	200	6.40	6.75	7.10	0.06
Hard blog	USD/PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Panniky hilso c	USD/PD	0.84	1.00	1.54	1.89	2.23	1.07	2.98	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Inputs Conclus (mill)	Free	0.15	0.15	0.37	0.39	0.14	0.14	0.41	0.49	0.99	0.67	0.74	0.90	0.94	0.99	1.02	1.15	1.10	1.04	0.04	0.93
<u> </u>			4.00	u .,,	4.4	uu ,	0.24	0.41		0.1		0.14	010	0114	4.00	1.02		1.10	1.04	0.4	0.117
Commercialization																					
Activities																					
Madering																					
Panily hitor Press Management	USD /PD	0.84	1.00	1_54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Pamily bloc	USD/PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Capital costs																					
Irrigation																					
Electric promp Electrical bookan	USD / moit	515.78	553.26	576.03	566.18	563.74	585.34	601.18	651.06	704_98	757.05	819.91	1,009.44	1,080.66	1,176.42	1,396.14	1,523.11	1,623.52	1,689.86	1 704 70	1,760.00
We	USD/meter	3.61	3.87	4.03	3.96	3.95	4.10	4.23	4.56	4.93	5.30	5.74	7.07	7.56	8.23	9.77	10.66	11.36	11.83	11.93	12.32
Spendare	USD/mont	10_96	11.76	12.24	12.03	11.99	12.44	1284	13.94	14.99	16.09	17.42	21.45	22.96	25.00	29.67	32.37	34.50	35.91	36.22	37.40
ingen & Honen	USD/moit	90.26	96.82	100.81	99,08	98655	102.43	105.73	113.94	123.37	132.48	143.48	176.65	18911	205.87	244.33	206.54	264.12	295.72	256.32	306.00
Backgroch and	USD Amin	77 87	89.00	Sec. 44	9.4 GB	ga ca	97 an	90.43	97.66	105-75-	113.55	177 90	151.42	162.10	176.46	209.47	229.47	243 53	253.40	255-24	264.00
Weed to acc	USD /wait	25.79	27.66	28.80	28.31	28.19	29.27	30.21	32.55	35.25	37.85	41.00	50.47	54.03	58.82	69.81	76.16	81_18	84.49	85.24	88.00
Motodale	USD/mit	147.85	158.59	165.12	162.30	161.60	167.79	173.19	186.63	202.08	217.01	235.03	289.36	309.77	337.22	400.21	436.60	465.39	484.40	488.66	504_51
Gunny sada Taga	USD /moin	0.26	0.28	0.29	0.28	0.28	0.29	0.30	0.33	0.35	0.38	0.41	0.50	0.54	337.22	0.70	0.76	0.81	0.84	0.85	0.88
Showh	USD/weit	1.47	1.57	1.64	1.61	1.60	1.66	1.72	1.85	2.00	215	2.33	2.87	3.07	3.34	3.97	4.33	4.61	4.80	4.94	5.00
Harvest & Processing																					
M	USD / moit	64.47	69.16	72.00	70.77	70.47	73.17	75.52	81.38	8812	94.63	102.49	126.18	135.08	147.05	174.52	190.39	202.94	211.23	213.09	220.00
Depos	USD /woit	38.68	41.49	43.20	42.46	42.28	43.90	45.31	48.83	52.87	56.78	61.49	75.71	81.05	88.23	104.71	114.23	121.76	126.74	127.85	132.00
Yields																					
Cothe shering	USD /km	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Coffie bean	USD /kg	0.74	0.66	0.48	0.50	0.22	0.17	0.12	0.10	0.37	0.40	1.17	1.10	1.15	1.25	1.70	1.67	1.60	1.57	1.50	1.53
Pap	USD /kg	0.0025	0.0025	0.0028	0.0031	0.0034	0.0037	0.0041	0.0046	0.0030	0.0055	0.0051	0.0068	0.0075	0.0082	0.0091	0.0100	0.0111	0.0122	0.0135	0.0149

Coffee Monocrop: Central	Highlands, Vietn	am										Year									
Inputs/Outputs (I/O), by Yes	ur Vinie	1	2	3	1	د	•	7	5	,	10	н	12	13	14	15	16	17	15	17	20
System Establishment																					
Activities																					
Land Preparation																					
Land densing Hand blow	MI (PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	1725	17.25	1725	1725	17.25	1725	17.25	1725	17.25	17.25	1725	17.25	175
Pamily hibor	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	1725	17.25	17.25	17.25	17.25	17.25	17.25	17.5
Digging holes	MJ/Machine hr	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.0
Fland Index	MI/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.5
Pannity Indoce	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.5
Planting																					
A family balance	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.5
Passity bib or	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.5
Harst hlor	MI/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.20	17.25	17.25	17.25	17.25	17.25	17.25	17.20	17.5
Phanniky halo car	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.5
NPK application	ML (JUD)	17.05	177.25	17.25	17.25	17.25	17.25	17.25	17.25	17 35	17.25	17.25	177.05	17.25	17 25	17.25	17 35	17.75	17.05	177.05	17-
Pamily bib or	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.5
Imputs																					
Cowden	MJ /Kg	6.71	6.71	6.71	6.71	6.71	6.71	6.71	6.71	6.71	6.71	6.71	671	6.71	6.71	6.71	6.71	6.71	6.71	671	6.7
NPK	MJ / La	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.3
3860.00	MJ/ Stasting	019	0.19	0.19	019	0.19	019	419	0.19	019	0.19	019	uiy	0.19	0.19	0.19	019	0.19	0.19	uly	0.1
Cop Management																					
Activities																					
Lengation																					
Hierd bibor Hamile bibor	MJ/PD MI/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	175
Perula er application					17.43	17.63	17.43	17.40	11.43		. /		. /	11.45	11.23	11.83	11.43	11.23			
11 ment habour	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.5
Panaly labor Perticide application	MJ /PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.5
H and hilton	MJ/MD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.5
Passally follow	MJ/PD	17.25	17.25	17.25	17_25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17_25	17.25	17_25	17.25	17.25	17.25	17.25	17.25	17.2
Hired bloc	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.5
Providy fallow	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.5
Bud triang	ML (PD)	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	175
Panaly fabor	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.5
Pressing																					
Provide follow	MJ/PD MI/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.5
Weeding																					
Hired bloc	MJ/PD	17.25	17.25	17.25	17_25	17.25	17.25	17.25	17.25	17_25	17.25	17.25	17.25	17.25	17_25	17.25	17_25	17_25	17.25	17.25	17.5
Promotive Inducer	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.35	17.25	17.5	17.25	17.25	175
Repets	MI (how	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.79	10.78	10.78	10.78	10.78	10.78	10-
NPK.	MJ/Ng	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.5
Perticide	MJ / How	41_87	41.87	41.87	41_87	41.87	41_87	41.87	41.87	41.87	41.87	41_87	41.87	41.87	41_87	41.87	41.87	41_87	41_87	41.87	41.5
Hashicida Gaudios (motodulla)	MJ / line	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.5
Gauciae (weed trimmer)	MJ / Here	32.20	322.20	32.20	32.20	32.20	32.20	32.20	32.20	322.20	32.20	32.20	32.20	32.20	32, 20	32.20	322.20	32.20	32.20	32.20	32.2
Harvest and Processing																					
Activities																					
Haconst																					
Hand bloor	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.5
Providy Indexe Protection	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.5
I licel bloc	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.5
Providy Index	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.5
Daying H inst hibor	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.5
Passally fallow	MJ/PD	17.25	17_25	17.25	17_25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17_25	17.25	17.25	17.25	17.25	17.25	17.5
Imputs																					
Ganaliae (mill)	MJ / Lines	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.20	32.5
Cornewsy is lization																					
A -timiti -																					
Marketing																					
Promoty Indexe	MJ /PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	175
Parm Maring concert Parm die federer	ML/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	1725	17.25	175
		1,22	11.325			1122		1,35	1120				11.20	1,22	1,22	1132				11.325	11.1
Capital costs																					
Intigation																					
Blostnic promp	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Riestwical bookap	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Spendaler	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Piper & Hoses	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Management																					
Backpack speayer	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Wood trimmer Materialie	NA NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Gwaay sacks	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Tage	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.C
Shewels	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Harvest & Processing																			_		_
Dever	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Yickls																					
Cottise cheeries	MJ / Ng	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Coffice bears Pade	MJ /kg	21.13	21.13	21.13	21.13	21.13	21.13	21.13	21.13	21.13	21.13	21.13	21.13	21.13	21.13	21.13	21.13	21.13	21.13	21.13	21.1
																		A REPORT OF A REPORT OF			

Coffee Monocrop: Central I	Lighlands, Vie	tra seren										Year	•									
Inputs/Outputs (I/O), by Year	0-4		2	2	1	5	•	7	•	,	-	н	12	ы	14	15	×	17	18	19	20	Tetal
Syntem Establishment																						
Activities																						
Land Preparation																						
Land densing Hand bilsor	1000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Passally failure	USED	33.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	33.0
I Sugara bears	1000	118.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	118.
Tant blog	USD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Promity follow	USD	4.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	4.5
Photog																						
Hand befor	UDD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Passally hilbor	USD	16.85	2.00	000	0.00	0.00	000	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	0.00	0.00	000	18.8
Hand bloor	1000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	
Paramity full-core	USDS	10.11	1_20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.2
Hard blog	1092	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Promity follow	USD	10.11	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.5
Inputs																						
Cowding	LEIDS	6.30	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	6.7
See Lings	12325	176.00	1760	0.00	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	191
Crop Management																						
Activities																						
Imagalican		0.00		0.00		0.00		0.00		000	0.00		0.00		0.00	0.00						
Pamily false	USDS	15.16	18.00	27.68	33.94	40.19	19.26	5271	58.97	65.22	71.48	77.74	84.00	9025	96.51	102.77	109.03	11528	121.54	127.80	14544	1,472
Pertiline application	-																					-
Hand labor Pamile false	USD	000	1200	18.45	22.02	26.80	12.84	0.00	0.00 39.31	43.48	47.65	0.00 51.83	0.00 56.00	0.00 6017	64.34	68.51	0.00	76.86	0.00 81.03	0.00 85.20	000 96.96	971
Perticide application	0.27																					
Hind bloc	USD	0.00	4.00	615	7.54	8.93	4.28	11.71	13.10	14.49	1588	17.28	18.67	20.06	21.45	22.84	24.23	25.42	27.01	28,40	32.32	323.
Parently Indexe Hardbickle applications	LEAD A	0.00	200	3.054	3.77	4.47	214	5.546	6.55	725	7.94	8.64	9.13	1003	10.72	11.42	1211	12.54	13.50	14.20	1616	161.
Hand labor	UPDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	0.0
Panaly Inland Burt trianger	USD	5.05	6.00	9.23	11.31	13.40	642	1757	19.66	21.74	23.93	25.91	291.00	3009	32.17	34.26	3634	38.43	40.51	12.60	461.463	176.
Highlight billion	USDS	0.00	0.00	30.75	94.27	133.98	64.20	175.09	196.55	217.41	238.27	259.13	279.99	300.85	321.70	342.56	363.42	394.28	405.14	426.00	484.80	4,785
Paramity Indexe	USIN	0.00	0.00	0.00	56.56	89.32	12.80	117.13	131.04	144.94	158.85	172.75	196.66	200.56	214.47	228.39	242.28	2:619	270.09	294.00	323.20	3,119.
Penning Himthilter	USD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Parmily Index	USD\$	0.00	0.00	15.30	28.29	44.66	21.40	58.56	65.52	72.47	79.42	86.38	93.33	100.29	107.23	114.19	121.14	12809	135.05	142.00	161.60	74 کہا
Weating Hand block	UND	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	
Passily billior	LESDS	8.42	1000	15.38	18.85	22.33	10.70	29 28	32.76	36.24	3971	43.19	46.66	5014	53.02	\$7.09	60.57	64.05	67.52	71.00	80.80	515
Legents																						
Electricity (impalican)	USD	23.15	2483	25.85	25.41	25.30	26.27	27.11	29.22	31.64	3398	36.80	45.30	48.50	52.80	62.66	68.36	72.86	75.84	76.50	78.99	874_
NPK.	LEEDS	0.00	393.34	31941	47/2.40	451.43	44539	570,74	673.18	796.29	307.30	1,050.70	7/3.47	154.00	992.14 173.17	1,364.75	230.57	1,137,20	1,029,285	9481.02	1,100,00	2,855
I fasthiside	USDS	00.0	11.44	9.29	13.74	13.13	12.96	1660	19.58	23.16	2349	30.57	45.58	2567	28.86	39.70	3843	33.08	31.12	27.58	32.00	475
Gasoline (motolbile)	USD	4.79	4.86	5.07	5.28	5.00	4.72	5.09	6.67	7.99	9.31	10.21	11.11	11.67	12.22	14.10	1597	15.21	14.44	12.99	11_53	155.
Gasoline (wind transity)	USD4	17.25	17.50	18.25	19.00	18.00	17.00	20.50	24.00	28.75	3350	36.75	40.00	4200	44.00	50.75	5750	54.75	52.00	46.75	41_50	•//
Elarvent and Processing																						
Activities																						
Hanant																						
I Lineal Inform	LEAN	0.00	3.90	23.06	42.42	66.99	32.10	87.85	98.28	108.71	119.13	129.56	139.99	1 90.42	160.85	171.29	163.54	15563	147.67	139.75	14313	2,034
Patrice		0.00						1441				107.97			1.1(0)	1.10	1.40.46	1	1.01.041			
I Light hilson	USD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	0.0
Pamily bloc Design	USD	0.00	1.04	615	11_31	17.86	856	2343	26.21	28.99	3177	34.55	37.33	40.11	42.89	45.68	43.61	41_50	39.38	3/2/	38.17	555.
Hint blee	USD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	
Passily fallor	LEDY	0.00	1.30	7.69	1414	22.33	10.70	29.28	32.76	34.24	3971	43.19	46.66	5014	53.02	57 09	54.51	51.88	49.22	46.58	47.71	694
lapacs																						
	USD	0.00	1.82	7.30	11.40	14.40	13.00	1640	19.20	23.00	26.90	29.40	32.00	3360	35.20	10.00	11.10	35.48	30.33	21.54	19.60	16 .
Commercialization																						
Activities																						
Marker brog																						
Panily false	UDD	8.42	10.00	15.38	18.85	22.33	10.70	29.28	32.76	36.24	3971	43.19	46.66	5014	53.62	57.09	60.57	64.05	67.52	71.00	80.80	815
Parent Marrie concert Parently balance	1.52.56	16.85	20.00	30.75	37.71	44.66	21_40	58.56	65.52	72.47	7942	96.38	93.33	100.28	107.23	114.19	121.14	12809	135.05	142.00	161.60	1,636
	-																					
Capital costs																						
I reig at item																						
Identities presser	LEAN	515.28	0.00	0.00	0.00	0.00	000	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	585
Wet	USDS	389.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	309_
Spendar	USES	21.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	21.5
Paper & Hours	USD	90.26	0.00	0.00	0.00	0.00	000	00.0	0.00	000	0.00	0.00	00.0	0.00	0.00	244.33	0.00	000	0.00	0.00	000	334_
Management	LEIM	77 37		0.00		0.00	0.00	0.00	0.00	000	111.52	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00		
Wood trimmor	USD	25.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	37.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	63.0
Meterbile	USDS	147.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	147_
Country sadds Tages	USD	12.99	0.00	0.92	0.00	14.09	0.00	0.00	1.04	000	1893	0.00	0.00	1.73	0.00	34.90	0.00	0.00	2.71	0.00	41.00	124
Showitz	USD	5.86	4.72	000	0.00	0.00	0.00	0.00	0.00	000	4.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.09	000	24
Harvest & Processing																						
Ma	USD	64.47	0.00	000	0.00	0.00	0.00	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	61.
Depite	USDS	38.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	38.4
Trice Julies																						
Coffice chaosies	LEAD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	
Coffine beam	USDS	0.00	0.00	714.99	1,735.30	950.43	381.03	430.83	397.09	1,003.34	1,334.86	3,888.02	4,460.20	3,402.27	5,064.04	5,109.23	4,574.63	3,941.53	3,500.25	2,998.15	2,75524	46,701
Pade	USD	0.00	0.00	14.00	37.61	51.05	29.16	5208	60.88	47 30	6527	71.45	95.64	76.99	116.38	97.01	96.36	95.72	95.08	94.45	94 82	1,291
Annual Benefits																						
Total second costs	USD	2,470.64	649.15	67019	1,066.61	1,234.21	891.93	1,561.94	1,791.26	2,04629	2,341_98	2,565.49	3,297.50	2,578.35	2,812.87	3,660.08	3,394.64	3,219.52	3,186.37	3,085.78	3,500.07	46,824
Total Accent avecar	LESIN	0.00	0.00	729.59	1,772.91	1,001_47	410.19	482.92	457.97	1,051.22	1,400,13	3,959.48	4,555.85	3,479.26	5,180.41	5,266.24	1,670,99	4,037.25	3,395.33	3,092.00	2,849.06	17,992
Annual disconcerd ort bearfits	USD	-2,470.64	-59014	49.09	530.65	-15896	-299.12	-609.08	-684.19	464.21	-399.44	537.44	441.04	287.06	685.79	422.95	305.55	177.96	80.91	1.23	-106.45	2,263
	-	_																				
Economic Indicators																						
Net Passent V	and a second second second	1.200																				

Estuars to LaddSD\$/bs. -2,262.55 Estuars to Parally LiBM\$/pd. -0.68 Estuars to Parally Labor/Masket Waye Eate -0.17

Coffee Monocrop: Central	Highlands, V	ictnam										Year	e								
Inputs/Outputs (I/O), by Yea	r Ouis	1	2	3	1	5	•	7	•	,	10	н	12	в	14	15	16	17	19	17	2
Syntema Entals lindamana t																					
Activities																					
Land Preparation																					
FC annul Industa	ъg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Passily follow	M	690.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Inighting setup	,	3,336.40	400	0.00	0.00	0.00	4.00	000	400	0.00	0.00	400	0.00	400	0.00	400	0.00	400	0100	4.00	01
J Linut Inlear	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Passify bilses: Phonting	ъg	86.25	0.00	00.0	0.00	0.00	0.00	000	0.00	00.0	0.00	0.00	0.00	0.00	00.0	0.00	0.00	0.00	000	0.00	DO
Planting																					
11 and billese	20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Panely Inter-	- MU	345.01	34.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
11 and Infor	мg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Parameter Indexe MURIC and Franking	M 0	207.01	20.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Hand blog	мg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
1ª manually find reset	M	207.01	20.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Inputer																					
Cow dance	NG	16,765.48	1,676.55	000	0.00	0.00	0.00	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	00
Seedings	Mg	190.00	19.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Crop Management																					
Activities																					
Long ation Union I follow	м	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Pamily hloc	- MJ	310_51	310.51	310.51	310.51	310.51	310.51	310.51	310.51	310.51	310.51	310.51	310_51	310.51	310_51	310.51	310.51	310.51	310.51	310.51	310
Portilizor application				<i>c</i>	<i>a</i>	<i></i>	<i></i>	<i>c</i>		<i>a</i>	<i>c</i>	<i>~</i>	e		e	e		<i>c</i>			
Discust habour Promity Inform	м <u>г</u>	0.00	207.01	207.01	207.01	207.01	207.01	207.01	207.01	207.01	207.01	207.01	207.01	207.01	207.01	207.01	207.01	207.01	207.01	207.01	2073
Perticile application																					
Hand below	NG	0.00	49.00	69.00	49.00	69.00	49.00	69.00	a	49.00	69.00	49.00	69.00	49.00	69.00	49.00	49.00	00.00	69.00	49.00 M 50	69.0
Herbinde application	رىد	0.00	34.30	34.30	24.50	200	00150	34.30	21.30	34.30	a130	30_30	21.30	24.30	2130	91.30	2130	24.30	200	a430	31.1
Hand below	M	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	00.0	0.00	0.00	0.00	0.00	0.00	0.0
Parmity Information	мј	103.50	103 50	103.50	103 50	103.50	103.50	103 50	103.50	103.50	103.50	103 50	103 50	103 50	103.50	103 50	103 50	103 50	103.50	103.50	103
Hanst hillow	ъg	0.00	0.00	345.01	862.52	1,035.08	1,035.03	1,035.03	1,035.03	1,035.03	1,035.03	1,035.03	1,035.03	1,035.03	1,035.03	1,035.03	1,035.03	1,035.03	1,035.03	1,035.03	1,035
Parameter Indexe	20	0.00	0.00	0.00	517.51	690.02	690.02	690.02	690.02	690.02	690.02	690.02	690.02	60.02	690.02	690.02	690.02	690.02	690.02	690.02	690.1
Hand biling	м	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Promity Infrare	ъğ	0.00	0.00	172.50	258.76	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	3451
Wooding Hand block	м	0.00	0.00	0.00		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.7
Passady Indexe		172.90	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.90	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.90	172
Loopets																					
(Generatively (arrighteen)	ъg	14,532,99	16,532.99	14,532.89	16,532.99	16,532.99	16,532.99	14,532.89	16,532.99	16,532.99	16,532,99	16,532.99	14,532.89	16,532.99	16,532.89	16,532.99	14,532.89	16,532.99	14,532.99	16,532.99	16,532
NPK	MG MG	0.00	39,378.74	39,378.74	39,378.74	39,378.74	39,378.74	39,378.74	39,378.74	39,378.74	39,378.74	39,378.74	39,378.74	39,378.74	39,378.74	39,378.74	39,378.74	39,378.74	39,378.74	39,378.74	39,378
Parenta and a	M3	0.00	167.48	167.48	167.48	167.48	167.48	167.48	167.48	167.48	167.48	167.48	167.48	167.48	167.48	167.48	167.48	167.48	167.48	167.48	167.
Garoline (motodbile)	20	447.22	447.22	447.22	417.22	447.22	447.22	447.22	447_22	447.22	447.22	417.22	447_22	447.22	147.22	417.22	447.22	417_22	447.22	447.22	447.5
Garoline (weed trimmer)	ъg	1,610.00	1,610.00	1,610.00	1,610.00	1,£10.00	1,610.00	1,610.00	1,610.00	1,610.00	1,610.00	1,610.00	1,610.00	1,610.00	1,610.00	1,610.00	1,610.00	1,610.00	1,610.00	1,610.00	1,610.
Elarwent and Proceeming																					
Activities																					
Harvert																					
Hand bibor	MJ	0.00	67.28	258.76	388.13	517.51	517.51	517.51	517.51	517.51	517.51	517.51	517_51	517.51	517_51	517.51	465.76	419.19	377.27	339.54	305.
Pulping		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Hand bloor	м	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Passing Infrom	<u>s</u> aj	0.00	17.94	0.00	103.50	136.00	136600	136.00	138.00	134.00	134.00	136600	138.00	134.00	136.00	1316.00	124.20	111.78	100.60	90.54	81.4
Harry I halo or	ъg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Passily Index	20	0.00	22.43	86.25	129.38	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	155.25	139.73	125.76	113.18	101.
Ingusts		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Garoline (m.ll)	M	0.00	167.44	644.00	966.00	1,228.00	1,2981.00	1,2285.00	1,229100	1,2281.00	1,2191.00	1,228.00	1,2291.00	1,2985.00	1,2381.00	1,2193.00	1,1.99,20	1,043.28	938.95	845.06	760
Commercialization																					
Activities																					
Madagning																					
Phaseably Indone	м	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.90	172.50	172.50	172.50	172.50	172.50	172
Parmily Infror	м	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	345.01	3451
-																					
Capital costs																					
Inigation																					
Electric promp Electrical Investory	NA																				
W	NA																				
Sprinklin	NA																				
Paper & Rows	NA																				
Management	NA																				
Wind wanter	NA																				
Motodolke	NA																				
Tages	NA																				
Showth																					
Harpert & Province																					
Ma	NA																				
Dayor	NA																				
Marking and a second se																					
TA SHALL MARKEN																					
Coffic downer Coffic laner	NA		0.00	31 (25 00	73.955.00	90 953 30	47.002 44	7619010	80.679.22	57 570 72	71,010,92	70.433.75	8542044	(2.301 C	85 322 44	64 440 00	57.994.00	22.105.40	46 976 76	42 279 09	38.054
Pulp	70	0.00	0.00	97,825.00	228,258.33	280,722.79	145,317.44	235,126.06	249,009.21	177,473.02	219,171.77	217,390.09	263,644.95	192,290.97	263,343.89	198,890.76	179,001.68	161,101.52	144,991.36	130,492.23	117,44
	-																				
Annual Energy Balance Total access income	м	51 599.04	G2 776 GP	61.676.98	GL4350P	64 903 14	64 503 16	64 503 14	64 503 14	64 503 14	64 503 14	64 503 16	64 503 14	64 503 14	64 903 14	64 503 14	64 248 47	64 01 9 18	63.872.85	63.677.15	63.445
Total around energy outputs	10	0.00	0.00	129,520.00	302,213.33	371 676.11	192,309.95	311,306.19	329,417.43	234,973.74	290,192.75	287,923,91	349,065.11	254,592.66	3-01666-30	263,330.76	236,997.64	213,297,91	191,941.12	172,771.31	155,494
Annual net energy output	ъg	-51,399.06	-62,776.00	67,843.02	238,778.25	307,172.95	127,896.69	246,803.02	265,184.27	170,470.58	225,679.59	223,320.65	284,561.95	190,089.50	284,163.34	198,827.60	172,749.25	149,278.74	128,155.27	109,144.16	92,034
Net energy accest fr	ystem litiliji	1,268,189.50																			
Net energy output ()	yrisaa kitäjj ECO I	4,635,967.43																			

Appendix 2.3: Pepper monocrop, Central Highlands, Vietnam

	CONTEXT AND POLICY SETT	TNG FOR LU	S ANALYSIS																			
System	Location	System !	cneth (years)																			
Penner monorrow	CH Vietnam		<u></u>																			
геррег попостор	CH, Vielham		20																			
Macroeconomic Context	Item	Units	Value	Notes																		
	Inflation rate	%	0.1037	(Mean inf. Rate 2006-2014)																		
Conversions	Item	Units	Value	Notes																		
	VND to USD		0.000044	May-17																		
	MJ to keal		238.845800																			
	keal to MJ		0.004187																			
Policy Setting	Item	Units	Value	Notes																		
	Discount Rate		01																			
Agroecosystem Setting	Item	Units	Value	Notes																		
	Plot size	ha	1																			
	Percenial	months	Jan-dec																			
Production System	Item	Units	Value	Notes																		
	Land quality																					
	Inigation	type		Using drip tape - standard practice in pepper growing households surveyed																		
	Spatial Scale of LUS Operation/Evaluation	hectares	0.27																			
	Timeframe of LUS Operation/Evaluation	years	20																			
	Previous land use		Pepper																			
	Plot size	m 2	2700	Based on sparing needed for 300 poles																		
	Number of poles	ana	300	1 0 1																		
	Pole spacing	meters	3	~1000 seedlings per hertzre																		
	Polle type	type	trees	Others households used concrete or wooden poles, but trees were most common																		
	Plot distance to home	meters	5000	2																		
	Pricing			3 total pruning events in first year based on GAP from International Pepper Community																		
	Seedlings/ha	vines	2000	2 pepper seedlings per pole																		
L	<u>a</u> .																					
Variety & expected yield	Item	Units	Value	Notes																		
in presed yield	Year 1	kilos/ha	0	Variety from WASI; specific variety unknown. Peak vields in year 7																		
	Year 2	kilos/ha	0	,																		
	Year 3	kilos/ha	400																			
	Year 4	kilos/ha	500																			
	Year 5	bilos/ha	800																			
	Year6	kilos/ha	1000																			
	Year 7.15	kilos/ha	1350	Assuming 5000 kg/hz vield, based on survey data																		
	Year 10 20	bilos/ha	see actes	Assume 10% decline in worderbridty ner war after year 15																		
	101110.00		000 120 000	noone tore demonstration production particles																		
Socioeconomic Context	Item	Units	Value	Notes																		
conoccononic content	Land teams	ente	Owneed	10100																		
	Household structure		00000																			
	Limit on contai		for small farmers																			
	Markat access		ecod																			
	Contracts		5000																			
	Technology availability		hish																			
	Sto of operational holding	hoster																				
	Size of optimizing	includes.																				
Labor	Item	Unite	Value	Notes																		
Labor	Keimeters to from olot/mar	birmstere	500	Assumes 100 meter distance visitue olut 100 days/year																		
	Motorbite first effectency	kilometers/liter	36	Assumes 100 merel ustance, vising plot 100 days/year																		
	Opportunity cost of HH kbor	LISD/PD	88	Resultes 100 mpg for charactery																		
	opportantly cost of fiff more	030,110		based of daily faint about wage falls gained of dailing fifth and values																		
Input prices (2016)	Itom	Unito	Value	Notes																		
input prices (2010)	Constant	USD/b	0 00052	The stal (NO)4																		
	Linkinida	USD/Mar	0.042.02	Average entry form LILI second																		
	Pretinide	USD/Her	34	Average costs from title and veys																		
	resolutione		24	A verige costs from first surveys																		
	с т	USD/seedling	0.572																			
	Seedlings	LIGTS AT	0.074	Even were also had a strain and an and a strain and a str																		
	Scotlings Gasoline	USD/liter	0.8316	Average costs from first surveys From www.globalpetrolprices.com/Vietnam/gasoline_prices/																		
	Seedlings Gasoline Electricity (2016)	USD/liter USD/kwh	0.8316 0.051524	Average costs from init surveys From www.plobabertophores.com/Victnam/gasokine_prices/ Average price per KWH in 2016: https://vebs.com.vn																		
	Seedlings Gasoline Electricity (2016) NPE	USD/liter USD/kwh USD/kg	0.8316 0.051524 0.44	Average costs from 111 surveys Fram www.globalpetricphices.com/Vietnam/gasoline_prices/ Average price per KWH in 2016. https://webs.com.vn Average NPK prices from HH intervies																		
	Seedlings Gasoline Electricity (2016) NPK. to-Herbicide	USD/liter USD/kwh USD/kg	0.8316 0.051524 0.44 18.18	Average roles from htt surveys From www.globalpetrolprices.com/Vietnam/gasoline_prices/ Average price per KWH in 2016. https://vcbs.com.vn Average NPK, prices from HH intervies																		
	Sections Gasoline Electricity (2016) NPFK. NPFK.to-Henbicide NPFK.to-Pesticide	USD/liter USD/kwh USD/bg	0.8316 0.051524 0.44 18.18 54.55	Average costs from 111 surveys From www.globalpetrolphices.com/Victnam/gasoline_prices/ Average price per EWH in 2016. https://vebs.com.vn Average NPK, prices from HH intervices																		
	Sectlings Gasoline Electricity (2016) NPK: NPK: to-Penticide NPK: to-Penticide	USD/liter USD/ks/h USD/kg	0.8316 0.051524 0.44 18.18 54_55	Average costs from 111 surveys From www.globabertubpices.com/Vietnam/gasoline_prices/ Average price per KWH in 2016: https://vebs.com.vn Average NPK prices from HH intervies																		
Capital costs (2016)	Seedlings Gasoline Electricity (2016) NPK. NPK. to-Henbicide NPK-to-Pesticide Item	USD/liter USD/ks/h USD/kg	0.8316 0.051524 0.44 18.18 54.55 Value	Average costs from HTI surveys From www.plobadpertup/inces.com/Vietnam/gasoline_prices/ Average price per KWH in 2016: https://webs.com.vn Average NPK_prices from HH intervies Notes																		
Capital costs (2016)	Sectings Gasoline Electricity (2016) NPK. NPK-to-Herbäide NPK. to-Pesticide Item Electric pump	USD/liter USD/kwh USD/kg USD/lg Units USD/pump	0.8316 0.051524 0.44 18.18 54.55 Value 1,760.00	Average costs from HTI surveys From www.globalpetrolphics.com/Victnam/gasoline_prices/ Average price per EWH in 2016. https://vebs.com.vn Average NPK_prices from HTI intervices Notes From bousehold survey data																		
Capital costs (2016)	Sectlings Casoline Electricity (2016) NPK NPK-to-Pesticide NPK-to-Pesticide Item Electric pump Electric pump Electrical hookup	USD/kter USD/ksvh USD/kg USD/kg USD/pamp USD/pamp	0.8316 0.051524 0.44 18.18 54.55 Value 1,760.00 1,760.00	Average costs from init surveys From www.plobabertroip/incex.com/Vietnam/gasoline_prices/ Average price per KWH in 2016. https://vebs.com.vn Average NPK_prices from HH intervies Notes From household survey data																		
Capital costs (2016)	Sections Gasoline Electricity (2016) NPK NPK-to-Hechicide NPK-to-Hechicide NPK-to-Pesticide Item Electric pump Electrical hookap Well installation	USD/kter USD/kwh USD/kg USD/pump USD/pump USD/hookap USD/meter	0.8316 0.051524 0.44 18.18 54.55 Value 1,760.00 1,760.00 12.32	Average coals unit in surveys From www.plobalpertuppinces.com/Victnam/gasoline_prices/ Average price per KWH in 2016: https://vebs.com.vn Average NPK_prices from HH intervies Notes From bousehold survey data From bousehold survey data																		
Capital costs (2016)	Sectings Gasoline Electricity (2016) NPK. NPK-to-Henbicide NPK-to-Pesticide Item Electric pump Electric pump Electrical hoolop Well installation Sprinklers	USD/kter USD/kyh USD/kg USD/pamp USD/hoohnp USD/hoohnp USD/hoohnp	0.8316 0.051524 0.44 18.18 54.55 Value 1,760.00 1,760.00 1,760.00 1,27.32 37.40	Average coals and infra surveys From www.globalgetrolphices.com/Victnam/gasoline_prices/ Average price per EWH in 2016: https://wdba.com.vn Average NPK_prices from HH intervices Notes From household survey data From household survey data From household survey data																		
Capital costs (2016)	Sectlings Gasoline Electricity (2016) NPK NPK-to-Henhicide NPK-to-Penticid	USD/kter USD/kwh USD/kg USD/pump USD/hookup USD/motter USD/spinikler USD/ail	0.8516 0.051524 0.44 18.18 54-55 Value 1,760.00 1,760.00 1,760.00 12.32 37.40 308.00	Average coals norm HT surveys From www.globalpetrolprices.com/Vietnam/gasoline_prices/ Average price per KWH in 2016: https://webs.com.vn Average NPK_prices from HH intervies Notes From household survey data From household survey data From household survey data From household survey data																		
Capital costs (2016)	Sections Gasoline Electricity (2016) NPK NPK-to-Herbicide NPK-to-Pesticide Plectric pump Electric pump Electric pump Electrical hoolog Well installation Sprinklern Pipes & Hoses Weed trionner	USD/kter USD/ks/h USD/kg USD/pamp USD/hookap USD/motter USD/spiniker USD/spiniker USD/all	0.8316 0.051524 0.44 18.18 54.55 Value 1.760.00 1.760.00 1.760.00 12.32 37.40 306.00 88.00	Average coals norm init surveys From www.globalgetrolphicse.com/Victnam/gasoline_prices/ Average price per KWH in 2016: https://vcbs.com.vn Average NPK_prices from HH intervices Notes From household survey data From household survey data From household survey data From household survey data From household survey data																		
Capital costs (2016)	Sectlings Gasdine Electricity (2016) NPK. NPK. to-Hethicide NPK. to-Pethicide PEthicite Electric pump Electric pump Electrical hoolup Well installation Spinikles Pipes & Hones Weed trianner County suchs	USD/kter USD/kyh USD/ky USD/ky USD/pacap USD/hookap USD/mother USD/soikler USD/soikler USD/soikler USD/soikler USD/soikler	0.8316 0.051524 0.44 18.18 54.55 Value 1,760.00 12.32 37.40 308.00 88.00 0.88	Average coas unit in surveys From www.plobalpetrulprices.com/Vietnam/gasoline_prices/ Average price per KWH in 2016. https://wds.com.vn Average NPK_prices from HH intervies Notes From household survey data From household survey data																		
Capital costs (2016)	Sections Gasoline Electricity (2016) NPK NPK-to-Herbicide NPK-to-Herbicide NPK-to-Herbicide NPK-to-Herbicide NPK-to-Herbicide NPK-to-Herbicide NPK-to-Herbicide NPK-to-Herbicide NPK-to-Herbicide NPK-to-Herbicide Herbicide Physical Horbicide Sprinklers Piper & Hores Wood trianmer Gunny suchs Motorchike	USD/ker USD/kwh USD/kyh USD/pamp USD/packap USD/packap USD/sackap USD/sackap USD/sackap USD/sackap USD/sackap	0.8516 0.051524 0.44 18.18 54.55 Value 1,760.00 1,760.00 1,232 37.40 308.00 88.00 0.88 504.51	Average coals norm HT surveys From www.globalpetrolprices.com/Vietnam/gasoline_prices/ Average price per KWH in 2016: https://webs.com.vn Average NPK_prices from HH intervies Notes From household survey data From household survey data																		
Capital costs (2016)	Sectings Gasoline Electricity (2016) NFK NPK-to-Herbicide NFK-to-Pesticide Item Electric pump Electrical hoolup Well installation Sprinklers Fipes & Hoses Weed trimmer Goony tacks Meetorbike Turps	USD/kter USD/ks/ USD/ks/ USD/pemp USD/metra USD/metra USD/metra USD/spinkler USD/spinkler USD/spinkler USD/spinkler USD/spinkler	0.8516 0.051524 0.44 18.18 54.55 Value 1,760.000	Average coals store Irri surveys From www.globalgetrolphices.com/Victnam/gasoline_prices/ Average price per KWH in 2016. https://vobs.com.vn Average NPK prices from HII intervies Notes From household survey data From household survey data																		
Capital costs (2016)	Sectlings Gasoline Electricity (2016) NPK: NPK: to-Henbicide NPK: to-Penticide NPK: to-Penticide Networks Science Science Science Notorbike Tarpa Shovel	USD/kter USD/kwh USD/kyh USD/pomp USD/pomp USD/nockap USD/anockap USD/anockap USD/anockap USD/anockap USD/anockap USD/anockap USD/anockap USD/anockap	0.8516 0.051524 0.44 18.18 54.55 74.00 1,760.00 12,32 37,40 308.00 88.00 0.88 504.51 0.56 5.00	Average coals norm HII survey From www.plobalpetrolprices.com/Vietnam/gasoline_prices/ Average price per KWH in 2016: https://webs.com.vn Average NPK_prices from HII intervies Notes From household survey data From household survey data																		
Capital costs (2016)	Sections Gasoline Electricity (2016) NPK NPK-to-Herbicide NPK-to-Herbicide NPK-to-Herbicide NPK-to-Herbicide NPK-to-Herbicide NPK-to-Herbicide Electrice Junos Electrice Junos Herbickers Sprinklers Sprinklers Pipes & Hones Weed trianner Gunny sachs Motorbike Theps Shovel Pole Trees	USD/kter USD/kwh USD/ky USD/pamp USD/pomp USD/nockap USD/mockar USD/mockar USD/mockar USD/mockar USD/mockar USD/sponkler USD/sponkler USD/sackar USD/sackar USD/sackar USD/sackar	0.8516 0.051524 0.44 18.18 54.55 Value 1,760.00 1,760.00 1,252 37,40 368.00 888.00 0.88 504.51 0.56 5.00 2.20	Average coals storm IrII surveys From www.globalgetrolphicse.com/Victnam/gasoline_prices/ Average price per KWH in 2016: https://vebs.com.vn Average NPK_prices from HH intervies Notes From household survey data From household survey data																		
Capital costs (2016)	Sections Gasoline Electricity (2016) NPK. NPK-to-Herbicide NPK-to-Festicide Teem Electric pump Electric pump Electrical hoolupp Well installation Spiniklers Fipes & Hoses Weed trianner Gunny sacks Motorbike Turps Shovel Pole Trees Electrice pump	USD/ker USD/kyh USD/kyh USD/pamp USD/hookap USD/hookap USD/anetr USD/anetr USD/anetr USD/anetr USD/anetr USD/anetr USD/anetr USD/anetr USD/anetr	0.8516 0.051524 0.44 18.18 54.55 Value 1,760.00 1,760.00 1,760.00 1,760.00 1,760.00 1,760.00 1,760.00 1,760.00 1,760.00 1,760.00 88.00 0.88 504.51 0.56 5.00 2,20 2,20 2,60	Average coals unit in survey of the second s																		
Capital costs (2016)	Sections Gasoline Electricity (2016) NPFK. NPFK.to-Herbielde NPFK-to-Herbielde NPFK-to-Herbielde Petricie promp Electrice prom	USD/kter USD/kwh USD/kyh USD/pomp USD/kookap USD/kookap USD/sookap USD/sookap USD/sookap USD/acokap USD/acokap USD/sack USD/sace USD/sace USD/sace	0.8516 0.051524 0.44 18.18 54.55 Value 1,760.00 1,760.00 1,760.00 1,760.00 1,760.00 1,770 308.00 80.05 80.05 80.05 80.000 80.00 80.00 80.000 800	Average coals norm in surveys From www.globalpetrolprices.com/Vietnam/gasoline_prices/ Average price per KWH in 2016: https://webs.com.vn Average NPK_prices from HH intervies Notes From household survey data From household survey data																		
Capital costs (2016)	Sectings Gasoline Electricity (2016) NPFK NPFK-to-Herbiside NPFK-to-Pestiside Herm Electric pump Electric pump Electric pump Electric pump Sprinklers Verli sestallistion Sprinklers Sprink	USD/kter USD/ks/h USD/ks/h USD/pemp USD/hookmp USD/motoPu USD/aphoker USD/apho	0.8516 0.051524 0.44 18.18 18.18 1.760.000000000	Average coals norm in surveys From www.globalgetrolphices.com/Victnam/gasoline_prices/ Average price per KWH in 2016: https://vobs.com.vn Average NPK_prices from HH intervies Notes From household survey data From household survey data																		
Capital costs (2016) Energy values Inputs	Sections Gaselines Electricity (2016) NPK. NPK-to-Henbicide NPK-to-Penticide PEctric pump Electric pump Electric pump Electrical hoolup Well installation Spiniklers Fipes & Hoses Weed trimmer Guany suchs Motorbike Turps Shovel Pole Trees Electres Electres Electres Human Labor	USD/kter USD/kyt USD/kyt USD/parter USD/parter USD/motor USD/andrer USD/andrer USD/andrer USD/andrer USD/andrer USD/andrer USD/andrer USD/stack USD/stack USD/stack USD/stack USD/stack USD/stack USD/stack USD/stack	0.8516 0.051524 0.44 18.18 54.55 1,760.00 1,760.00 1,760.00 1,760.00 1,760.00 1,760.00 1,760.00 1,760.00 2,37,40 306.00 88.00 0.88 504.51 0.56 5.00 2.20 2.64.00 Value 17.25	Average coals unit if survey is a constraint of the constraint of																		
Capital costs (2016) Energy values Inputz	Sectings Gasoline Electricity (2016) NPK. NPK.to-Nesticide NPK-to-Pesticide Item Electric pump Electric pump Electric pump Electric pump Section publisher Vedl installation Vedl installation Sprinklers Pipes & Hoxes Wedl trimmer Gunny tacks Motorbike Tarps Shovel Pole Trees Eachpack sprayer Item Human Labor NPEK	USD/kter USD/kwh USD/kwh USD/pamp USD/pomp USD/nochar USD/sochar USD/actor USD/actor USD/a USD/sochar USD/sack USD/sack USD/sack USD/sack USD/sack USD/sack USD/sack USD/sack USD/sack	0.8516 0.051524 0.44 18.18 54.55 Value 1,760.00 1,252 37,40 308.00 88.00 0.38 504.51 0.56 5.00 2.20 2.64.00 Value 17.75	Average coals solvely disconserved and average of the period of the solution o																		
Capital costs (2016) Energy values Inputs	Sectings Gasoline Electricity (2016) NPEK NPEK-to-Herbicide NPEK-to-Pesticide Item Electric pump Electric pump Electric pump Electrical hoolung Well installation Sprinklers Fipes & Hoses Weel trimmer Geong sucks Motochike Turps Shovel Pole Turps Backpack sprayer Item Human Labor NPEK Secellines	USD/kter USD/ks/t USD/pamp USD/pamp USD/hookap USD/hookap USD/ackr USD/apinkler USD/apinkler USD/apinkler USD/apinkler USD/apinkler USD/apinkler USD/apinkler USD/sack USD/sackr USD/sachr USD/sackr USD/sachr	0.8516 0.051524 0.44 18.18 54.55 Value 1,760.00 1,760.00 1,760.00 1,232 37.40 306.00 88.00 0.88 504.51 0.56 5.00 2.20 2.20 2.64.00 Value 17.25 15.75 0.19	Average coals not hit survey From www.plobalpetticphics.com/Vietnam/gasoline_prices/ Average price per KWH in 2016: https://wds.com.vn Average NPK_prices from HH intervies Notes From household survey data From household																		
Capital costs (2016) Energy values Inputs	Sections Gasoline Bectricity (2016) NPEK NPEK-to-Herbielde NPEK-to-Herbielde NPEK-to-Herbielde Petricie promp Electrice promp	USD/kec USD/kyk USD/kyk USD/pomp USD/kockap USD/meter USD/ackat USD/and USD/an	0.8516 0.051524 0.44 18.18 54.55 7 4 Jue 1.760.00 1.760.00 1.760.00 1.760.00 1.760.00 1.760.00 1.760.00 1.760.00 2.37.40 308.00 88.00 0.88 504.51 0.56 5.00 2.20 2.64.00 Value Value Value	Average coals solvely discrete and average of the period o																		
Capital costs (2016) Energy values	Sectings Gasoline Bectricity (2016) NPK NPK-to-Herbiside NPK-to-Pestiside Herm Electric pump Electric pump Electric pump Electric pump Stockers Vedi installation Sprinklers Spr	USD/kter USD/ksvh USD/pamp USD/pamp USD/hookap USD/motor USD/spinkler	0.8516 0.051524 0.44 18.18 54.55 Value 1,760.00 1,770.000	Average coas solvable training arrays From www.globalpetrolphics.com/Vietnam/gasoline_prices/ Average price per KWH in 2016: https://vcbs.com.vn Average NPE, prices from HH intervies Notes From household survey data From																		
Capital costs (2016) Energy values Inputs	Sections (2016) Gasoline (2016) NPK - Network (2016) NPK - Destricte NPK - Destricte Destrice pump Electrice pu	USD/kter USD/kyk USD/kyk USD/pamp USD/kooka USD/kookap	0.8516 0.051524 0.44 18.18 54.55 74.00 1,760.00 1,760.00 1,760.00 1,760.00 1,760.00 1,760.00 1,760.00 1,760.00 2,37,40 306.00 88.00 0.88 504.51 0.56 5.00 2,20 2,64.00 Value 17.25 15.75 0,19 41.87 41.87 41.87	Average coals normal narreys From www.globalgeturghetics.com/Vietnam/gasoline_prices/ Average price per KWH in 2016: https://webs.com.vn Average NPK prices from HH intervies Notes From bousehold survey data From bousehold survey data Fro																		
Capital costs (2016) Energy values Inputs	Sectlings Gasoline Electricity (2016) NPK NPK-to-Herbicide NPK-to-Herbicide Teem Electric pump Electric pump Electric pump Electrical hoolog Well instillation Sprinklers Pipes & Hones Well instillation Sprinklers Pipes & Hones Wedl timmer Gueng sacks Motorbike Them Horman Labor NPK Storel Pick Trees Earlopack sprayer Item Horman Labor NPK Seedlings Herbicide Weed timmer	USD/kter USD/ks/ USD/ks/ USD/poorp USD/moter USD/solar U	0.8516 0.051524 0.44 18.18 54.55 Value 1,760.00 1,760.00 1,232 37.40 366.00 88.00 0.88 504.51 0.26 5.00 2.20 2.64.00 Value 17.25 15.75 0.19 41.87 1.61.00	Average coals used in H11 starks From www.globalgettelpites.com/Vietnam/gasoline_pites/ Average price per KWH in 2016: https://webs.com.vn Average NPK, prices from H11 intervies Notes From bousehold survey data From bous																		
Capital costs (2016) Energy values Inputz	Sectings Gasoline Bectricity (2016) NPK. NPK-to-Herbicide NPK. to-Herbicide NPK. to-Pesticide Item Electric pump Electric pump Electrical hoolung Well installation Sprinklers Fipes & Hones Well installation Sprinklers Fipes & Hones Weed trimmer Gonny tacks Motorbike Theps Shovel Pole Thees Backpack sprayer Item Human Labor NPK Sectings Herbicide Weed trimmer Cox dang	USD/kter USD/ksyk USD/pamp USD/pamp USD/hookap USD/hookap USD/hookap USD/ackr USD/apinkler USD/apinkler USD/apinkler USD/apinkler USD/apinkler USD/apinkler USD/ackr USD/ackr USD/shovel USD/shovel USD/sprayer USD/shovel USD/sprayer USD/shovel USD/sprayer USD/shovel USD/sprayer USD/shovel USD/sprayer	0.8516 0.051524 0.44 18.18 54.55 Value 1,760.00 1,760.00 1,232 37,40 306.00 88.00 0.88 504.51 0.56 5.00 2.20 2.64.00 Value 17.25 15.75 0.19 41.87 41.87 41.87 41.87	Average costs survey data From www.plobalgetteiphices.com/Vietnam/gasoline_prices/ Average price per KWH in 2016: https://webs.com.vn Average NPK_prices from HH intervies Notes From household survey data From household s																		
Capital costs (2016) Energy values Inputs	Sections Gasoline Electricity (2016) NPEK. NPEK. NPEK.to-Hetheide NPEK-to-Hetheide NPEK-to-Hetheide NPEK-to-Pesticide Electric promp Electric	USD/kter USD/syth USD/pomp USD/pomp USD/pomp USD/notokap USD/atokap USD/atokap USD/atokak USD/atokak USD/atokak USD/atokak USD/shovel USD/shove	0.8516 0.051524 0.44 18.18 54.55 Value 1,760.00 1,760.00 1,252 37.40 308.00 88.00 0.88 504.51 0.56 5.00 2.20 2.64.00 Value 17.25 15.75 0.19 41.87 41.87 41.87 161.00 6.71 32.20	Average coals not hit survey From www.globalgetteiphices.com/Vietnam/gasoline_prices/ Average price per KWH in 2016: https://webs.com.vn Average NPK prices from HH intervies Notes From bousehold survey data From bousehol																		
Capital costs (2016) Energy values Inputz	Sectings Gasoline Beetricity (2016) NPK NPK-to-Herbiside NPK-to-Pesticide Item Electric pump Electric pump Electric pump Electric pump School Wedl installizion Sprinklers Pipes & Hoses Wedl installizion Sprinklers Pipes & Hoses Wedl installizion Sprinklers Pipes & Hoses Wedl installizion Shovel Pole Tress Backpack sprayer Item Homan Labor NPK Seedlings Herbiside Pesticide Wedl trimmer Corv dang Casoline Electricity	USD/kter USD/ksvh USD/pemp USD/hookap USD/hookap USD/hookap USD/motor USD/sprakker	0.8516 0.051524 0.44 18.18 14.55 Value 1,760.00 1,725 1,575 0,19 4,187	Average costs stores for HT streeps From www.plobalgettelprices.com/Vietnam/gasoline_prices/ Average price per KWH in 2016: https://wds.com.vn Average NPK_prices from HH intervies Notes From household survey data From household survey da																		
Capital costs (2016) Energy values Inputz	Sections Gasoline Bectricity (2016) NPK NPK Nestricite NPK-to- Herbride NPK-to- Herbride Destric pump Electric pump Electric pump Electric pump Spiral Action Pole Trees Gonny sucks Weed trianner Gonny sucks Mottebile Tupp Shovel Pole Trees Backpack sprayer Herm Human Labor NPK Sectilings Herbride Pestricite Weed trianner Cov dung Gasoline Electricity Pepper bernies	USD/kter USD/kyth USD/pamp USD/hookap USD/hookap USD/hookap USD/hookap USD/hookap USD/arbiter USD/arbi	0.8516 0.051524 0.44 18.18 54.55 Value 1.760.00 1.760.00 1.760.00 1.760.00 1.760.00 1.760.00 1.760.00 1.760.00 88.00 0.88 504.51 0.56 5.00 2.20 2.20 2.66 0.56 5.00 2.20 2.66 0.56 5.00 2.20 2.66 0.57 15.75 0.19 41.87 41.87 41.87 161.00 6.71 3.220 10.78 19.05	Average coas som HTI survey From www.jdobajertup/inces.com/Vietnam/gasoline_prices/ Average price per KWH in 2016: https://wds.com.vn Average NPK prices from HH intervies Notes From household survey data From h																		
Capital costs (2016) Energy values Inputs Outputs	Sectings Gasoline Electricity (2016) NPK. NPK. NPK-to-Pesticide NPK-to-Pesticide Electric pump Electric pump Electric pump Electrical hoolonp Well instillation Sprinklers Pipes & Hoxes Well instillation Sprinklers Pipes & Hoxes Well instillation Sprinklers Pipes & Hoxes Well instillation Sprinklers Sectore Terps Electrical hoolong Well instillation NPK Sectore Sec	USD/kter USD/ks/ USD/ks/ USD/poonp USD/molap USD/molap USD/solar USD/spinlker USD/spinlker USD/spinker USD/spinker USD/spinker USD/spinker USD/spinker USD/spinker USD/spinker USD/spinker MJ/kter MJ/kter MJ/kter MJ/ksh	0.8516 0.051524 0.44 18.18 14.55 Value 1,760.00 1,730.00 12.32 37.40 0.88 0.08 88.00 0.88 504.51 0.26 5.00 2.20 2.64.00 Value 17.25 15.75 0.19 41.87 1.61.00 6.71 3.2.20 1.0.78 1.905 1.78 1.905 1.78 1.905 1.78 1.78 1.78 1.78 1.78 1.78 1.75 1.77 1.78 1.75 1.75 1.75 1.75 1.75 1.75 1.75 1.75 1.77 1.78 1.75	Average coals survey From www.globalpetrulprices.com/Vietnam/gasoline_prices/ Average price per KWH in 2016: https://webs.com.vn Average NPK_prices from HH intervies Notes From household survey data From household survey																		
Capital costs (2016) Energy values Inputs Outputs NPK (assume 15-15-15)	Sectings Gasoline Bectricity (2016) NPK NPK-to-Herbicide NPK-to-Pesticide Item Electric pump Electric pump Electric pump Secting pump Secting pump Secting pump Well installation Sprinklers Sprinkler	USD/kter USD/ksvh USD/pamp USD/pamp USD/hookap USD/moter USD/sprayer USD/sprayer USD/sack USD/smotobile USD/smotobile USD/smotobile USD/smotobile USD/smotobile USD/smotobile USD/smotobile USD/smotobile USD/smotobile USD/sprayer USD/sprayer USD/shovel USD/sprayer USD/sprayer USD/shovel USD/sprayer USD/spra	0.8516 0.051524 0.44 18.18 54.55 Value 1,760.00 1,760.00 1,760.00 1,760.00 1,232 3,7,40 308.00 88.00 0.88 504.51 0.56 5.00 2.20 2.64 0.08 5.00 2.20 2.20 2.64 0.00 Value 17.25 15.75 0.19 41.87	Average coast software for the set of the se																		
Capital costs (2016) Energy values Inputz Outputz NPK (assume 15-15-15)	Sectings Gasoline Electricity (2016) NPK. NPK.to-Hetheide NPK-to-Hetheide NPK-to-Pesticide Item Electric pump Electric pump Ele	USD/kec USD/swh USD/parap USD/parap USD/hookap USD/hookap USD/hookap USD/hookap USD/sovel USD/sproker USD/sproker USD/shovel USD/sho	0.8516 0.051524 0.44 18.18 54.55 Value 1,760.00 1,775 1,575 0,19 4,187 1,600 6,71 3,220 1,078 1,905 Value	Average coals story From www.globalgeturbjoinces.com/Vietnam/gasoline_prices/ Average price per KWH in 2016: https://wds.com.vn Average NPK prices from HH intervies Notes From household survey data From household survey data See NPK, below Assume sume energy content as cassava stems Pinnental, 2009 USDA National Nutrient Database: 455 kzal per 100 <u>5</u> = 4550 kzal per k <u>5</u> Notes Conversions based on values from Finnental (2009)																		
Capital costs (2016) Energy values Inputs Outputz NPK (assume 15-15-15)	Sections Gasoline Electricity (2016) NPK. NPK-to-Pesticide NPK-to-Pesticide Item Electrice pump Electrice pump	USD/kter USD/ksyk USD/syk USD/peenp USD/hookap USD/hookap USD/sohoker USD/spenkler	0.8516 0.051524 0.44 18.18 54.55 Value 1,760.00 1,765 1,75 0,19 4,187 1,670 1,670 1,670 1,670 1,670 1,75 1,075 1,	Average coals survey From www.globalpettophics.com/Vietnam/gasoline_prices/ Average price per KWH in 2016: https://web.com.vn Average NPK, prices from HH intervies Notes From household survey data From household survey d																		
Capital costs (2016) Energy values Inputs Outputs NPK (assume 15-15-15)	Sectionses Gasolines Bectricity (2016) NPK. 10- Herbridte NPK. to- Herbridte NPK. to- Herbridte Detricit holmp Electricit holmp Well installation Spiniklers Piper & Honen Well installation Spiniklers Piper & Honen Well installation Spiniklers Piper & Honen Well installation Spiniklers Piper & Honen Well installation Shovel Pole Trees Barlyack sprayer Herbridte New Herbridte Pesticide Weed trimmer Coar dung Gasolines Electricity Pepper bernies N N N N	USD/kter USD/ksyk USD/pamp USD/pamp USD/hookap USD/hookap USD/ackr USD/apinkler USD/apinkler USD/apinkler USD/apinkler USD/apinkler USD/apinkler USD/apinkler USD/apinkler USD/sackr USD/sachr USD/sachr USD/sachr USD/sachr USD/sachr USD/sachr USD/sachr USD/sachr USD/sachr USD/sachr USD/sachr USD/sachr USD/sachr USD/sachr USD/s	0.8516 0.051524 0.44 18.18 54.55 Value 1,760.00 1,760.00 1,760.00 1,232 37,40 306.00 88.00 0.88 504.51 0.56 5.00 2.20 2.64.00 Value 17.25 15.75 0.19 41.87 4	Average costs stores, com/Vietnam/gasoline_pices/ Average price per KWH in 2016: https://wds.com.vn Average NPK_pices from HH intervies Notes From household survey data From household survey da																		
P M		L Vinter										¥	_									
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Tepper Monterio	D by Year De		,	3	4	5	6	,	я	q	10	п	` ₽	13	14	T i	16	77	19	19	20	Tatal
			-	-	•	-	-			,		-	-	-		-	~	-		2	-	
System Establishe	NCOV																					
Activities																						
Land Perparation																						
Land clearing Filmed falser	II.		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Pamily Mor	FL FL	5.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.6
Tilling																						
Einsellaber	PE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Family labor Discission holes	PC	13.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.5
Hinydalor	PE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Family labor	FC	5.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.9
Pole instillation																						
Eiredlabor	PC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Inisation when	•	, , ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	<u></u>
Eired.kbor	FC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Family labor	PE	1.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.3
Pleating																						
Einedlabor	PC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Pamily Mor	PE	7.56	0.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.5
Vine training	_																					
Earediator	PE PE	0.00 1090	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Manure application.			2.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Hiredlabor	PE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Family labor	PC	3.78	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41
NPK application Higgs Islaw	187	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
Pamily labor	PE	3.78	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41
Instants																						
Courdants	lo lo	1,215.00	121.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1,336 '
NPK.	-6 kg	21.60	216	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.7
View	-	600.00	60.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	660.0
Crop Management	I.																					
Activities																						
Inigation																						
Einedikber	PC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Pannity taken Postilator and action	HL.	19.44	19.44	19.44	19,44	19.44	19.44	19.44	19.44	19.44	19,44	19.44	19.44	19,44	19.44	19.44	19,44	19.44	19.44	19,44	19.44	3291.8
Einedlabor	PE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Panily labor	PC	6.21	6.21	6.21	6.21	6.21	6.21	6.21	6.21	6.21	6.21	6.21	6.21	6.21	6.21	6.21	6.21	6.21	6.21	6.21	6.21	124.2
Pesticide application																						
Finesthilter Family block	PC	177	1.00	1.00	1.72	1.77	1.00	1.72	1.00	1.00	1.72	1.00	1.00	1.72	1.00	1.00	1.72	1.00	1.00	1.77	1.00	24.3
Herbicide application																_						
Rivedkbor	PC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Pannily Inform	PD	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	10.8
Proving Direct Inform	H.		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Family labor	PE	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.0
Vine training																						
Rineellabor	PE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Family Idea Wheelson	PC	0.00	10.80	1.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.8
Rinedlabor	PC	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
R'annily falses	PE	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	20.25	405.0
Imputs																						
Rectricity (migation)	kul	h 1,652.40	1,652.40	1,652.40	1,652.40	1,652.40	1,652.40	1,652.40	1,652.40	1,652.40	1,652.40	1,652.40	1,652.40	1,652.40	1,652.40	1,652.40	1,652.40	1,652.40	1,652.40	1,652.40	1,652.40	33,048L
NPK	19 1	0.00	540.00	540.00	540.00	540.00	540.00	540.00	540.00	540.00	540.00	540.00	540.00	540.00	540.00	540.00	540.00	540.00	540.00	540.00	540.00	10,260.
Besticide	*6 lite	n 0.00	1,040.00	1,080.00	1,040.00	1,040.00	1,040.00	1,040.00	1,040.00	1,040.00	1,040.00	1,040.00	1,040.00	1,040.00	1,040.00	0.81	1,040.00	1,040.00	1,040.00	1,040.00	1,040.00	16.3
Heatricide	liter	en 0.00	135	1.35	135	1.35	1.35	135	1.35	1.35	1.35	135	1.35	1.35	1.35	1.35	135	1.35	1.35	135	135	Z5.6
Gescline (matarbike)	liter.	a 13.80	13.89	13.89	13.80	13.89	13.89	13.89	13.89	13.89	13.80	13.89	13.80	13.80	13.89	13.80	13.89	13.89	13.89	13.89	13.89	277.3
L'ENGACIÓN MUNIT MUNICI	zaug																					
Activities																						
Hausent			0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00		0.00	0.00	0.00	
Family later	HL.	. 0.00	0.00	26.67	33 33	10.00 13.33	66.67	67.75	87.67	98.02	110 10	69.29	111 28	94.77	104.09	128.27	81.00	72.90	65.61	59.05	53.14	1.371.5
																						•
Commercialization	a																					
Activities																						
Marketing																						
Pannily Inform	PE	2.70	2.70	2.70	2.70	2,70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	2.70	270	2.70	2.70	2.70	2.70	56.0
rann an ngement Family hity -	187	1 s.m	540	5.40	540	5.40	5.40	540	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	5.40	1080
	11	2.00																				
Capital custs																						
Establishment																						
Pole trees		. 300.00	30.00																			
Interation																						
Electric pump		1.00																				1.0
Electrical hookup		1.00																				1.0
Well Socialities	met	ata 108.00																				108.0
-panets Pipes & Hown		L 200														1.00						2.0
		200														2.00						_
management Backnack warner		100									1.00											7.0
Motorbike		L 100									1.00											1.0
Gamy sada		12.00				12.00					12.00					12.00					12.00	60.0
Tap		2.00				2.00					2.00					2.00					2.00	10.0
Shovels		L 4.00									4.00											8.0
Yields																						
Pepper basies	jro/i	ba 0.00	0.00	400.00	500.00	80 0.00	1,000.00	1,016.23	1,315.10	1,470.30	1,651.57	1,024.26	1,669.15	1,271.54	1,561.34	1,934.05	1,215.00	1,093.50	984.15	885.74	797.16	20,578
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	Total Labor																					
	Panily labor PD	125.70	69.90	83.50	89.09	109.09	122.42	123.50	145.45	153.77	165.86	124.04	167.03	140.52	159.84	184.03	136.76	128.66	121.37	114.80	108.90	2,572.:
	Total Labor PC	125.70	69.90	83.50	89.09	109.09	122.42	123.50	143.43	153.77	165.86	124.04	167.03	140.52	159.84	184.03	136.76	128.66	121.37	114.80	108.90	2,572.:
Te	tattabar (aystem life) PC mile labor (aystem life) PC	2,572.20																				
1 and 10		- 201200																				

Pepper Monocrop: Central Inputs/Outputs (I/O), by Yea	Highlands, Vie z vaie	inam 1	2	3	4	5	6	7	а	9	10	Year 11	ъ п	в	14	15	16	12	123	15	20
Sectors Firstalls Firstoneset																					
Activities																					
Land Preparation																					
Land dearing Hired labor	USD/PD	0.84	1.00	1.54	1.89	225	107	2.93	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	675	7.10	8.08
Family Idear	USD/PD	0.84	1.00	1.54	1.89	223	1.07	2,93	3.28	3.62	3.97	432	467	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Thing Fired labor	1550/20	0.84	1.00	154	190	2 23	107	2 03	3 28	362	3.07	432	467	5.01	536	571	6.06	640	675	7 10	8.08
Panily Idea:	USD/PD	0.84	1.00	1.54	1.89	225	1.07	293	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Digging holes Elizet labor	USD/PD	0.84	1.00	1.54	1.89	225	1.07	2,93	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	675	7.10	8.08
R'amily Infrac	USD/PD	0.84	1.00	1.54	1.89	225	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Pole instillation. Elinet Jabor	USD/PD	0.84	1.00	1.54	1.89	225	1.07	2,93	3.28	3.62	3.97	432	467	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Family Idear	USD/HD	0.84	1.00	1.54	1.89	225	1.07	2,93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Einvel kiloar	USD/PD	0.84	1.00	1.54	1.89	225	1.07	2,93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	675	7.10	8.08
R'amily labor	DSD/PD	0.84	1.00	1.54	1.89	223	1.07	2,93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Planing Plating																					
Elineri Idhar	USD/FD	0.84	1.00	1.54	1.89	225	1.07	2.93	3.28	3.62	3.97	432	467	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Panily labor Vine training	USD/PD	0.84	1.00	154	1.89	125	1.07	295	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Elinert Jahoar	USD/PD	0.84	1.00	1.54	1.89	225	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Family labor Manure ambigation	USD/PD	0.84	1.00	154	1.99	125	1.07	295	5.28	3.62	5.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Elineri Jabor	USD/PD	0.84	1.00	154	1.89	223	1.07	2,93	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Panily labor NPK ambation	USD/PD	0.84	1.00	154	1.89	225	1.07	293	3.28	3.62	3.97	432	467	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Einert labor	USD/PD	0.84	1.00	1.54	1.89	225	1.07	2,93	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Pannily Idear	USD/PD	0.84	1.00	1.54	1.89	225	1.07	2.95	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Inputs Construction	TWD /hrs	0.0025	0.0075	0.0029	0.0054	0.0054	0.0077	0.00.41	0.0046	0.0050	0.0055	0.0061	0.0049	0.0075	0.0097	0.0001	0.0100	0.0111	0.0477	0.04.35	0.0140
NPK	USD/kg	0.18	0.0425	0.13	0.0051	0.0034	0.16	0.23	0.27	0.32	0.0055	0.0001	0.0002	0.35	0.40	0.55	0.526	0.0111	0.42	0.26	0.14
Seedings	USD /seeding	0.57	0.5720	0.6313	0.6968	0.7691	0.8488	0.9369	1.0340	11412	1.25%	1.3902	1.5344	1.6935	1.8691	2.0629	2.2768	2,5129	2.7735	3.0611	3,3786
Crop Management																					
Activities																					
Impation																					
Hinedikler Famile blev	USD/PD USD/PD	0.84	1.00	154	1.89	223	1.07	293	3.28	3.62	3.97 3.97	432	467	5.01 5.01	5.36 5.36	5.71 5.71	6.06 6.06	6.40 6.40	675	7.10	8.08 8.09
Pentilizer application	0.207110	0.14	200			12	207	1,5	5.26	5,12	237		-0.7	2.04		5.74	0.00	440	u, j	7.20	a ca
Hinred Baber Firmily Islaw	USD/PD	0.54	1.00	15	1.89	223	1.07	2,93	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	640	675	7.10	8.08
Peticide application	0.307115	0.84	200			10	207	1,5	2.46	5.02	237		-207	5.04		5.74	0.00	0.40	475	7.40	8.08
JEineeUkaber Waarite tetera	USD/PD	0.84	1.00	154	1.89	223	1.07	2,93	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Herbicide application	Dab/Hb	0.04	100	1.54	1.80	115	107	193	3.28	3.62	397	411	407	5.01		5.71	6.06	0.40	673	7.10	a.va
Rinedlabor	USD/PD	0.84	1.00	154	1.89	223	1.07	2,93	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Promity Line	DSD/HD	0.34	1.00	154	1.89	115	107	293	3.28	3.62	397	4.52	4.67	5.01	5.26	5.71	6.06	6.40	6.75	7.10	8.08
Rinedlabor	USD/PD	0.84	1.00	1.54	1.89	225	1.07	2,93	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Pamily labor Vine training	USD/PD	0.84	1.00	154	1.89	125	1.07	295	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Hinstlabor	USD/PD	0.84	1.00	1.54	1.89	225	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Family labor Weedno	USD/PD	0.84	1.00	154	1.99	125	1.07	295	5.28	3.62	5.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Hinedlabor	USD/PD	0.84	1.00	1.54	1.89	225	1.07	2,93	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Panily labor	USD/PD	0.84	1.00	1.54	1.89	225	1.07	295	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Imputs Whethinky (minution)	IND /book	0.0151	0.0467	0.0160	0.0166	0.0165	0.0171	0.0177	0.0101	0.0706	0.0777	0.0340	0.0704	0.0316	0.0344	0.0400	0.0446	0.0475	0.0405	0.0400	0.0515
NPK.	DSD/kg	0.18	0.16	0.13	0.19	0.0105	0.16	0.23	0.27	0.32	0.32	0.42	0.63	0.25	0.40	0.55	0.58	0.045	0.43	0.26	0.44
Cow dung	USD / liter	0.0025	0.0025	0.0028	0.0031	0.0034	0.0037	0.0041	0.0046	0.0050	0.0055	0.0061	0.0068	0.0075	0.0082	0.0091	0.0100	0.0111	0.0122	0.0135	0.0149
Herhiede	DSD/liter	3.22	2.86	232	3.44	3.28	3.24	415	4.90	5.79	5.87	7.64	11.39	6.42	7.22	9.93	9.61	8.27	7.78	6.89	8.00
Gædine (notorbike)	USD / liter	0.35	0.35	0.37	0.38	0.36	0.34	0.41	0.48	0.58	0.67	0.74	080	0.84	0.88	1.02	1.15	1.10	1.04	0.94	0.83
Harvest and Processing																					
Activities																					
Havet																					
Eineellaber Femile leber	USD/PD	0.84	1.00	154	1.89	225	1.07	2,93	3.28	3.62	3.97	432	467	5.01	5.36	5.71	6.06	6.40 6.40	675	7.10	8.08
·		0.01	2.00				2.07	1.75			237					3.44	4.04		u., ,	7.40	a.v6
Commercialization																					
Activities																					
Marketing Family labor	1350 (80	0.94	1.00	154	190	2.75	107	205	3 29	3.67	3.07	437	467	5.01	536	5.71	6.06	640	675	7 10	8.09
Parm Management			200													2.74	4.04		4.5		
Panily kbor	USD/PD	0.84	1.00	154	1.89	223	1.07	295	3.28	3.62	3.97	432	467	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Capital costs																					
Establishment																					
Pole tases	DSD/anit	0.64	0.69	0.72	0.71	0.70	0.73	0.76	0. 81	0.88	0.95	1.02	1.26	1.35	1.47	1.75	1.90	2.03	211	2.13	2.20
Irrigation																					
Ristric pump Ristric hashe	USD/cmit	515.78	553.26	576.03	566.18	563.74	585.34	604.18	651.06	704.98	757.05	819.91	1009.44	1080.66	1176.42	1396.14	1523.11	1625.52	1689.86	1704.70	1760.00
wei	DSD/mater	515.78 3.61	553.26 3.87	576.03 4.03	>66.18 3.96	563.74 3.95	5a5.34 410	604.18 4.25	601.06 4.56	704.98 4.93	757.05 5 3 0	a19.91 5.74	2009.44	1080.66 7.56	117642	1496.14 9.77	10.66	1623.52	1649.86	1704170	1/60.00 12.32
Sprinkler View A. K. Stars	USD/canit	10.96	11.76	12.24	12.05	11.98	12.44	1284	13.84	14.98	16.09	17.42	21.45	22.96	25.00	29.67	32.37	34.50	35.91	36.22	37.40
rapes & Hoses	DSD/cmit	90.26	96.82	100.81	99.08	98.65	102.43	105.73	113.94	123.37	13248	143.48	176.65	189.11	205.87	244.33	266.54	28412	295.72	298.32	308.00
Management Backrack warw	135D / comit-	77 37	gr7 00	96.41	84 0 5	gu 54	977 SAN	Ø0.63	07.66	105 75	11356	17700	151.47	167 10	176 44	200.40	709.47	24553	253.49	255 71	364.00
Matanhike	USD/anit	147.85	158.59	165.12	16230	161.60	167.79	173.19	186.63	202.08	217.01	235.03	289.36	309.77	337.22	400.21	436.60	465.39	481.40	488.66	504.51
Gouny sada Tàna	USD/conit USD (conit	0.26	0.28	0.29	0.28	0.28	0.29	0.30	0.33	0.35 0.75	0.38	0.411 0.745	0.50	0.54	0.59 0.59	0.70	0.76	0.81	0.84	0.85	0.88
Shovels	DSD/cmit	1.47	1.57	1.64	1.61	1.60	1.66	1.72	1.85	2.00	215	233	2.87	3.07	3.34	3.97	4.33	4.61	4.80	4.84	5.00
V.D.																					
N	Y10-5- /s																				
repper bemer	DaD/lig	1.82	2.07	2.15	257	235	113	248	2.57	1.66	1.12	297	3.07	2.38	2.85	4.68	6.10	6.17	7.08	8.47	7.04

Pepper Monocrop: Central	Highlands, V	ietnam										Yea	Б								
Inputs/Outputs (I/O), by Yea	r Unit	1	2	3	4	5	6	7	8	9	10	п	12	в	н	ъ	16	17	18	19	20
System Establishment																					
Activities Land Preparation																					
Land clearing																					
El invel.kabor If anniby haboar	МД/РЮ МД/РЮ	17.25	17.25 17.25	17.26 17.25	17.25 17.25	17.25	17.26 17.25	17.26 17.25	17.25 17.25	17.25 17.25	17.25	17.25 17.25	17.26 17.25	17.25 17.25	17.25	17.26 17.25	17.25 17.25	17.26 17.25	17.25 17.25	17.25	17.25 17.25
Time	-		40.00	40.05	40.05		40.00	40.05	40.05	40.00		40.00	40.00	40.00		40.05	40.00	40.05			
E meetadori E amily labor	мј/но мј/но	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Digging holes				477.795																	
F mily labor	мд/но	17.25	17.25	17.25	17.25	1725	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Pole instillation. If involvation	MI/PD	1775	17.25	17.75	17.75	1775	17.75	17.75	17.25	17.25	1775	17.75	17.75	17.25	1775	17.75	17.25	17.75	1775	1775	17.75
Pamily labor	MJ/PD	17.25	17.25	17.26	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.26	17.25	17.25	17.25
Inigation setup El inveltation	MI/PD	1725	17.25	17.25	17.25	1725	17.25	17.25	17.25	17.25	1725	17.25	17 25	17.25	1725	17.25	17.25	17.25	1725	1725	17.25
I' amily labor	мј/РО	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Floating Planting																					
El invel kallen	мј/ро	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Pannity labor Vine training	мј/РО	17.25	17.25	17.25	17.26	17.25	17.25	17.26	17.25	17.25	17.25	17.25	17.26	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
El invedikation	мд/РО	17.25	17.25	17.25	17.25	1725	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
A many stream Mamme application	муль	1/25	1/20	1120	17.25	1745	1/25	1/10	1/20	1120	17.25	1/20	11.15	1/20	1745	1/25	1/10	1120	1/20	1725	1/10
El intel·labor Franily labor	MJ/PD MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.26	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.26 17.75	17.26	17.25	17.25	17.25
NPK application																					
El ineclador Franily labor	м]/РО МІ/РО	17.25 17.25	17.25 17.75	17.26 17.76	17.25 17.75	17.25	17.25 17.75	17.25 17.75	17.25 17.25	17.25 17.25	17.25	17.25 17.75	17.26 17.75	17.25 17.75	17.25	17.25 17.75	17.25 17.75	17.26 17.26	17.25 17.25	17.25	17.25 17.75
I mana																					
Cow dang	мJ/kg	6.71	6.71	6.71	6.71	6.71	6.71	6.71	6.71	6.71	6.71	6.71	6.71	6.71	6.71	6.71	6.71	6.71	6.71	6.71	6.71
NPK.	мј/Lg MT/rime	15.75	15.75 0.10	15.75	15.75 0 10	15.75	15.75	15.75	15.75 0.10	15.75 0.10	15.75	15.75 0.10	15.75	15.75 0.10	15.75	15.75	15.75	15.75	15.75 0.10	15.75	15.75
		0.25	0.25	0.29	0.15	0.19	0.15	0.29	0.25	0.15	0.25	0.15	0.19	0.13	0.25	0.15	0.15	0.25	0.19	0.25	0.25
Caop Management																					
Activities																					
Inigation. Hirediator	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Pannily Jalman	мј/РО	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Penniner application Hireddaloar	мј/но	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Promity fairs:	мј/ро	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Eirediator	мј/ро	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Family labor Harbicity and entities	мј/ро	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Riredlabor	мј/РО	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Parmity latear	мј/ро	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Eiredlabor	мј/ро	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Panily labor Vice training	мј/ро	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Hiredlabor	мј/РО	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Panily later Weeding	мј/РО	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
ElinedJabor	мј/ро	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Pannlykitar	мј/РО	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	1725	17.25	17.25
Exputs Riversieity (misstion)	MI /kwh	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78
NPE	MJ/Kg	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75
Cow dang Penticide	мј/Ig M]/liter	6.71 41.87	6.71 41.97	6.71 41.87	6.71 41.87	6.71 41.87	6.71 41.87	6.71 41.87	6.71 41.87	6.71 41.87	6.71 41.87	6.71 41.97	6.71 41.87	6.71 41.87	6.71 41.87	6.71 41.87	6.71 41.87	6.71 41.87	6.71 41.87	6.71 41.87	6.71 41.87
Herbicile	Mj/liter	41.87	41.87	41.87	41_87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87	41.87
Gasoline (motodnike)	MJ/Mer	3220	32.20	32.20	32.20	3220	32.20	32,20	32.20	\$2.20	3220	32.20	32.20	32.20	3220	32,20	\$2,20	12.20	3220	3220	22.20
Harvest and Processing																					
Activities																					
Harvest Eiredlabor	MI/PD	17.25	17.25	17.26	17.25	17.25	17.25	17.26	17.25	17.25	17.25	17.25	17.26	17.25	17.25	17.26	17.25	17.25	17.25	17.25	17.25
Parmilly Jalman	мј/но	17.25	17.25	17.25	17.25	17.25	17.25	17.26	17.25	17.25	17.25	17.25	17.26	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Commercialization																					
Activities																					
Marketing Franita latera	MI/PD	1725	17.25	17.75	17.25	1775	17.75	17.25	17.75	17.25	1775	17.25	17.75	17.25	1775	17.75	17.25	17.25	1775	1775	17.25
Farm Manzerment																					
I" country halt car	мј/ро	17.25	17.25	17.26	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.26	17.25	17.25	17.26	17.25	17.25	17.25	17.25	17.25
Capital costs																					
Establishment																					
Pole trees	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Irrigation																					
Riestric pamp Riestrical bookup	NA NA	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
We	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sprinkler Fiper & Hoser	NA NA	0.00 0.00	0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00	0.00 0.00	0.00	0.00	0.00	0.00 0.00	0.00 0.00	0.00	0.00 0.00	0.00 0.00
- Management																					
Backpack sprayer	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Motorhike Grunny szeks	NA NA	0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00
Taup	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Shoven	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Yields																					
Pepper benies	мј/ц _е	19.05	19.05	19.05	19.05	19.05	19.05	19.05	19.05	19.05	19.05	19.05	19.05	19.05	19.05	19.05	19.05	19.05	19.05	19.05	19.05

Pepper Monocaop: Central Highla Inputs/Outputs (I/O), by Year	unds, Vietnam Unit	1	2	3	4	5	6	7	8	9	10	Уеал П	п	в	н	ъ	16	17	18	19	20	Total
System Establishment:																						
Activities																						
Land Preparation																						
Land dening Himediation	125128	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.0
R ^a mmily fails a	USDS	4.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.5
11ing																						
Family later	DSDS	11 37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.3
Digging holes	-																					
Elinediation	DSD\$	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Pannly Idea Pale instillation	DSD	5.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	54
Elinediation	DSDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20
Pannily faller	DSDS	6.37	0.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.1
Hinystation	DSDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Panily klow	USIDS	1.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11
Flanting																						
Finaling	125126	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
F annily fallen	USIDS	6.37	0.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.1
Vine training																						
Einsdahen Kamila biter	DSDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	101
Manage application	Contra 1	9.20	2.06	0.00	0.00	0.00	0.00	0.00	400	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Einediator	DSDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10
Pamily kilow	DSDS	3.18	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.
KPK application Filmediation	125126	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Pannily falses	USIDS	3.18	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.5
Incuts																						
Convidance	DSDS	3.06	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.2
NPK	USDS	3.83	0.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.1
Vine	DSD\$	343.20	34.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	377.
Case Manuatory of																						
Activities																						
Rinedlaltar	USDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10
PonityIdear	DSDS	16.38	19.44	29.89	36.65	45.41	20.80	56.92	63.68	70.44	77.20	85.96	90.72	97.47	104.23	110.99	117.75	13451	131.26	138.02	157.08	1,590.
Petilizer application		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Provide Labor	15176	5.25	6.20	0.00	11.71	13.87	6.64	1818	2034	22,50	24.66	26.82	29.99	31 14	33 30	0.00 35.46	37.61	30 77	41.00	44.00	50.18	509.
Peticide application																						
EineelJalzar	DSDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Romity Alter Florinide audioxica	0307	1.02	12	1.87	229	271	130	3.56	3.98	4.40	4.82	5.25	5.6/	6.09	651	6.94	7.36	7.78	8.20	863	9.82	99.4
Eineellaltar	DSDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10
Remity labor	DSDS	0.45	0.54	0.805	1.02	1.21	0.58	1.58	177	1.96	214	2.33	252	271	2.90	3.08	3.27	3.46	3.65	3.83	436	44.1
Paraing Strengthered	10000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Pennity Jahran	DSDS	8.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.4
Vine training																						
Hined Idea	USIDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10
Weeding	0500	0.00	10.80	1.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	124
Rineellabar	DSDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10
PonityIdea	DSDS	17.06	20.25	31,14	38.18	45 <i>2</i> 2	21.67	59.30	66.34	73.38	80.42	87.46	94.50	101.54	108.58	115.61	122.65	129.69	136.73	142.77	163.62	1,67.
Inputs																						
Rhetricity (migsticn)	USDS	34.95	26.76	27.87	27.39	27,27	28.32	29.23	31,49	34,10	36.62	39.66	48.83	52.28	56.91	67.54	75.68	78.54	81.75	82.46	85.14	960.
NPK.	USD\$	0.00	84.96 2.72	68.99 3.00	102.04	97.51	96.20	123.28	145.41	172.00	17438	226.95	338.42	190.58	214.30	294.79	226.33	246.63	231.10	204.77	287.60	3,534
Peticide	USDS	0.00	6.95	5.64	835	7.98	7.87	10.09	11.90	14.07	14.27	18.57	27.69	15.59	17.53	34.12	25.34	20.10	18.91	16.75	19.44	289.
Heriside	DSDS	0.00	3.86	3.14	4.64	443	437	5.60	6.61	7.82	7.93	10.32	15.38	8.66	9.74	13.40	12.97	11.17	10.50	9.31	10.80	160.
Gascline (motorbike)	DSD\$	4,79	4.96	5.07	5.28	5.00	472	5.69	6.67	7.99	9.31	10.21	11.11	11.67	12.22	14.10	15.97	15.21	54.44	12,99	11.53	1991.
Haward and Parenty inv																						
LICENSEN, MILLER PROPERTY HUM																						
Activities																						
Hawet Hinedialtar	DSDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
PanilyIdea	DSDS	0.00	0.00	41.00	62.84	119.09	71,33	198.38	287.21	355.18	437.34	294.90	519.27	425.04	558.06	732.54	490.62	466.90	463.02	419.34	429.40	6,351
Commences in lighting																						
Activities Multities																						
Ponitylatur	USD\$	2.27	2.70	415	5.09	6.03	2.89	7.91	884	9.78	10.72	11.66	12.60	13.54	1448	15.42	16.35	17.29	18.25	19.17	21.82	220.
Pan Mangement																						
Panily labor	DSDS	4.55	5.40	8.30	10.18	12.06	5.78	15.81	17.69	19.57	21.44	25,52	25.20	27.08	28.95	30.85	30.71	54,59	延希	39.34	48.63	40.
Capital costs																						
Fatshickment																						
Pole tases	DSDS	193.42	20.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	ZHL
Testentine																						
Rietric pomp	USID	515.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	515.
Riemial hockup	DSDS	515.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	515.
We	USDS	380.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	389.
apanitier Pipes & Hones	USIDS	21.92 90.26	0.00	0.00 0.00	0.00	0.00	0.00	0.00	0.00 0.00	0.00	0.00 0.00	U.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 244.33	0.00	0.00	0.00	0.00 0.00	0.00	21.5 354.
			0.00	2.00	3.00	3.00	3.00	3.00	100	3.00	3.00	0.00	3.00	0.00	3.00		3.00	0.00	0.00	0.00	3.00	
management Backnack wirzwi	134234	77 37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	113.56	0.00	ը m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7500
Aforetike	USDS	147.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	147.
Georgeach	USDS	3.09	0.00	0.00	0.00	3.38	0.00	0.00	0.00	0.00	4.54	0.00	0.00	0.00	0.00	8.38	0.00	0.00	0.00	0.00	10.56	Z .
T'arn Showsh	0505	0.33	0.00	0.00	0.00	0.36	0.00	0.00	0.00	0.00	0.49	0.00	0.00	0.00	0.00	0.90	0.00	0.00	0.00	0.00	1.13	3.7
and the second s	0.000	0.85	0.00	0.00	0.00	0.00	0.00	0.00	400	0.00	4.60	0.00	J.W	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	HA.
Yields																						
Pepper benden	0505	0.00	0.00	859.85	1,282.78	2,281.84	1,131.00	252264	3,373.95	2,440.55	1,850.42	3,039.58	5,122.13	3,026.77	4,447.20	8,997.44	7,416.85	6,744.71	6,972,31	7,498.54	5,612.02	74,62
					,	,	,	,,	,	,	,	,	,	,	,	, .	,	,	,	,	,	-
Annual Benefits																						
Total annual costs	USDS	2,447.30	25174	342.11	318.97	393.18	276.52	540.00	67686	798.62	1,034.33	848.02	1,728.18	991.43	1,176.61	1,728.02	1,250.45	1,206.59	1,189.39	1,155.95	1,272.18	
A most and not incrute	USD\$	-2,447.30	-255.74	617.74	اه/ عصر، 963,81	1,989.66	854.48	1,982.65	دودرد. 2,697.10	1,641.93	816.09	2,191.56	3,893.95	2,035.33	لم. روسوره 3,270,59	7,269.42	6,166.39	5,53812	5,7 82.9 2	6,342.59	4,339.84	
Annual discounted net benefits	DSDS	-2,447.30	-232.49	510.53	734.12	1,289.98	530.57	1,119.15	1,384.04	765.97	346.10	844.94	1,364.81	648.52	947.37	1,914.26	1,476.19	1,205.26	1,141.12	1,140.77	709.60	

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6,987.03 5.98 1.46 Returns to InnUSD \$/ba must to family MBB\$/PD ally labor/musicat wage cate

Pepper Monocrop: Central H Inputs/Outputs (I/O), by Year	ighlands, V Veix	Vietnam 1	2	3	4	5	6	,	8	9	10	Yean 11	5 12	в	14	Б	16	10	18	в	20	Total
System Establishment																						
Activities																						
Land Preparation Land cleaning																						
Eined.labor	мj	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Panniy kiloar Tilling	M 9	97.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	97.8
Elinesthalscar	Аij	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Digging holes	A9	111.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	60
Einedlabor	МJ VI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Pole instillation.	~	102.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1024
Einedlabor Komite blan	ЪЩ М	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Inigation setup	~	100.41	13.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	inter i
Elinexidadour Frankladour	М <u>ј</u> М	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0 73.7
Finning	~,		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Planting Einediator	м	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	مە
Paunity kiltar	мý	130.41	13.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	145.4
Vine training Hinediator	м	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Promity kaltar	мј	186.30	18.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	204.5
Manue application ElizeUnicor	м	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Promity Ralicar	мj	65.21	652	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	71.7
Einediator	м	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Pannily Release	м	65.21	652	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	71.7
Inputs					0.00			0.00			0.00			0.00								
NPK	мя, мај	8,248.02 340.23	34.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	374.3
V	м	114.00	11.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	125.4
Cop Management																						
Activities																						
Inigation																						
ELineeUlaboar Pizanida kabear	АЛ Л	0.00 33535	0.00 335.35	0.00 335 35	0.00 335.35	0.00 335.35	0.00 335 35	0.00 335.35	0.00 335.35	0.00 335 35	0.00 335.35	0.00 335.35	0.00 335 35	0.00 335.35	0.00 335.35	0.00 335 35	0.00 335.35	0.00 335 35	0.00 335.35	0.00 335.35	0.00 335.35	0.0 6 706.'
Pentilizer application.	7																					-
Rinediabar Pamilylabar	세 제	0.00 107.13	0.00 107.13	0.00 107.13	0.00 107.13	0.00 107.13	0.00 107.13	0.00 107.13	0.00 107.13	0.00 107.13	0.00 107.13	0.00 107.13	0.00 107.13	0.00	0.00 107.13	0.00 107.13	0.00 107.13	0.00 107.13	0.00 107.13	0.00 107.13	0.00 107.13	0.0 2,142.
Penticide application.																						•
Rimeellaloar R'anniky kaloar	세	0.00 20.96	0.00 20.96	0.00 20.96	0.00 20.96	0.00 20.96	0.00 20.96	0.00 20.96	0.00 20.96	0.00 20.96	0.00 20.96	0.00 20.96	0.00 20.96	0.00 20.96	0.00 20.96	0.00 20.96	0.00 20.96	0.00 20.96	0.00 20.96	0.00 20.96	0.00 20.96	0.0 409.1
Herbicide application.				0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00		0.00			0.00	0.00		0.00	0.00	
Panily labor	м, М	9,32	9,32	9,322	9,32	9.32	9.52	9,32	9,32	9.32	9,32	9,32	932	9,32	9,52	9,32	9,32	9,52	9,322	9,322	9,52	186.3
Proming Disord Inform	147	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Panily labor	му Му	172.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	172.5
Vine training Filing Information	ы	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
It's milly fails at	м, м,	0.00	186.30	18.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	204.5
Weeding Hined labor	м	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
Promity Referen		349.32	349.32	349.32	349.32	349.32	349.32	349.32	349.32	349.32	349.32	349.32	349.32	349.32	349.32	349.32	349.32	349.32	349 32	549.32	349.32	6,986/
Inputs																						
Electricity (migation) NPF	М <u>ј</u> М	17,820.58 0.00	17,820.58 8 50 5 81	17,820.58 8 505 81	17,820.58 8 505 81	17,820.58 8,505,81	17,820.58 8 505 81	17,820.58 8,505.81	17,820.58 8 505.81	17,820.58 8 505 81	17,820.58 8 505.81	17,820.58 8,505,81	17,820.58 8 505 81	17,820.58 8.505.81	17,820.58 8,505,81	17,820.58 8,505,81	17,820.58	17,820.58 8,505,81	17,820.58 8 505 81	17,820.58 8 505 81	17,820.58 8 505.81	356,411. 161,610
Cow dung		0.00	7,242.69	7,242.69	7,242.69	7,242.69	7,242.69	7,242.69	7,242.69	7,242.69	7,242.69	7,242.69	7,242.69	7,242.69	7,242.69	7,242.69	7,242.69	7,242.69	7,242.69	7,342.69	7,242.69	137,611.
Pestizide Herbicide	мј М	0.00	33.91 54.52	33.91 56.52	33.91 56.52	33.91 56.52	33.91 56.52	33.91 56.52	33.91 56.52	644.2 1.073.1												
Gescline (motoshike)	мý	447.22	447.22	467.22	467.22	447.22	417.22	467.22	447.22	467.22	467.22	467.22	447.22	467.22	447.22	447.22	447.22	417.22	467.22	447.22	417.22	8,944
Harvest and Processing																						
Activities																						
Harvest																						
Elined Jabar Franklik Jabar	ЪЩ МГ	0.00	0.00	0.00	0.00	0.00 970.07	0.00	0.00	0.00 1 517.40	0.00	0.00	0.00	0.00 1919 SR	0.00	0.00 1 79547	0.00	0.00	0.00 1 757 56	0.00	0.00	0.00 916 76	0.0 73.666.
Commercialization	-							·,						·,·		-	·		· · · · ·	·,		
Madering																						
Panily labor Pana Marzaanar	м	46.58	46.58	46.58	46.58	46.58	46.58	46.58	46.58	46.58	46.58	46.58	46.58	46.58	46.58	46.58	46.58	46.58	46.58	46.58	46.58	931.5
Pamily labor	м	93.15	93.1 5	93.15	93.15	93.15	93.15	93.15	93.15	93.15	93.15	93.1 5	93.15	93.15	93.1 5	93.15	93.1 5	93.1 5	93.15	93.1 5	93.15	1,863.6
Capital costs																						
Estab lishment																						
Pole mees	NA																					
Inigation																						
Electric pump Electrical bookup	NA NA																					
We	NA																					
Sprinkler Finen & Honen	NA NA																					
Management																						
Backpack sprayer	NA																					
Motorbike Gunny racky	NA NA																					
Taga	NA																					
Shoveh	NA																					
Yields																						
Pepper berries	м	0.00	0.00	7,620.34	9,525.43	15,240.68	19,050.85	19,359.98	25,053.71	28,010.42	31,463.88	19,512.94	31,798.80	14,725.8 7	29,743.00	36,654.80	25,146.78	20,832.10	18,748.89	16,874.00	15,186.60	392,047.
Assessed Discourse 10-1																						
Total annual energy inputs	м	29,038.35	36,172.82	35,547.18	35,64 3 .55	35,988.56	36,218.56	36,237.23	36,580.94	36,759.42	36,967.89	36,246.46	36,988.11	36,530.84	36,864.01	37,281.25	36,465.82	36,326.09	36,200.34	36,087.16	35,985.29	
Total annual energy outputs	хij	0.00	0.00	7,620.34	9,525.43	15,240.68	19,050.85	19,359.98	25,053.71	28,010.42	31,463.88	19,512.94	31,798.80	34,225.87	29,745.00	36,654.80	25,146.78	20,832.10	18,748.89	16,874.00	15,186.60	
American and carry output	~	-197039132	-35,17232	-21,926,84		-20,/47,33	-17,167.71	-10,877.24	-11,52722	-a, 749.00	-0,204.01	-16,73352	-3,09.31	06.97 ھر 22-	-7,121.01	-646.45	-19.04	-12,-02,00	-17,401.44	15. נח קש-	-20,798.69	
Net energy input (system. Net energy output (system. KBO)	lare) Auf 168) Auf 1	720,129,97 392,047.09 0.54																				

Appendix 2.4: Pond aquaculture, Central Highlands, Vietnam

	CONTEXT AND POLICY SETT	ING FOR LU	S ANALYSIS	
System	Location	Sya	tem life	
Mixed-culture aquacult	CH, Vietnam		20	
Magroagonomia Context	Itam	Unite	Value	Notes
Macroeconomic Context	Inflation rate	%	0.1037	Mean inf. Rate 2006-2014
	-			
Conversions	Item VND to USD	Units	Value 0.000044	Notes Mine-17
	MJ to keal		238.845800	
	keal to MJ		0.004187	
Policy Setting	Item	Units	Value	Notes
	Discount Rate		aı	
Agroaconstan Satting	Itam	Unite	Value	Notes
Goes plot	Plot size	ha	01	110/08
	Perrenial	months	Jan-dec	
Pond	Pond area Pond depth	ha m	2	
	Pond volume	m3	1	
	Stocking rate	months	4	Among 250 ks (a modern d modern d modern
	Stocking donsity	~g kg./m3	250	Associal 2.45 kg hy particulation every without
				•• -
Production System	Item	Units	Value	Notes
	Spatial Scale of LUS Operation/Evaluation	hectares	0.6	Pond and grass plot
	Timeframe of LUS Operation/Evaluation	years	20	
	Previous land use Plot distance to home	meters	10	
	Seeding rate (grass plot)	kg seed/ha	10	
Variety & avageted wight	Item	I Inite	Value	Notes
ratiety of expected yield	VA06, Year 1-4	MI'/ba	100	VA-06 hybrid (conservative yield estimate)
	replant year 4			
Socioeconomic Context	Item	Units	Value	Notes
Context	Landtonm	0.003	Owned	
	Household structure		<	
	Limits on capital Market access		for small tarmers	
	Contracts		none	
	Technology availability	h	bigh 7	
	Other (market) institutional factors?	DEC LADES	3	
	Other (non-market) institutional factors?			
Labor	Item	Units	Value	Notes
2000	Service fee - exervator	USD/mh	11.73	From household survey data
	Kameters to from plot/year	kalimeters	01	Plot and pond at house location
	Opportunity cost of HIII labor	USD/PD	-96	Assumes 100 mpg fuel efficiency Based on daily farm labor wage rates gathered during HH interviews
Input prices (2016) Pond	Item Fry	Units USD/ke	Value 1.76	Notes Multi-trophic mix of species, average cost = 40.000/kp (typical from all surveys)
	Grass	USD/kg	0.044	Assume a low-value feed price of 1000 VND/kg
	Industrial feed	USD/kg	0.484	Typical feed costs is 11,000/kg
	Variable Pond cleaning chemicals	USD/kg USD/umit	13.2	
Genes plot	Seed	LSD/kg	6.6	10 kg/ha/yr; replant every 4 years
Other	Gascline Electricity (2016)	USD/lister	0.8316	From www.globalpetrolprices.com/Vietnam/gasoline_prices/ America price per KWH is 2016 https://why.com/m
	NPK (grass plot)	USD/kg	0.44	Average NPK prices from IIII intervies
	-			•
Output prices (2016)	Item Fah	Units USD/KG	Value 1.98	Notes
Stocking cycle	Item	Units	Value	Notes
	1.4000 Species		7	
	Harvest cycle	cycles/yr	3 3	Multi-trophic mix of species, average cost = 40,000/kg (typical from all surveys) Harvest 3 times /yr
	Harvest cycle Fry stocked/cycled	eyedes/yr kg	3 3 250	Molti trophic mix of species, average cost $\equiv 40,000/{\rm kg}$ (typical from all surveys) Harvest 3 times/yr
	Harvest cycle I ^r ty stucket/cycled Fush harvested/cycle	anura cyceles/yr kg kg	3 3 250 1150	Molte trophic mix of species, average cost = 40,000/kg (typical from all surveys) Harvest 3 times/yr
Capital costs (2016)	Harvest cycle Fry stockæt/cycled Fesh harvested/cycle Item	oura cycles/yr kg kg Units	3 3 250 1150 Value	Malte trophic mix of species, average cost = 40,000/kg (typical from all surveys) Harves 3 times/yr Notes
Capital costs (2016) Pcod	Harvesi eyele Fry standael/cycled Fels harvenieel/cycle Item Hired labor (aclading, backboe) Seillwore	eum cycks/yr kg kg Units USD/PD	3 3 250 1150 Value 6.60 2.200 00	Malti trophic mix of species, average cost = 40,000/kg (typical from all surveys) Harvest 3 times/yr Notes From hom-chold survey data from hom-chold survey data
Capital costs (2016) Pond	Harvesi cycle Fry stucked/cycled Fels harvested/cycle Hiem Hierd labor (occloding backhoe) Spillway Cement	entra cycles/yr kg kg Units USD/PD USD/voit USD/kg	3 3 250 1150 Value 6.60 2,200.00 2.20	Malti trophic mx of species, average cost = 40,000/kg (typical from all surveys) Harvest 3 times/yr Notes Fromhouehold wavey data Fromhouehold wavey data Fromhouehold wavey data
Capital costs (2016) Pcod	Harvest cyclet Fry stacked/cyclet Fish harvested/cycle Item Hared labor (actuding backhoe) Spillway Coment Rocka	enn cycles/yr kg kg Units USD/PD USD/PD USD/aait USD/kg USD/m3	3 3 250 1150 Value 6.60 2,200,00 2,200,00 2,200 2,20 2,20	Malti trophic mix of species, average cost = 40,000/kg (typical from all surveys) Harvest 3 times/yr Notes Fromhouehold wavey data Fromhouehold wavey data Fromhouehold wavey data Fromhouehold wavey data
Capital costs (2016) Pead	Harvesi eyele Fry stocked/cycled Fels harvested/cycle Item Hared labox (acloding backboe) Spillway Comeat Rocks Strel Metarchike	entra cycles/yr kg kg USD/PD USD/PD USD/asi USD/kg USD/kg USD/kg	3 3 250 1150 Value 6.60 2,200.00 2,20 2,20 2,20 2,20 2,20 2,20	Molis trophic max of spoces, average cost = 40,000/kg (typical from all surveys) Harvest 3 times /yr Notes Fromhonehold survey data Fromhonehold survey data Fromhonehold survey data Fromhonehold survey data Fromhonehold survey data Fromhonehold survey data
Capital costs (2016) Pood Other	Harvesi cycle Fry stuckad/cycled Fesh harvented/cyclen Hired labor (occluding, backhoe) Spillway Cerneot Gerneot Strel Motorbike Tarpa	entra cycles/yr kg kg USD/PD USD/asi USD/asi USD/kg USD/moturbile USD/moturbile	3 3 250 1150 Value 6.60 2,200.00 2,20 2,20 2,20 2,20 2,20 2,20	Molts trophic mix of spoces, average cost = 40,000/kg (typical from all surveys) Harvest 3 times/yr Notes Frombounchold survey data Frombounchold survey data Frombounchold survey data Frombounchold survey data Frombounchold survey data Frombounchold survey data Frombounchold survey data
Capital costs (2016) Pood Other	Harvesi eyele Fry stacked/cycled Felsh harvested/cycle Hired labor (ocloding backboe) Spillway Comont Rocks Strel Mosterielle Mosterielle Stary Sharvel	entra cycles/yr kg Units USD/PD USD/aoit USD/kg USD/maturbike USD/kaye USD/showel	3 3 250 1150 Value 6.60 2,200.00 2,20 2,20 2,20 2,20 2,20 2,20	Molts trophic mix of species, average cost = 40,000/kg (typical from all surveys) Harrest 3 times /yr Notes Prombonshold survey data Frombonshold survey data
Capital costs (2016) Posd Other	Harvest eyele Fry stanked/cycled Fish harvested/cycle Hined labor (occlodiog, backhoe) Spillway Carnon t Kneks Strel Netschike Tarpa Sharvel Purap (faura pasel)	estra cycles/yr kg kg USD/pD USD/pD USD/pD USD/kg USD/rasturbike USD/rasturbike USD/rasturbike USD/rasturbike	3 3 250 1150 Value 6.60 2,200.00 2.20 2.20 2.20 2.20 2.20 504.51 0.56 5.00 7.00	Molts trophic mox of species, average cost = 40,000/kg (typical from all surveys) Harvest 3 times /yr Notes Fromhousehold survey data Fromhousehold survey data
Capital costs (2016) Pood Other Energy values	Harvest eyde Fry stacked/cycled Feds harvested/cycle Hierd labor (aclodiog, backhoe) Spillway Carne at Racka Stard Matarbike Tarpa Sharvel Purap (fram post) Item	estra cycles/yr kg tg USD/ab USD/Ab USD/Ab USD/Ab USD/Ab USD/Abwel USD/Abwel USD/abwel USD/abwel	3 3 250 1150 Value 6.60 2,200.00 2,20 2,20 2,20 2,20 2,20 2,20	Mella trophe mx of sposes, sverage cost 40,000/kg (typical from all surveys) Harvest 3 times /yr Notes Fromhonehold survey data Fromhonehold survey data
Capital costs (2016) Pood Other Energy values lopets	Harvest eyde Fry stucked/cycled Feds harvested/cycled Feds harvested/cycle Hinsd labox (acloding, backhoe) Spilkway Carne ot Carne ot Carne ot Rocks Strel Motarchike Tarpa Shavel Puop (fram pose) Hem Horma Labor NEW	estra cycles/yr kg tg Units USD/PD USD/PD USD/PD USD/raai USD/raai USD/raathelike USD/shared USD/shared USD/shared USD/shared USD/shared	3 3 250 1150 Value 6 60 2,200 00 2,20 2,	Mella trophic mix of species, average cost = 40,000/kg (typical from all surveys) Harvest 3 times /yr Notes Fromhonebald survey data Fromhonebald survey data
Capital costs (2016) Pood Other Energy values Inputs	Harvesi cycle Fry stuckad/cycled Fesh harvested/cyclen Hired labor (ocluding, backhoe) Spillway Cement Rocks Steel Misterielle Tarps Shovel Purge (inum puest) Item Hurmo Labor NPK Industal feed	entra cycles/yr kg tag Units USD/PD USD/Anåt USD/raå USD/raå USD/rað USD/rabevel USD/shevel USD/shevel USD/farp USD/farg USD/fabevel USD/farg USD/fabevel	3 3 250 1150 Value 6.60 2,200.00 2,200.00 2,20 2,20 2,20 2,20	Molis trophic mix of species, average cost = 40,000/kg (typical from all surveys) Harvest 3 times /yr Notes Franchounchold survey data Franchounchold survey data
Capital costs (2016) Pead Other Energy values Inputs	Harvesi cycle Fry stacked/cycled Feish harvested/cycle Hired labor (ocloding backhoe) Spillway Coment Kocks Strel Mosteriale Mosteriale Stred Parage (fram pose) Hem Horman Labor NPK Industral feed Fry	entra cycles/yr kg kg Units USD/PD USD/rad USD/rad USD/rad USD/rad USD/rad USD/shavel US	3 3 250 1150 Value 6.60 2,200.00 2.20 2.20 2.20 2.20 2.20 2.20	Molis trophic mix of species, average cost = 40,000/kg (typical from all surveys) Harrest 3 times /yr Notes Frombonshold survey data Frombonshold survey data
Capital costs (2016) Pood Other Energy values Inpets	Harvesi cycled Fry stocked/cycled Feish harvesieed/cycled Hens Harvesieed/cycle Hens Harvesieed/cycle Cannoa Cannoa	estra cycles/yr kg kg Units USD/pD USD/pD USD/kg USD/rastrobike USD/rastrobike USD/sharel USD/sharel USD/sharel USD/sharel USD/sharel USD/sharel	3 3 250 1150 Value 6.60 2,200.00 2,20 2,	Molts trophic mox of species, average cost = 40,000/kg (typical from all surveys) Harress 3 times /yr Notes Fromhonshold survey data Fromhonshold survey data
Capital costs (2016) Pood Other Energy values Inputs	Harvest eyele Fry stocked/cycled Feish harvested/cycle Hired labor (occlodiog, backhoe) Spilway Cornent Kreks Strel Notorbike Tarpa Shorel Pump (from poss) Hem Hornon Labor NPK Industral feed Fry Grass socil Vinucake	entra cycles/yr kg tg Units USD/AD USD/AD USD/Ag USD/rastrbike USD/rastrbike USD/rastrbike USD/rastrbike USD/rastrbike USD/rastrbike USD/rastrbike USD/rastrbike USD/rastrbike USD/skavel USD/skavel USD/skavel	3 3 250 1150 Value 6.60 2,200,00 2,20 2,	Mello trophe mx of spoces, average cost 40,000/kg (typical from all surveys) Harvest 3 times /yr Notes Fromhounehold warvey data Fromhounehold warvey data Notes
Capital costs (2016) Pood Other Energy values Inputs	Harvest eydel Fry stucked/cycled Feds harvested/cycle Hend Hend Hend labor (oclodiog backhoe) Spillway Carne ot Rocka Strel Matorbile Tarpa Sharvel Matorbile Tarpa Sharvel Matorbile Tarpa Sharvel Matorbile Tarpa Sharvel Natorbile Tarpa Sharvel Natorbile Tarpa Sharvel Natorbile Tarpa Sharvel Natorbile Tarpa Sharvel Natorbile Tarpa Sharvel Natorbile Tarpa Sharvel Natorbile Tarpa Sharvel Natorbile Tarpa Sharvel Natorbile Tarpa Sharvel Natorbile Tarpa Sharvel Shar	estra cycles/yr kg tg Units USD/PD USD/AD USD/AD USD/kg USD/showd USD/showd USD/showd USD/showd USD/showd MJ/kg MJ/kg MJ/kg MJ/kg MJ/kg MJ/kg MJ/kg	3 3 250 1150 Value 6 660 2,200,000 2,201 2,	Mells trophic mix of species, average cost = 40,000/kg (typical from all surveys) Harvest 3 times /yr Notes Fromhon-dodd survey data Fromhon-dodd
Capital costs (2016) Pood Other Energy values Inputs	Harvesi cycle Fyr stockad/cycled Fesh harvested/cyclen Hired labor (oclosing backhoe) Spillway Cerneat Rocks Steel Notscielale Tarps Skovel Purge (fram poss) Hem Hurman Labor NPK Indostral feed Fry Grass seed Vinusike Poud (kasning chemicals Muchine (hackbox) Gauskie	entra cycles/yr kg tg Units USD/PD USD/PD USD/ra USD/ra USD/ra USD/ratorbike USD/stored	3 3 250 1150 Value 6.60 2,200,00 2,20 2,20 2,20 2,20 504:51 0.56 5.00 7.00 Value 17.25 15.75 7.70 Value 17.25 15.75 7.70 186,57 7.18 87.93 140.91 140.91 161.00 32,20	Molis trophic mix of species, average cost = 40,000/kg (typical from all surveys) Harvest 3 times /yr Notes Franchoundhold survey data Franchoundhold survey
Capital costs (2016) Pood Other Energy values hopets	Harvesi eyele Fiy stocked/cycled Fish harvested/cycle Tiem Tiem Grans Gradi labor (oclodiog backboe) Spillway Comeat Kocks Strel Mosteriale Tarps Shored Parag (form pose) Tiem Horman Labor NPK Indestaal feed Fry Grass Grass Grass Grass Grass Grass Michien (backboe) Grandion Blochoity	entra cycles/yr kg kg USD/PD USD/PD USD/kg USD/kg USD/kbwel USD/kbwel USD/kbwel USD/kbwel USD/kbwel USD/kbwel USD/kbwel USD/kbwel USD/kbwel Mj/kg Mj/kg Mj/kg Mj/kg Mj/kg Mj/kg Mj/kg	3 3 250 1150 Value 6.60 2,200.00 2,20 2,	Molis trophic mix of species, average cost = 40,000/kg (typical from all surveys) Harrest 3 times/yr Notes Frombouchold survey data Frombouchold survey data Frombouch and Frombouch Frombouchold survey data Frombouchold su
Capital costs (2016) Pood Other Energy values Inpots	Harvesi eyele Fry stocked/cycled Fry stocked/cycled Feish harvesteed/cycle Heem Hired labor (ocloding backhoe) Spillway Como at Rocks Strel Notarci labo Rocks Strel Notarci labo Notarci labo Notarci labo Notarci labo Notarci labo NPK Industrial feed Fry Grass Grass Grass Grass Grass Virueide Pond cleaning chemicals Michien (backhos) Gastine Electricity Grass	estra cycles/yr kg kg USD/ab USD/PD USD/st USD/ra USD/ra USD/raturbike USD/raturbike USD/sharel USD	3 3 250 1150 Value 6 60 2,200,00 2,20 2,00 2,20 10,78 2,20 2,00 2,20 2,00 2	Mello trophe max of species, average cost 40,000/kg (typical from all surveys) Harvest 3 times /yr Notes From homoshold survey data From homoshold survey homoshold survey From homoshold survey homoshold survey From homoshold survey homoshold survey From h
Capital costs (2016) Pood Other Energy values Inputs Outputs	Harvesi eyele Fry stocked/cycled Fry stocked/cycled Feish harvesiee//cycle Hem Hord labor (occlodiog, backhoe) Spillway Corneat Kreks Sirel Notarbike Tarpa Sharvel Notarbike Tarpa Homan Labor NPK Indenstaal feed Fry Grass Grass aced Vinusike Pound cleaning chemicals Machine (backhoe) Grass Fash Fash Fash Fash Fash Fash Fash F	entra cycles/yr kg tg Usits USD/fD USD/fa US	3 3 250 1150 Value 6 60 2,200,000 2,201 2,205 2,755 7,700 166,577 7,78 8,679 3,160 2,200 10,78 3,200 10,78 7,18 11,600 3,2200 10,78 7,18 140,911 140,91	Mella trophe mor of species, average cost = 40,000/kg (typical from all surveys) Harvest 3 times /yr Notes From homehold survey data From homehold survey homehold ho
Capital costs (2016) Pood Other Energy values Inputs Outputs	Harves cycle Fry stockad/cycled Fesh harvested/cycle Harvested/cycle Harvested/cycle Harvested/cycle Harvested/cycle Karles Karl	entra cycles/yr kg tg Units USD/PD USD/A USD/A USD/a USD/rat USD/rat USD/rat USD/showd USD/showd USD/parg USD/showd	3 3 250 1150 Value 6.60 2,200,00 2.20 2.20 2.20 2.20 2.20 2.20	Mells trophic mix of species, average cost = 40,000/kg (typical from all surveys) Harvest 3 times /yr Notes From homohold survey data From homohold survey homohold homohold survey homohold survey homohold survey homohold survey homohold survey homohold homoh
Capital costs (2016) Pcod Other Energy values Inputs Outputs	Harvest cycle Fry stocked/cycled Fesh harvested/cycle Harvested/cycle Harvested/cycle Harvested/cycle Harvested/cycle Harvested/cycle Harvested/cycle Harvested/cycle Notested/fest Harvested/fest Harves	estra cycles/yr kg tg Units USD/PD USD/PD USD/rad USD/rad USD/ratorbike USD/ratorbike USD/ratorbike USD/ratorbike USD/ratorbike USD/ratorbike USD/ratorbike USD/ratorbike USD/ratorbike MJ/kg MJ/kg MJ/kg MJ/kg MJ/kg MJ/kg MJ/kg MJ/kg MJ/kg MJ/kg MJ/kg MJ/kg MJ/kg MJ/kg MJ/kg MJ/kg MJ/kg MJ/kg	3 3 250 1150 Value 6.60 2,200,00 2,20 2,21 2,21 2,21 2,21 2,21 5,04,51 0,56 5,00 7,00 Value 17,25 15,75 7,70 186,57 7,70 186,57 7,70 186,57 7,78 87,93 140,91 161,00 32,20 10,78 7,18 140,91 140,91 140,91 Value Value Value 7,78 7,74 7,78 7,74	Mells trophic mix of species, average cost = 40,000/kg (typical from all surveys) Harvest 3 times /yr Notes Franchounehold survey data Franchounehold survey
Capital costs (2016) Pood Other Energy values Impets Outputs	Harvesi cycle Fyr stocked/cycled Feish harvested/cycle Tiem Hirod labor (oclodiog backhoe) Spillway Coment Rocks Strel Mosterielle Mosteri	entra cycles/yr kg kg USD/PD USD/PD USD/kg USD/kg USD/kbwel USD/fam USD/fam USD/fam USD/fam USD/fam USD/fam USD/fam Mj/kg Mj/kg Mj/kg Mj/kg Mj/kg Mj/kg Mj/kg Mj/kg Mj/kg Mj/kg Mj/kg Mj/kg	3 3 250 1150 Value 6.60 2,200,00 2,20 2,21 2,21 2,21 2,22 2,23 2,24 5,05 7,00 Value 17,25 15,75 7,70 186,57 7,18 87,93 140,91 161,00 32,20 10,78 7,18 140,91 16,00 10,78 7,18 140,91 16,60 191 Value	Mells trophic mox of spocies, average cost = 40,000/kg (typical from all surveys) Harrest 3 times/yr Notes Framhounchold survey data Framhounchold s
Capital costs (2016) Pood Other Energy values hepots Outputs	Harvesi cycled Fry stocked/cycled Feish harvesteed/cycled Feish harvesteed/cycle Hired labor (excludiog backhoe) Spillway Common Common Spillway Common Common Common Spillway Rocks Strel Motare File Tarps Shoved Parag (from pass) Hem Horman Labor NPK Indential feed Fry Grass Grass Grass Secol Viruside Poret cleaning chemicals Michien (backhos) Gaastine Electricity Grass Fesh Nether Strel Nether Strel Shoved Nether Strel Strel Nether Strel Strel Nether Strel Nether Strel	estra cycles/yr kg kg Units USD/ab USD/Ab USD/kg USD/fay USD/fay USD/fay USD/fay USD/fay USD/fay USD/fay USD/fay Mj/kg Mj/kg Mj/kg Mj/kg Mj/kg Mj/kg Mj/kg Mj/kg Mj/kg Mj/kg Mj/kg Mj/kg Mj/kg Mj/kg	3 3 250 1150 Value 6 60 2,200,00 2,20 2,	Mella trophe max of sposes, svenge cost 40,000/kg (typical from all surveys) Harvest 3 times /yr Notes From homohold survey data From homohold survey homohold homohold survey homohold survey homohold survey homohold surv

Acuaculture: Central High	lands. Vietna	m										Y	-ar									
Inputs/Outputs (I/O), by Yes	a Viiit	1	2	3	4	5	6	7	8	9	10	n	n	13	и	15	16	77	19	19	20	Tetal
System Establishment																						
Gozs plot																						
Activities																						
Land Preparation Land clearing																						
ElicedJabar	PD/ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Digging holes	113/112	50.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	50.00
Elicedalear Panile labor	PD/ha PD/ha	0.00 15.00	0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00	0.00 0.00	0.00 15.00						
Inigation actup	-				0.00																	
Elicedabar Pamily labar	PD/ha PD/ha	0.00 5.00	0.00	0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00	0.00	0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00	0.00 0.00	0.00 0.00	0.00 5.00
Planting Photor																						
ElicedIaltrac	PD/ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Family labor NPK application	PD/ha	20.00	0.00	0.00	20.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00	20.00	0.00	0.00	0.00	0.00	100.00
ElicecUldrar Franklig labour	PD/ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
r anny acres	113/112	200	0.00	0.00	1.00	0.00	0.00	0.00	100	0.00	0.00	0.00	200	0.00	0.00	0.00	200	0.00	0.00	0.00	0.00	
NPK	kg/ha	50.00	0.00	0.00	50.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00	50.00	0.00	0.00	0.00	0.00	Z50.00
Seed	ig/ia	10.00	0.00	0.00	10.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	10.00	0.00	0.00	0.00	0.00	50.00
Pond																						
Activities Fond Construction																						
ElicedIdtar Waada Islaat	PD/ha	30.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	30.00
Transits	113/114	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2010
Backhoe	MH/ba	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.00
Con Management																						
Antipitier																						
Inigation																						
Rinsellahar Pamihylahar	PD /ha PD /ha	0.00 4.00	0.00 4.00	0.00 4.00	0.00 4.00	0.00 4.00	0.00 4.00	0.00 400	0.00 4.00	0.00 4100	0.00 4100	0.00 4.00	0.00 41.00	0.00 4.00	0.00 4.00	0.00 4.00	0.00 4.00	0.00 4.00	0.00 4.00	0.00 4.00	0.00 4.00	0.00 00.00
Petiline application																						
Rureeusura Pannily Jahon	HD/ha HD/ha	0.00 3.00	0.00 3.00	0.00 3.00	0.00 3.00	0.00 3.00	0.00 3.00	0.00 3.00	0.00 3.00	0.00 3.00	0.00 3.00	0.00 3.00	0.00 3.00	0.00 3.00	0.00 3.00	0.00 3.00	0.00 3.00	0.00 3.00	0.00 3.00	0.00 3.00	0.00 3.00	0.00 60.00
Weeting Birediator	PE3 /hrs	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Panily labor	PD/ha	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	12.00	240.00
Inputs																						
Electricity (migation) NPE	kash kg/ba	500.00 50.00	500.00 50.00	500.00 50.00	500.00 50.00	500.00 50.00	500.00 50.00	500.00 50.00	500.00 50.00	500.00 50.00	500.00 50.00	500.00 50.00	500.00 50.00	500.00 50.00	500.00 50.00	500.00 50.00	500.00 50.00	500.00 50.00	500.00 50.00	500.00 50.00	500.00 50.00	10,000.00 1,000.00
Hand Management																						
Politik makungennerik																						
Stocking																						
Eliced Jahrar Plannike Jahrar	PD/ha PD/ha	0.00 18.00	0.00 18.00	0.00 18.00	0.00 18.00	0.00 19.00	0.00 18.00	0.00 18.00	0.00 19.00	0.00 18.00	0.00 18.00	0.00 19.00	0.00 18.00	0.00 18.00	0.00 18.00	0.00 18.00	0.00 18.00	0.00 18100	0.00 18.00	0.00 18.00	0.00 19.00	0.00 360.00
Feeding		1100			1100				1100		11.00	1100		moo	1100		1100			1100		
Einvellahar Pamilylahar	PD/ha PD/ha	0.00 32.00	0.00 32.00	0.00 32.00	0.00 322.00	0.00 322.00	0.00 32.00	0.00 32.00	0.00 32.00	0.00 322.00	0.00 322.00	0.00 32.00	0.00 322.00	0.00 32.00	0.00 32.00	0.00 322.00	0.00 32.00	0.00 32.00	0.00 32.00	0.00 32.00	0.00 32.00	0.00 640.00
Vinacide application Direct Infra-	HED days	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pannily Jalour	PD/ha	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	200	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	40.00
Pond cleaning Hired Idaa	PD /ha	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pannily labor	PD/ha	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17_50	350.00
Inputs			a 600 00	. 600.00	. 600.00				. 500.00	. 600.00			. 600.00									
Gam	kg/m⊥ kg/m⊥	36,000.00	36,000.00	36,000.00	36,000.00	36,000.00	36,000.00	36,000.00	36,000.00	36,000.00	36,000.00	36,000.00	36,000.00	36,000.00	36,000.00	36,000.00	36,000.00	36,000.00	36,000.00	36,000.00	36,000.00	720,000.00
Industrial feed. Vinceide	kg/ba ktors/ba	4,500.00 4.00	4,500.00 4.00	4,500.00 4.00	4,500.00 4.00	4,500.00 4.00	4,500.00 4.00	4,500.00 400	4,500.00 4.00	4,500.00 4.00	4,500.00 4.00	4,500.00 4.00	4,500.00 4.00	4,500.00 4.00	4,500.00 4.00	4,500.00 4.00	4,500.00 4.00	4,500.00 4.00	4,500.00 4.00	4,500.00 4.00	4,500.00 4.00	90,000.00 30.00
Fond dening chemicals	liters/ba	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	120.00
Harvest and Processing																						
Grzes olot																						
Activities																						
Havet																						
Elicedlatear Pamilylatear	PD/ha PD/ha	0.00 18.00	0.00 18.00	0.00 18.00	0.00 18.00	0.00 18.00	0.00 18.00	0.00 18.00	0.00 18.00	0.00 18.00	0.00 18.00	0.00 18.00	0.00 18.00	0.00 18.00	0.00 18.00	0.00 18.00	0.00 18.00	0.00 18.00	0.00 18.00	0.00 18.00	0.00 18.00	0.00 360.00
Pond																						
Activities																						
Havet Bired ktor	1413 Auro	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Pannily Jabon	PD/ha	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	17.00	340.00
Commercialization																						
Activities																						
Matating																						
Pamilylabor Parm Management	PD /hz	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	200.00
Panilylabor	PD/ha	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	400.00
Capital custs																						
Injection																						
Rietnic pump		1.00																				1.00
Rietneal hooksp Pipes & Hoses		1.00																				1.00
Management																						
Backpack sparyer Motorbike		1.00									1.00											2.00
Pand		2.00																				
Spinney	-	1.00																				
Cement Roda	kg/ka m3/ka	2,000.00 5.00																				
Steel	kg/ba	400.00																				
Yields																						
Gum	kg/ha	111,427,42	80,136.61	129,603.02	121,029.42	109,345.91	101,767.59	121,342.66	78,476.87	90,769.39	107,386.53	115,332.51	105,632.31	122,685.13	110,871.90	67,490.98	79,599.16	71,639.28	64,475.22	56,027.79	52,225.01	
Fah	lg/h	7,876.90	7,626.39	7, 196.2 6	6,843.31	7,557. 86	7,566.91	7,853.84	7,573.79	7,052.33	7,309.15	7,75 4.1 0	5,779 <i>9</i> 1	5 <i>,9</i> 36.33	5 <i>,999.19</i>	6,617.10	7,991.43	6,750.33	7,228.31	7,628.38	7,480.08	143,6 71 .90
Total	Labor																					
Panily kit Himed La	xar PD/ha har PD/ha	27450 30.00	153.50 0.00	153.50 0.00	184.50 0.00	153.50 0.00	153.50 0.00	153.50 0.00	18450 0.00	153.50 0.00	153.50 0.00	153.50 0.00	184.50 0.00	153.50 0.00	153.50 0.00	153.50 0.00	184.50 0.00	153.50 0.00	153.50 0.00	153.50 0.00	153.50 0.00	3,315.00 30,00
Total La	bor PD/ba	304.50	153.50	153.50	184.50	153.50	153.50	153.50	184.50	153.50	153.50	153.50	184.50	153.50	153.50	153.50	184.50	153.50	153.50	153.50	153.50	3,345.00
Total Labor (system	linie) PD/ba	3,34 5.00																				
Total famil labor (system	life) PD/hz	3,315.00																				

5.14

Aqua culture: Central High	alands, Vietnam								Year												
Prices (\$USD) by Year	Umit	1	2	3	4	5	6	7	8	9	10	п	n	13	14	15	16	77	18	19	20
System Establishment																					
Grass alot																					
enas por																					
Activities																					
Land Preparation																					
Land deamg			4.00	4.54		775	4.07	1.05	5.00	10	5.07	433	10	6.04		6.74	101	7 10	175	7 40	a 0a
Franklik Kalene	USD (PD	0.84	100	154	190	223	1.07	2,03	3.28	3.62	307	432	4.67	5.01	536	5.71	6.06	640	675	7.10	a.ua 9.09
Dissing boly			200	2.			20.							5.01		5.11	404		4.5		0.00
Elined labor	USD/PD	0.84	1.00	154	1.89	223	1.07	2,93	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Family Moar	DSD/PD	0.84	1.00	154	1.89	223	1.07	2.93	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Inigation as hep																					
Elineel Jaboar	DSD/PD	0.84	1.00	154	1.89	223	1.07	2,93	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Pannily Idea:	USD/PD	0.84	1.00	154	1.89	223	1.07	293	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Planing																					
Plantag	1975 / 1975					2.25		3.05	5.00	10	5.02	433		6.04		6.74		<i>.</i>	6.76	7.40	
Electric Marca	USD/HD	0.64	100	154	190	223	1.07	2.93	3.28	3.62	397	437	10/	5.01	536	5.71	6.06	6.40	6.75	7.10	a.ua 9.09
NPK application	0.20/112	0.04	200		,		2.07	1,0		5.02	237	-54		3.01	5.20	5.74	uou	440	u.))	7.20	0.00
Elined Jabor	USD/PD	0.84	1.00	154	1.89	223	1.07	293	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Pannily Idea:	USD/PD	0.84	1.00	154	1.89	223	1.07	2,93	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
loputs																					
NPK.	USD /kg	0.18	0.16	a 13	0.19	0.16	0.16	0.23	0.27	0.22	0.32	0.42	0.63	0.35	0.40	0.55	0.50	0.45	0.43	0.36	0.44
Seed	USD Ag	1.93	2.07	216	212	211	2.20	2.27	2.44	264	284	3.07	3.79	4.05	4.41	5.24	5.71	6.09	634	6.39	6.60
Pond																					
Antibility																					
Bend Communition																					
Fined labor	150/90	0.84	100	154	1 89	223	1.07	2 93	3 28	362	397	432	467	5.01	536	5.71	6.06	640	6.75	7 10	8.08
Pamily labor	USD/PD	0.84	1.00	154	1.89	223	1.07	2,93	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
- 																					
Batters		5.44	360	544	\$77	\$76	5.00	4.05	454	470	5.05	5.46	675	7.20	7 84	0.50	10.15	10.97	44.34	44.34	44.73
Divine			5.05	2.54	2.77	2.70	2.90	-2.05	1.1	-270	5.05	5.40	u.,,	7.40		9.20	10.15	10.64	11.40	1200	12/3
Crop Management																					
Activities																					
Inizion																					
Hineditabor	USD/PD	0.84	1.00	154	1.89	223	1.07	293	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Pamily labor	USD/PD	0.84	1.00	154	1.89	223	1.07	2,93	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Pentilizer application																					
Hinsellabor	DSD/PD	0.84	1.00	154	1.89	223	1.07	2.93	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Pamily labor	USD/PD	0.84	1.00	154	1.89	223	1.07	2,93	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Weeding																					
Himed Rabor	USD/PD	0.84	1.00	154	1.89	223	1.07	293	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Panniy falser	DSD/PD	0.84	100	154	189	223	1.07	295	3.2	3.62	397	432	4.67	5.01	5.26	5.71	6.06	6.40	6.75	7.10	8.08
Inputs																					
Electricity (inigation)	USD/kseh	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.05	0.05	0.05	0.05
NPK.	Dan /ug	0.18	0.16	0.15	0.19	0.18	0.18	0.25	0.27	0.32	0.52	0.42	0.63	0.35	0,40	0.55	0.53	0.45	0.42	0.38	0.44
Pond Management																					
Activities																					
Stocking	1970 / 197		4.00			225	4.07	2.05	5.00	10	5.07	432	10	6.04		6.74	101	7 10	175	7.40	a 0a
Franke Labor	USD (PD	0.84	100	154	190	223	1.07	2,03	3.28	3.62	307	432	4.67	5.01	536	5.71	6.06	640	675	7.10	a.ua 9.09
Postino			200	2.			20.	1.00			201			5.01		5.11	4.04		4.15		1.04
Rinedkaber	USD /PD	0.84	1.00	154	1.89	223	1.07	2,93	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Pamily labor	USD/PD	0.84	1.00	154	1.89	223	1.07	2.93	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Viruside application																					
Einedlabor	DSD/PD	0.84	1.00	154	1.89	223	1.07	2,93	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Pamily labor	USD/PD	0.84	1.00	154	1.89	223	1.07	293	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Pond cleaning																					
Einedlabor	DSD/PD	0.84	100	154	1.89	223	1.07	293	3.28	3.62	397	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Panniy false	DSD/PD	0.246	100	154	1.89	115	1.07	293	2.0	3.62	397	4.52	4.67	5.01	96. C	5.71	0.00	6.40	¢.\)	7.10	8.08
Inputs																					
Phy	USD Ag	0.52	0.55	0.58	0.57	0.56	0.59	0.60	0.65	0.70	0.76	0.82	1.01	1.08	1.18	1.40	152	1.62	1.69	1.70	1.76
Gazes	USD/kg	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04
Verseich	USD/kg	2.59	277	2.99	293	797	2.05	3.07	3.26	3.57	370	410	5.05	0.30 5.40	5.99	6.09	7.62	947	0.46 6.45	9.57	0.444
Pond cleaning chemicals	USD / liter	3.87	415	432	425	423	4.39	4.53	4.88	5.29	5.68	615	7.57	8.10	8.82	10.47	11.42	12.18	1267	1279	13.20
o																					
Harvest and Processing																					
Grass plot																					
Bauat																					
Hined Ballen	DSD/PD	0.84	1.00	154	1.89	223	1.07	2,03	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Pamily labor	DSD/PD	0.84	1.00	154	1.89	223	1.07	2,95	3,28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Pond																					
Antipitian																					
AN LURDES																					
Haves Hind block	IND (mit	0.94	100	154	190	225	1.07	2.03	5.29	10	3.07	437	10	5.01	5 34	5.71	606	640	6.75	7 10	9.09
Panity kber	USD / mit	0.84	100	154	1,80	223	1.07	203	3,28	3,62	3,07	432	4.67	5.01	536	571	606	640	675	7 10	8.08 8.09
Commercialization																					
Activities																					
Marketing																					
Panniky labore	USD/cmit	0.84	1.00	154	1.89	223	1.07	2.93	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Paras Management																					
Panily labor	DSD/anit	0.84	1.00	154	1.89	223	1.07	293	3.28	3.62	3.97	432	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
0.51																					
Capital costs																					
Inigation																					
Riettic pump	USD/anit	515.78	553.26	576.03	566.18	563.74	585.34	604.18	651.06	704.98	757.05	819.91	1,009.44	1,080.66	1,176.42	1,3% 14	1,525.11	1,625.52	1,689.86	1,704.70	1,760.00
Riettrical hookup	USD/cmit	515.78	553.26	576.03	566.18	563,74	585.34	604.18	651.06	784.98	757.05	819.91	1,009.44	1,080.66	1,176.42	1,396.14	1,525.11	1,623,52	1,689.86	1,704.70	1,760.00
Fipes & Hosen	DSD / anit	462	495	5.16	5.07	5.05	5.24	5.41	5. 83	6.31	6.78	7.34	9.03	9.67	10.53	12.50	13.63	14.53	15.12	15.26	15.75
Management																					
Backpack sprayer	DSD/cmit	77.37	82.99	86.41	84.93	84.56	87.80	90.63	97.66	105.75	113.56	122.99	151.42	162.10	176.46	209.42	228.47	243.53	253.48	255.71	264.00
Matarhike	DSD/amit	147.85	158.59	165.12	162.30	161.60	167.79	173.19	186.63	202.08	217.01	235.03	289.36	309.77	337.22	400.21	436.60	465.39	484.40	488.66	504.51
Pond																					
Spillway	DSD/anit	644.72	691.57	720.04	707.73	704.67	731_67	755 .23	813.83	881.22	94631	1,024.89	1,261.80	1,350.82	1,470.52	1,745.18	1,903.89	2,029.40	2,112.32	2,130.88	2,200.00
Cement	USD Ag	0.64	0.69	0.72	0.71	0.70	0.73	0.75	0.81	0.88	0.94	1.02	1.26	1.35	1.47	1.74	1.90	203	211	2.13	2.20
Rocks	USD/mð	0.64	0.69	0.72	0.71	0.70	0.73	0.75	0.81	0.88	0.94	1.02	1.26	1.35	1.47	1.74	1.90	203	211	2 13	2.20
steel	USD /kg	0.64	0.69	0.72	0.71	0.70	0.73	0.75	0.81	0.88	0.94	1.02	1.26	135	1.47	1.74	1.90	203	211	2.13	2.20
Yields																					
Gaze	USD /kg	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.03	0.035	0.03	0.03	0.04	0.04	0.04	0.04	0.04
rinh	USD Arg	0.39	0.45	0.43	0.61	0.74	0.84	0.93	1.11	1.09	117	114	1.12	1.15	1.45	1.88	1.64	173	1.81	1.90	1.98

Aquacultre: Central Higi Energy Inputs/Outputs (1/)	ilands, Vietnam D), by Yeanie	1	2	3	4	5	6	7	а	9	10	Yea 11	и 12	บ	14	ъ	ъ	17	18	19	20
System Establishment	-,, -, -, -, -, -, -, -, -, -, -, -, -,																				
Grasplot																					
Activities																					
Land Preparation																					
Land cleaning El inted kalter	м]/РО	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	1725	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
F analy labor	мј/но	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Digging holes If intel labor	MI/ID	1775	1775	17.75	17.25	17.25	1775	17.75	17.75	17.75	1775	1775	17.75	17.75	17.25	1775	17.25	17.75	17.75	1775	17.75
P maily labor	мд/но мд/но	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Inigation samp																					
El intel·kallen F anniby kalten	м]/но м]/но	17.25	17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25	17.25 17.25	17.25 17.25	17.25 17.25	1725	17.25	17.26 17.26	17.25 17.25	17.25 17.25	17.25	17.25	17.25 17.25	17.25 17.25	17.25	17.25
Flanting	<i>r</i>																				
Planting El invellabor	MI/PD	1725	1725	17 25	17.25	17 25	1725	17.25	17.25	17.25	1725	1725	17 25	17.25	17 25	1725	17.25	17.25	17.25	1725	17.25
F amily labor	мј/но	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.26	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
NPK application				47.05	an 112	47 75		47.75	477.755	47 . 75			47 75	40.05	47 75		47 75	471.75	47 N.		
F anily ldcar	MU/HD MU/HD	17.25	17.25	17.26	17.26	17.26 17.25	17.25	17.26	17.26 17.26	17.26	17.25	17.25	17.26	17.26 17.26	17.26	17.25	17.25	17.26	17.26	17.25	17.25
Inputs																					
NPK	му/Lg	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75
Seed	мј/ це	87.93	87.93	87.93	87.95	87.93	87.93	87.93	87.93	87.93	87.93	87.93	87.93	87.93	87.93	87.93	87.93	87.93	87.93	87.93	87.93
Pond																					
Activities Fond Construction																					
IELinesel.Ballour	мј/но	17.25	17.25	17.26	17.25	17.25	17.25	17.25	17.26	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
F smilly fabrar	мј/но	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Improts Backhoe	MI/machine br	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00	161.00
		101.00	102.00	101.00	102.00	101.00	101.00	101.00	142.00	101.00	101.00	102.00	ICLO	142.00	101.00	101.00	101.00	10100	102.00	101.00	ILL OF
Cup Management																					
Activities																					
Hinselfabor	MĮ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	1725	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Promity fabrar	мј/но	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Petilizer application Elizad block	MI/ID	1775	1775	17.75	17.25	17.25	1775	17.75	17.75	17.75	1775	1775	17.75	17.75	17.25	1775	17.25	17.75	17.75	1775	17.75
Family labor	мд/но	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Weeding	147/185	4775	4775	477.795	47.75	477.785	4775	47 76	477.755	47.76	1775	1776	477.795	47.75	477.785	4775	477.785	477.755	47.76	4776	47.76
Family fabor	мд/но мд/но	17.25	17.25	17.26	17.26	17.25	17.25	17.26	17.26	17.26	17.25	17.25	17.25	17.26	17.26	17.25	17.25	17.25	17.26	17.25	17.25
Inputs																					
Riectricity (migation)	MJ/kwh	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78	10.78
MPK.	Alij / Hg	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75	15.75
Fond Management																					
Activities																					
Stocking Filing labor:	MI/PD	1775	1775	17.75	17.75	17.25	1775	17.75	17.75	17.75	1775	1775	17.75	17.75	17.75	1775	17.25	17.25	17.75	1775	17.25
Panify labor	м]/но	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Pessing				40.05	40.05	40.05		40.05	40.05	40.05	4885		40.05	40.05	40.05		40.00	40.05	40.05		
Panity labor	мџ/но мџ/но	17.25	17.25	17.26	17.26	17.25	17.25	17.26	17.26	17.26	17.25	17.25	17.26	17.26 17.26	17.26	17.25	17.25	17.26	17.26	17.25	17.25
Vincente application																					
Einedlabor Family labor	мд/но мт/но	17.25	17.25	17.26 17.25	17.26 17.25	17.26 17.25	17.25	17.25 17.25	17.26 17.25	17.25 17.25	1725	1725	17.25 17.25	17.26 17.25	17.26 17.25	17.25	17.25	17.26 17.25	17.26 17.25	17.25	17.25
Foud cleaning																					
ElizedJabor	MJ/PD	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.26	17.25	17.25	17.25	17.25	17.26	17.25	17.25	17.25
I soundly fail to a	му/но	1/20	1/20	1/20	<u>م</u> ـ <i>ب</i> ا	1/_0	1/20	1/20	1/20	1/20	1/20	1/20	1/20	1/20	1/20	1/20	1/20	1/20	<u>م</u> ـ <i>ب</i> ا	17.45	1/20
Pay	мŋ/kg	186.57	186.57	186.57	186.57	186.57	186.57	186.57	186.57	186.57	186.57	186.57	186.57	186.57	186.57	186.57	186.57	186.57	186.57	186.57	186.57
Gaza	м у/I g	7.18	7.18	7.18	7.18	7.18	7.18	7.18	7.18	7.18	7.18	7.18	7.18	7.18	7.18	7.18	7.18	7.18	7.18	7.18	7.18
Industrial feed Vinacide	Мј/Ig M[/Ber	7.70	7.70	7.70	7.70 140.91	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.70	7.70 140.91	7.70
Pour dening chemicals	MJ/liter	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91
Harvest and Processing																					
Grassolot																					
Activities																					
Hawest																					
Hinced Balcar It's unitly Balcar	мд/но мд∕но	17.25	17.25	17.25 17.25	17.25	17.25 17.25	17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25	17.25	17.26 17.26	17.25 17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Pond																					
Activities																					
Hawet																					
Il Linced Ballscar	м]/но мг/ло	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Companyatio	sig/ HJ	11.15	17.25	11.10	1120	010	17.15	1120	11.10	11.10	17.15	1725	17.10	11.10	0.10	17.15	1120	1120	1120	(72)	1710
Commencements																					
Matering																					
Panify habor	мј/но	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25	17.25
Parm Manzgement Parmite latros	MI/PD	1725	1725	17.25	17.25	17 25	1725	17.25	17.25	17.25	1725	1725	17.25	17.25	17.25	1725	17.25	17.25	17.25	1725	17.25
Canital enete																					
Inighter Corne																					
Risetnic pump	NA																				
Riestrical bookup	NA																				
Fipe & Hose	NA																				
Management Backpack mawe	NA																				
Motorbile	NA																				
Pond																					
Spillery	NA																				
Comence Rocks	NA NA																				
Steel	NA																				
Yields																					
Gam),#F/km	7 49	7 19	749	719	7 49	7 49	7 49	749	7 19	7 19	7 19	749	7 19	7 49	7 49	7 19	749	7 19	7 19	744
Fah	- у/ ж Мј/це	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91	140.91

Aquaculture: Central Highlands \$USD, by Year	s, Vietnam Uiit	1	2	3	4	5	6	7	Year 8	,	10	п	п	13	14	ъ	16	T	18	в	20	Tetal
System Establishment																						
Gous plot																						
Activities Land Perparation																						
Landebring		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Panily Mex	1503	42.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4212
Digging holes Final block	1513	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Panity Mor	USDS	12.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.64
English setup Final Max	1513	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Panity Mon	11505	4.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.21
Planting Planting																						
Einedalter	USD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Panity labor NP K. application.	1503	16.85	0.00	0.00	37.71	0.00	0.00	0.00	652	0.00	0.00	0.00	93.33	0.00	0.00	0.00	121.14	0.00	0.00	0.00	0.00	334.54
Eined.labor	125125	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PonityMor	1505	0.34	0.00	0.00	1.89	0.00	0.00	0.00	3.28	0.00	0.00	0.00	4.67	0.00	0.00	0.00	6.06	0.00	0.00	0.00	0.00	16.73
NPK	1505	8.86	0.00	0.00	9.45	0.00	0.00	0.00	13.46	0.00	0.00	0.00	31.34	0.00	0.00	0.00	26.42	0.00	0.00	0.00	0.00	89.53
Seed	USD)	19.34	0.00	0.00	21.25	0.00	0.00	0.00	3441	0.00	0.00	0.00	37.85	0.00	0.00	0.00	57.12	0.00	0.00	0.00	0.00	159.96
Pond																						
Activities Feed Construction																						
Hiredlabar	DED)	Z 5. Z 7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	52
R'amily labor	1503	16.85	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.85
Imputs Baddhoe	USD)	34.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	34.59
6 M																						
Casp management																						
Ingation																						
Hinred Baltrar Manufacto for sec	15125	0.00	0.00 4.00	0.00	0.00 754	0.00	0.00	0.00	0.00 13.10	0.00	0.00	0.00	0.00 19.67	0.00 70.04	0.00 71.45	0.00	0.00 74175	0.00	0.00	0.00	0.00 77 77	0.00
Petilizer application		100	4.00	4.D	1.4	293		11/1	12.10	1440	1.000	0.46	18.67	20.06	4.40			10.02	27.01	24.40		36.23
RiceUdea Paulikkter	USD) USD)	0.00 2.53	0.00 3.00	0.00	0.00 5.64	0.00	0.00 3.71	0.00 9.79	0.00	0.00	0.00	0.00 57 GK	0.00 54.00	0.00 15 M	0.00 % 00	0.00	0.00 19.17	0.00 10 77	0.00 20.24	0.00	0.00 34.34	0.00 245 49
Waring	وانهما	23	3.00	-101	3.00	470	- 11	4.78		20.67	1671		2400	20.04	at 19	4.13	ad 17	44	96 .04	تعلم		2017D
Hierildra Fasikkbra		0.00	0.00	0.00	0.00 77.67	0.00	0.00	0.00	0.00 30 31	0.00	0.00 47.65	0.00	0.00 56.00	0.00 60.17	0.00 64.34	0.00 69.51	0.00	0.00	0.00	0.00	0.00 06.06	0.00
			12.00			2000			20.01		1.0		5400			-	12.00		22.05		7254	
Inputs Maturity (minution)		7.65	a 10		9.20	475	9.57		0.53	10 33	11.09	7 7.00	14.79	15 83	1 7 70	20.44	00.00		34.74	34.05	75.74	780 773
NPK.	1505	8.86	7.87	6.39	9.45	9.03	8.91	11.41	13.46	15.93	16.15	21.01	31.34	17.65	19.84	27,30	26.42	22.74	21.40	18.96	22.00	336.10
Proved Manuagement																						
Activities																						
Stocking																						
Hired Altar Banik hira		0.00 15.14	0.00	0.00	0.00 33.04	0.00	0.00	0.00	0.00 59.07	0.00	0.00	0.00	0.00 94100	0.00 00.75	0.00 06.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Feeding		0.8	14.00	27.68	33,94	40.19	19.16	11/1	34.97	0.11	71.48	11.14	a	301 0	94.14	a LL <i>11</i>	109.05	10.26	1104	117.80		LAIL ST
Hired Altar	USD)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 1.078-01
Panniy kitor Vincicle application	1.51.75	26.96	32.00	40.21	60.39	7140	34,24	93.70	104.85	11295	127.08	138.20	140.39	160.45	17158	1822.70	193.82	204.95	26.07	217.20	258.56	268161
EinerUklear	1505	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Point deming	1503	1.68	200	3.08	3.//	44/	114	0.86	600	ط ،	794	a.64	9.33	10.03	10.22	1142	1211	17.90	13.50	24.20	16.16	10.500
Riccillabor		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ranny stra	150.0	**	17.50	- A91	11,99	39.08	18./3	51.44	57.33	63.41	69.50	/0.08	81.66	87.75	93.85	9991	106.00	112.08	718.17	1410	2452.40	1,43200
Phy	1505	773.67	829.88	864.05	849.27	845.61	878.00	906.27	976.59	1,057.47	1,135.57	1,229.87	1,514.17	1,620.98	1,764.63	2,094.22	2,294.67	2,425.28	2,534.78	2,557.05	2,640.00	29,792.04
Gazes Technotrial food		464.20	407.93 64.65	518.43 213.94	509.56 200.45	507.37	526.80	543.76	585.96	63448	681.34	737.92	908.50 1 340.10	972.59	1,058.78	1,256.53	1,370.90	1,461.17	1,520,87	1,534.23	1,584.00	12,875.22
Vincile	1505	10.32	11.07	11.52	11.32	11.27	11.71	12.08	13.02	14.10	15.14	16.40	20.19	21.61	25.53	17.92	30.46	32.47	33.80	34.09	35.20	377.23
Pourt deming chemicals	12505	33	34.90	25.92	25.48	26.37	26.34	27.19	29.30	31,72	34.07	36.90	45.42	48.63	32.94	62.65	68.54	75.06	76.04	76.71	79.20	893.76
Hawest and Processing																						
Gaus plot																						
Activities																						
Harret Riccilator	1505	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pamilylatea	125126	15.16	18.00	27.68	33.94	40.19	19.26	52.71	58.97	65.22	71.48	77.74	84.00	90.25	96.51	102.77	109.03	115.28	121.54	127.90	145.44	1,472.57
Pond																						
Activities																						
Harvet RiceUkbar		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pannily labor	1513	14.32	17.00	26.14	22.05	3 7.96	18.19	49.78	55 <i>6</i> 9	61.60	67.51	75.42	79.33	85.24	91.15	97.06	102 <i>9</i> 7	108.88	114.79	120.70	137.36	1,29113
Commercialization																						
Activities																						
Marketing Panify labor	LED S	8.42	10.00	15.38	18.85	2233	10.70	29.28	32.76	36.24	39.71	45.19	46.66	50.14	3.0	57.09	60.57	64.05	652	71.00	80.80	818.31
Pann Management Franklich broc	TRINE	42 F	20.00	50.75	37.78	щи	74.40	59.52	65 00	73.47	20.49	9K 16	77 20	100.26	107 75	114 10	128.42	128.00	1755 OF	142.00	161 60	1624 47
1 anny and 1		210	20.00	20.75	3 7.74	4600	12-60		0112	12.57	77. 1	61.96		100.28	207.20	410	ala	120.07	25.05	2442.00	202.00	, and a second
Capital costs																						
Inigation	TETM	545 79	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	505 00
Electrical hookup	USDS	515.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	515.78
Fipe & Hose	USD)	462	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.62
Management Backpack spraw	15176	77 30	0.00	0.00	0.00	0 00	0 M	0.00	0.00	0.00	113 %	0 m	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	190.97
Matanhile	USDS	147.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	147.85
Pond																						
Spilluny Commt	USDA) USDA	644.72 1,286.77	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	644.72 1,286.77
Rocks	12503	3.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	372
Sheel	1505	267.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27.55
Yields																						
Gore Boh	USD) USD)	1,4266.80 3.061.05	1,108.40 3.459.00	1,866.40 3 113.45	1,713.12 4 190 %	1,541.06 5,613.78	1,499.20 6 337 04	1,631.32 7.333.75	1,277.33 8.407.00	1,599.76 7 703.44	2,032.40 8 530 77	2,364.06 8,829 50	2,665.75 6.454.49	3,314.51 6,800 50	3,260.79 8,757.40	2,355.68 12.424.04	3,030.96 13 133.44	2,907.69 11.661.72	2,725.85 13,025.47	2,473.00 14.467.35	2,297.90 14,810 57	43,239.58 163,091,45
		-,002.03	-,******	-,,*	- m- m	18 مەدىر.	00.00	الدىنىر.	13706.99	.,rua. m	لللدوحاديد	-y-2 -1 7		-yano _9		-, - 1 90	,	,004.1A			js.().)/	
Accornel Benefits Total annual costs	151M	5,690 10	2,217 00	2383 62	2,473,64	2,447,29	2348.02	2,706.73	3,042107	3,192.64	3,553,32	3,731,67	4,667.06	4,804.25	5,225 78	6,093 34	6,628152	7,040 71	7,339 30	7.445.42	7.804-44	
Total Annual resource	1505	4,407,83	4,526.49	4,979,94	5,902.46	7,154.85	7,921.27	9,164.56	9,685,33	9,303.20	10,571.62	11,192.65	9,120.25	10,115.09	11,978,22	11,770.64	16,164-40	14,569.42	15,819.52	16,935.35	17,108.47	
Annual discounted not benefity	USDS	-1,19236	2,098.72	2,145.64	2,576.08	3,215.33	3 <i>397.9</i> 0	3,645.28	408.53	2,850.62	2,976.44	7,400.98 2,876.53		1,692.20	цла. 4 1,921 ж	2,225.00	2, 254.9 5	7,466/1 1,63847	1,677.77	-,989.93 1,706.85	5,504.03 1,521.28	
Economic Indicators																						

Net Present Value of SystemED\$ 26,56492

Ectama: to land (ED)\$/tz 44,7486 Ectama: to family labor (ED)\$/PD 801 Ectama: to family labor/masket wage and 196

Acusculture Central High	himule 1	Vietnam										v										
Energy I/O, by Year	Unit	1	2	,	4	5	6	7	в	9	10	н		5	н	15	16	17	16	19	20	Total
System Extabilishment																						
Gass plat																						
Activities																						
Land Preparation. Land dening																						
Riccollabor	м,	0.00	0.00	0.00	a.co	0.00	0.00	0.00	0.00	a.co	0.00	0.00	0.00	0.00	a.co	0.00	0.00	0.00	0.00	a.co	0.00	0.00
I wany inter Digging hales		60404	0.00	400	400	0.00	0.00	0.00	400	400	0.00	0.00	0.00	400	uw	0.00	0.00	0.00	0.00	400	0.00	642.52
Turnita Labour	ы) М	0.00 256.76	0.00	000	0.00 0.00	0.00	0.00	0.00	000	0.00 0.00	0.00	0.00	0.00	0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00	0.00	0.00 0.00	0.00
Integration setup	7																					
Illievellabuar Faceily labuar	9 19	0.00 66.25	0.00	000 000	0.00 0.00	0.00	0.00 0.00	0.00	000 000	a.co a.co	0.00	0.00	0.00	000 000	0.00 0.00	0.00	0.00 0.00	0.00	0.00	0.00 0.00	0.00 0.00	0.00 B6.25
Planing	-																					
Plasting Riccellabor	щ	0.00	0.00	000	a.co	0.00	0.00	0.00	000	aœ	0.00	0.00	0.00	0.00	a.00	0.00	0.00	0.00	0.00	aœ	0.00	0.00
Fursily labor	щ	245.01	0.00	0.00	345.01	0.00	0.00	0.00	245.01	aœ	0.00	0.00	345.01	0.00	۵œ	0.00	345.01	0.00	0.00	۵œ	0.00	1,725.04
Rivellabar	м	0.00	0.00	a.00	aœ	0.00	0.00	0.00	a.00	aoo	0.00	0.00	0.00	a.oo	۵œ	0.00	0.00	0.00	0.00	aoo	0.00	0.00
I' mosily Labour	м	17.25	0.00	000	17.25	0.00	0.00	0.00	17.25	a oo	0.00	0.00	17.25	0.00	α.00	0.00	17.25	0.00	0.00	a.co	0.00	86.25
Imputs New		78757	0.00		307.57				307.57			a aa	797 57				787 57	0.00				5 000 00
Seal		679.27	0.00	000	679.27	0.00	0.00	0.00	679.27	a.co	0.00	0.00	679.23	000	aw	0.00	679.27	0.00	0.00	a.co	0.00	4,1936,15
Pond																						
Activities																						
Ponel Construction.		547.54	0.00					0.00			0.00	a aa	a aa	a a a		0.00			a a a			972.54
Facesily Juliane		345.01	0.00	000	a.co	0.00	0.00	0.00	000	aoo	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	a.co	0.00	345.QL
Inputs																						
Earkhor	ч	1,410.00	0.00	000	0.00	0.00	0.00	0.00	000	۵œ	0.00	0.00	0.00	000	aœ	0.00	0.00	0.00	0.00	a.co	0.00	1,610.00
Crop Management																						
Activities																						
Irightion.													0.00									
Facely labour		69.00	69.00	49.00	49.00	69.00	69.00	69.00	49.00	49.00	69.00	69.00	69.00	49.00	a9.00	69.00	69.00	69.00	49.00	49.00	69.00	1,360.04
Fortilizer application.	1.0	0.00	0.00	000		0.00	0.00	0.00	000	a.m	0.00	0.00	0.00	000		0.00	0.00	0.00	0.00	0.00	a.m	
Facesby Julian		51.75	51.75	51.75	91.75	51.75	51.75	51.75	51.75	91.75	51.75	51.75	51.75	51.75	91.75	91.75	51.75	51.75	51.75	91.75	51.75	1,035.03
Weeding. Disc disbur	м	0.00	0.00	000	aœ	0.00	0.00	0.00	000	aoo	0.00	0.00	0.00	0.00	a.co	0.00	0.00	0.00	0.00	aæ	0.00	0.00
Family Inland	мj	207.01	207.01	207.00	207.04	207.01	207.01	207.01	207.00	207.01	207.01	207.01	207.04	207.00	207.01	207.01	207.04	207.01	207.01	207.01	207.01	4,10.11
lapats																						
Electricity (inightion)	9 19	5,392.33 787.57	5,3972.23 787.57	5,992.33 767.57	5,392.28 767.57	5,7492.38 767.57	5,392.33 787.57	5,3992.23 787.57	5,992.33 767.57	5,392.28 767.57	5399238 76757	5,392.33 787.57	5, 3932.33 787.57	5,992.33 787.57	5,39233 767.57	5,7992.78 787.57	5,392.33 787.57	5, 992.28 787.57	5,992.33 787.57	5,39233 767.57	5,7492.38 767.57	107,846.65 15,751.49
	,																					
Pond Blanagement																						
Activities																						
Elier el Johan	м	0.00	0.00	0.00	aw	0.00	0.00	0.00	0.00	۵œ	0.00	0.00	0.00	a.o o	۵w	0.00	0.00	0.00	0.00	۵œ	0.00	0.00
Fuendy labour Freeding	м	210.51	21051	210.51	310.51	210.51	310.51	240.51	210.51	340.5	210.51	310.51	240.51	240.5	210.51	210.51	310.51	240.51	21051	240.50	210.51	6,210.16
filie: el labor	м	0.00	0.00	000	a.co	0.00	0.00	0.00	0.00	a.co	0.00	0.00	0.00	0.00	a.co	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Family inter Vicaride application		552.01	55204	5520	352.01	552.04	552.04	55204	5520	552.04	552.01	552.01	5520	552.0	552.04	552.04	552.04	55204	5520	552.04	55201	почав
Rhine el Lisbaue Xiannalia balance	14 9	0.00	0.00	000 54 E0	0.00 14 60	0.00	0.00	0.00	000 54 E0	0.00 14 60	0.00	0.00	0.00	0.00 M 60	0.00 74 60	0.00	0.00	0.00	0.00	0.00 14 60	0.00	0.00
Pund cleaning	-	<i></i>	<i>a</i>	<i>a</i>	200	<i>a</i> .0	<i>a</i>	<i>a.</i>	<i></i>	<i>a</i>	2.0	34.50	81.50	0.16	<i>a.</i>	2.0	<i>a</i>	<i>a</i> 1.00	0.00	<i>a.</i>	21.0	100.01
filier el labour Facealte la bour	14) 141	0.00 2011 66	0.00 2011 66	0.00 2011.68	0.00 301.66	0.00 201.66	0.00 301 66	0.00 2011 66	0.00 2011.66	0.00 301.66	0.00	0.00 2011 66	0.00 20166	0.00 2011.66	0.00 301.66	0.00	0.00 300.66	0.00	0.00 201.65	0.00 301.66	0.00 201 66	0.00 6.007.65
lenants	7																					
Fry	м	279,859.06	279 <i>,</i> 859.06	279,659.06	279,659.06	279 <i>,</i> 859.06	<i>279,859.</i> 06	279 <i>,</i> 859.06	279 <i>j</i> 859.08	279,859.06	279,859.06	<i>279,85</i> 9.06	279,659.0B	279,659.08	279,659.06	279 <i>,</i> 859.06	<i>279,859.</i> 06	279,859.06	279,859.0B	279,859.06	279,859.06	5,597,181.60
Grann Jackastział ficad	4	256,616.32 34,650.52	256,61632 24,650.52	28,016.32 34,050.52	256,616.32 24,650.52	256,616.32 34,650.52	256,616.32 24,650.52	256,616.32 34,650.52	28,616.32 34,650.52	256,616.32 24,650.52	256,616.32 34,650.52	2%6,6%6.32 24,650.52	256,616.32 34,650.52	28,616.32 34,650.52	256,616.22 24,650.52	256,016.32 34,050.52	256,616.32 24,650.52	256,016.32 34,050.52	28,01632 34,050.52	256,616.22 24,650.52	256,616.32 34,650.52	5,072,006.06 695,010.44
Vincide	ц,	563.64	562.64	563.64	563.64	569.64	562.64	562.64	563.64	563.64	569.64	562.64	563.64	563.64	563.64	569.64	569.64	563.64	563.64	562.64	569.64	11,772,74
Pond cleaning chemicals	м	64546	645.46	815.46	815.46	645.46	64546	645.46	815.46	815.46	645.46	64546	645.46	645.46	815.46	645.46	645.46	645.46	645.46	815.46	645.46	16,909.12
Hassest and Pascessing																						
Grass plot																						
Activities																						
Blacent Blie: dJohne	м	0.00	0.00	000	am	0.00	0.00	0.00	000	aoo	0.00	0.00	0.00	0.00	a.co	0.00	0.00	0.00	0.00	a.00	0.00	00.0
I needy habane	ы	240.54	21051	240.91	340.54	210.51	340.51	340.51	240.91	240.51	210.51	310.51	240.51	240.91	340.5	210.51	310.51	240.51	20051	240.9	210.51	6,710.16
Pond																						
Activities																						
Harvest Blie dlabar	м	0.00	0.00	0.00	۵œ	0.00	0.00	0.00	0.00	am	0.00	0.00	0.00	a.00	aœ	0.00	0.00	0.00	0.00	a.00	0.00	0.00
F seesily Julian	м	293.26	292.26	293.26	293.26	250.26	273.26	273.26	293.26	293.26	250.26	293.26	293 26	293.26	293.26	259.26	250.26	293.26	293.26	293.26	250.26	5,865.15
Commencialization																						
Activities																						
Marketing.																						
Family labor Fam Management	щ	17250	17250	17250	17250	17250	17250	17250	17250	17250	17250	17250	17250	172.50	17250	172.50	172.50	17250	17250	17250	172.50	3,450.09
Facesity Industr	м	345.01	34501	245.01	345.01	245.01	345.01	34501	245.01	345.01	245.01	345.01	345.01	245.01	345.01	245.01	345.01	24501	345.0I	345.01	245.01	6,900.16
Carried costs																						
Inisation																						
Hertrie pump	NA																					
Electrical knokop Finan & Blown	NA NA																					
Management																						
Earlipack sprayer	NA																					
Alotochike																						
rwithi Spillung	NA																					
Connent	NA																					
Roeia .	NA NA																					
hafe in the second seco																						
Smi																						
Stat Yields																						
Stret Yields Gran Faik	uj Juj	800,47084 1,109,92687	575,684.34 #########	931,040.45 1,014,019.42	869,449.51 964,286.20	785,917.65 #########	734,078.64 ########	870,980.40 #########	566,/61.06 1,067,217.01	652,067.95 9973,739.26	77 1,494 .71 ########	828,524.17 ########	756,600,90 614,442,71	626,463.71	790,480.09 845,241.44	464,640.82 932,410.62	571,628.26 1,126,067.21	951,168.64	4 65,1 7692 ########	416 <i>659.2</i> 3 ########	375,173,24 1,054,013.47	
Saret Yšekks Genes Fak	4	800,47084 1,109,92887	575, 684.24 #########	9781,040.45 1,014,019.42	869,449.51 964,386.20	765,917.65 ########	734,578,64 ########	670,960.40 #########	565,761.06 1,067,217.01	852,087.95 993,739.28	77 1,424.71 ########	828,524,17 ЛИНИЛИИ	758,630.99 614,442.71	626,463.71	796,460.09 845,241.44	464,640.62 933,410.62	571,621.24 1,126,067.24	951,163.64	4 6 9,17692 #########	416 <i>539.2</i> 8 ########	3759178391 1,054,013.47	******
Sted YSelds Genn Fais Assemal Konsyn Balsone Tidd annal congyinpats	4	800,470,84 1,109,928,87 989,072.02	575,684.24 ######### 580,742.86	938,040.45 1,014,019.42 563,362.86	849,449.51 964,386.20 585,391.97	785,917.45 1111111111111 583,342.86	701,076,64 2011/2011/1 983,562,66	670,948,40 ########### 560,342,86	565,291.97 565,291.97	653,067,95 9973,789,26 563,362,66	771,494.74 ######### 560,742.66	828,528,17 ######### 983,342,86	758,600,90 614,442.71 985,901,97	680,463.71 583,463.71 583,742.85	545,241.44 545,241.44	464,840.82 973,410.62 563,742.86	571,628,26 1,126,067,24 585,291,97	51,163,64 551,163,64 563,742,66	403,176.92 ######## 563,342.86	416 <i>559.20</i> ######### 560,362.66	373173291 1,054,013.47 563,742.84	
Seel YSelek Gren Faik Assental Kenergy Bahcare Tutal annual over goging to Tutal annual over goging to Assent or to prove outputs	77 773	800,47084 1,109,92887 989,07202 1,940,299,72	555,684,24 ######### 580,342,86 ######### #########	931,040.45 1,014,019.42 563,342.86 #########	849,449.51 964,386.20 585,391.97 #########	785,917.85 ######### \$23,942.86 ######### #########	701,070.04 ######### \$53,262.86 1,797,228.11 1,23,049,25	870,968,40 ######## 563,362,66 1,977,661,16 #########	545,291.97 1,067,217.01 545,291.97 22201.97 22201.97	652,067 <i>9</i> 5 993,789.28 563,302.66 #########	771,424.71 ######### 563,242.66 1,601,242.42 1,217,000.54	828,528,17 ######### 983,542,84 1,921,149,14 ##########	758,600.00 614,442.71 585,999.97 ######## 987,899.75	626,462.71 526,462.71 562,242.85 1,717,627.52 4,919,444.4	545,241.44 545,241.44 545,262.66 1,641,621.53 #########	464,640.62 932,410.62 563,642.66 1,417,251.45 633,666 57	571,623,26 1,126,067,24 585,299,97 ######## 1,112,499,70	547,440.02 551,160.64 560,26266 #100,0000 662.470.07	440,176.92 ######### 560,242.86 1,460,712.62 #38,240.24	416 <i>559.28</i> ######### 562,362.66 ######## 906 #65.52	3/51/3231 1,054,013.47 563,202.66 ######### 845,673.97	
Seel Yieldk Gens Fish Assemal Rongy Robuce That annual onegrispits That annual onegrispits Assemal net morg output		800,47084 1,109,928.87 989,072.02 1,940,999.72 1,928,927.70	575 <i>9</i> 84 M ######## 563,342 BS ######## ########	970,040,45 1,014,019,42 563,742,86 ######## 1,761,997.01	849,449.51 964, 386.2 0 585,391.97 ######## ########	785,987.85 ######### ######### ######### ########	74,076.64 ######## \$53,262.86 1,797,228.11 1,213,961.25	670,960,40 ######### 563,962,86 1,977,661.16 ########	505,701.05 1,067,217.01 585,391.97 2000000000000000000000000000000000000	852,087,95 993,789,28 983,302,86 ######### #########	771,404,71 ######### 583,342.84 1,801,342.42 1,217,999.56	828,538,17 283,242,84 1,921,149,14 297,149,14	758,600 50 614,442.71 985,991.97 ######## 987,690.78	626,463.71 5363,242.85 1,717,627.52 ########	735,480,09 845,241,44 583,362,86 1,641,821,53 #########	484,840.82 932,410.62 583,242.86 1,417,251.45 633,886.56	571,623,26 1,126,067,24 585,291,97 ######## 1,112,498,70	547,440,02 951,368,64 548,742,86 ######## 682,468,80	405,17692 ######## 563,342.86 1,460,712.62 #88,349.36	416 <i>559.25</i> ######## 563,362.66 ######## 908,406.56	375478284 1,054,013.47 583,762.86 ######### 845,623.92	
Seed Yields Grows Fash Assence I Knowygy Habbares That assent overy suppos That assent overy suppos Assent or trangy output Mail Congy input (system Mic) What congy input (system Mic)		800,47084 1,109,92887 989,07202 1,940,99972 1,940,99972 1,940,99972 1,940,92977 11,941,982,84	575,684 M ######### 560,M2 B ######## ######## ########	978,040,45 1,014,019,42 560,742,60 ######## 1,261,697.01	849,449,54 964, 286,20 585,391,97 ######## ########	785,987.45 1100100000 1203,982.86 110000000 110000000	74,076,04 ######## %3,342,866 1,797,239,11 1,213,941,25	670,941.40 ######### 563,362.86 1,977,661.16 ########	502,701.00 1,067,217.01 585,291.97 ######## ########	623,007,95 993,799,28 563,302,86 ######### #########	774,404,71 ######### 560,342,86 1,601,342,42 1,217,999,56	828,538,17 ######## %3,342,864 1,921,149,14 ########	758,600,90 614,442,71 985,991,97 ######## 987,691,78	626,462,71 563,462,71 563,242,86 1,717,627,52 ########	754,46105 845,241.44 563,362.66 1,641,821.53 #########	484,840.82 932,410.42 563,942,86 1,417,251.45 633,888.56	571,623,26 1,126,067,24 565,291,97 ######## 1,112,498,70	543,463,64 553,342,64 563,342,64 ######### #82,448,80	465,17692 ######## 565,362.86 1,468,712.62 838,349.36	416,559.25 ######## 5453,362.86 ######## 908,406.56	3753773291 1,054,013.47 563,242.84 ######### 845,623.92	

Appendix 2.5: Intensive pigs, Central Highlands, Vietnam

System Piga (meat)	Location CH, Vietnam	Synteen ken 20	ngth (years)]
Macroeconomic Context	Item Inflation.com	Units	Value 0.1037	Notes Mena inf. Rate 2006-2014
Conversions	Item	Units	Value	Notes
	VND to USD MJ to lead		0.000044 238.845800	Мяу. 2017
	kend ke Mj		0.004187	
olicy Setting	Item Disconst Rate	Units	0.1	Notes
groecosys tem Setting	Item	Units	Value	Notes
	Sty size	m2 months	100	
			,	N
roduction System	Item Boreding femiles (initial)	BP	5	Notes
	Programmer per BP/yr Nomber of offspring/parg	Pang. pigliots	2.5	Each BF - 3 gaug. In 2 years. Avgunge from all house hold surveys
	Num. additional BPs Pielot monthly only	2 75	3	Gauvaing herd. 3 bfs per 2 years (from own litters) Assess: 5% mentality out
	Norn potential alloping (pour 1)	Turglast.	118.75	
	Taneticate of LUS Operation/Postantion	years	10	
ferd growth	Year 1	BFs 5	Piglets sold 119	Notes
	2	5	119 190	Assuming all piglets are sold at 4 months
	4	8	190	
	6	11	261 261	
	7	11	261	
	2	11	261	
	10	11	261 261	
	12	11	261	
	14	11	261	
	15	11 11	261 261	
	17	11	261	
	18	11	261	
	220	11	261	
ocioeconomic Context	Item I and home	Units	Value	Notes
	House hold sincetone		00110	
	Limits on capital Madut accurs	f	for small factors	
	Contor to		ENC MONT	
	Size of operational building		A ga	
	Other (maket) institutional factors? Other (non-market) institutional factors?			
abas	Tenne	Vinder	Vaha	Notos
ator	Kimetees to-from-plot/year	hilimetees	0	Assumes pag sty is dicently adjure at to become
	Motochile foel effeciency Oeming and dong conceal	PD/day/pig	36	Assumes 100 mpg fael efficiency
	Peeding	PD/day/30 pigs	0.025	
	Version	PD/m/30 page	2	
	Denva ming no daina	PD/7-/30 pmg-	25	
	Opportunity cast of HIH labor	USD/PD	8.8	Based on daily farm labor wage rates gatheard during EEE interviews
Feeding	Age	kg/pig/day		kg/type/yr
	> 1.mo 1-2.mo	0_5		1781.25 3562.5
	2-4 mo RP	3		21375 4843.75
Year	x >1.000	1-2 mo	2-4 mo	Aduk
1	1785	3570	10710	6843.75 6843.75
a	2850	5700	17100	10950
3	3015	7830	23490	15056.25
	3915 3915	7850	23490	15056.25
8	3915	7830	23490	15056.25
10	3915	7830	23490	15056.25
11	3915	7830	23490 23490	15056.25
13	3915	7830	23490	15056.25
14	3915 3915	7830	23490 23490	1505625 1505625
16	3015	7840	23490	15056.25
18	3915	7830	23490	15056.25
19	3915 3915	7830	23490 23490	15056.25
nputs	Item	Units	Value	Notes
	Værnämers (pägliets)	erpelle/päylet	1	accounting 3 types at 3 days, 3 types at 10 days, and 1 type at 15 days
	Verseures (1115) Denoucesing medicine (piglets)	ranner/piglet	2	
	Antiousl spray	100 ee / wase k	1	
nput prices (2016)	Item	Units	Value	Notes
	ceete oneennate (young unimuls) Feete oneentaate (old unimuls)	USD/kg	0.66	>1 month
	Internitation fre Antivial spray	USD/100 cr	8.8	
	Dewooming medicine	USD/cycle/piglet	0.044	Each piglet is given 1000 VND worth of deworming medicine
	Vaccination (pightly Vaccination (BP5)	USD/BP/year	6.6 5.28	See monet notes for default. Multiple vacuum icons (@ 3, 10 and 15 days 2 vaccinations per year per BP, 60,000 per time
Dutputs	Item	Units	Value	Notes
	Dung (everage from all animals)	hg/ammad/day	1.13	wearge from all serverys
	- Brees	-Z/man	U.C.	
Capital costs (2016)	Item Eg sty	Units USD	Value 660.00	Notes Average costs from surveys ~150,000 per m2
	Boreding females	USD	56.42	Avenue per fire and a successory a
	Spanjez	USD	504_51 198.00	.com nouishcid savvy data Pram houshcid savvy data
	Well module firm	USD/meter	12.32	Prom household snevey data
Energy values	Item	Units	Value	Notes
aparts.	Hormen Labor Geseline	MJ/PD MJ/Mass	17.25	Permentati wadi Permental, 2008 Haristowed, 2008
	Electricity Partic concentrate	MJ/kwh	10.78	Frenentel, 2009 Transmittand Provided 2008
	Antivial spray	MJ/Max	140.91	remember and Pamentel, 2009 Pamentel and Pamentel, 2008 (Referred to as "Medicine" - scanned same energy values)
	Devocaing an dising Version	MJ/Mos MJ/Mos	140_91 140_91	Assume and the set of
Distgrats	Peak	MJ/hg	9.81	Pimentel and Pimentel, 2008 (maning 72% dans weight)
	Arony (from all annuals)	MJ/NE	15.57	

Intensive sime CH. Vistnam												¥										
Intensive pigs: Cri, vietnam Inputs/Outputs (I/O), by Year	Unit	1	2	3	4	5	6	7	8	,	10	u 11	12	13	14	15	16	17	18	19	20	Total
System Establishment																						
Activities Pen installation Construction/installation																						
Hired labor Family labor	PD PD	0.00 6.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 6.00															
Herd Management																						
Activities																						
Feeding																						
Hind labor	PD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Family labor	PD	37.72	37.72	60.23	60.23	82.73	82.73	82.73	82.73	82.73	82.73	82.73	82.73	82.73	82.73	82.73	82.73	8273	82.73	82.73	82.73	692_28
Watering Himid labor	PD	0.00	0.00	0.00	000	0.00	0.00	0.00	000	0.00	0.00	0.00	000	0.00	0.00	000	000	0.00	0.00	000	000	0.00
Family labor	PD	37.72	37.72	60.23	60.23	82.73	82.73	82.73	82.73	82.73	82.73	82.73	82.73	82.73	82.73	82.73	82.73	82.73	82.73	82.73	82.73	692.28
Pen cleaning and dung removal																						
Hired labor	PD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Family labor:	PD	3.02	3.02	4.82	4.82	6.62	6.62	6.62	6.62	6.62	6.62	6.62	6.62	6.62	6.62	6.62	6.62	6.62	6.62	6.62	6.62	55.38
Vaccination	PD	0.00	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	0.00	0.00	000	000	0.00	0.00	000	000	a aa
Family labor	PD	8.27	8.27	13 20	13.20	18 13	1813	18 13	18 13	1813	1813	18.13	18 13	1813	1813	18 13	18 13	1813	18.13	18 13	18.13	151.73
Devorming medicine		•	0.01	10 100	10.10	14.10	1410	10.10	10.10	1410			10.10			10.10	10.20		10.10	10.10	10.22	
Hind labor	PD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Family labor:	PD	10.33	10.33	16.50	16_50	22.67	22.67	22.67	22.67	22.67	22.67	22.67	22.67	22.67	22.67	22.67	22.67	22.67	22.67	22.67	22.67	189.67
Antiviral spray	BD	0.00	0.00	0.00	000	0.00	0.00	0.00	000	0.00	0.00	0.00	000	0.00	0.00	000	000	0.00	0.00	000	000	0.00
Family labor	PD	2.00	2.00	2.00	200	2.00	200	2.00	200	2.00	200	200	200	2.00	2.00	200	200	2.00	2.00	200	200	20.00
Pen maintenance and repairs																						
Hind labor	PD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Family labor:	PD	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	5.00	50.00
Inputs																						
Feed concentrate (young animals)	kg	1,785.00	1,785.00	2,850.00	2,850.00	3,915.00	3,915.00	3,915.00	3,915.00	3,915.00	3,915.00	3,915.00	3,915.00	3,915.00	3,915.00	3,915.00	3,915.00	3,915.00	3,915.00	3,915.00	3,915.00	32,760.00
Feed concentrate (old animals)	kg	21,123.75	21,123.75	33,750.00	33,750.00	46,376.25	46,376.25	46,376.25	46,376.25	46,376.25	46,376.25	46,376.25	46,376.25	46,376.25	46,376.25	46,376.25	46,376.25	46,376.25	46,376.25	46,3 76.25	46,376.2 5	368,005.00
Antiviral spray	100 cc	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00	52.00	520.00
Varcination (ointets)	0000 0000	119.00	119.00	190.00	190.00	261.00	261.00	261.00	261.00	261.00	261.00	261.00	261.00	261.00	261.00	261.00	261.00	261.00	261.00	261.00	261.00	2,184.00
Vaccination (BFs)	000	10.00	10.00	16.00	16.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	184.00
Insemination fre	ava	12.50	12.50	20.00	20.00	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	27.50	230.00
Pen repairs	000A	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00 '	10.00
Commercialization																						
Activities																						
Sales and Marketing	DD	10.00	1000	10.00	10.00	10.00	1000	10.00	10.00	1000	1000	10.00	10.00	1000	1000	10.00	1000	1000	10.00	10.00	1000	100.00
Farm Management	rD	1000	1000	10.00	10.00	1000	1000	10.00	10.00	1000	1000	10.00	10.00	1000	1000	10.00	10.00	1000	10.00	10.00	10.00	1 70.00
Family labor	PD	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	200.00
Capital costs																						
Establishment																						
Pig pen Breeding females	ana ana	1.00 5.00	0.00 0.00	0.00 3.00	0.00 0.00	0.00 3.00	0.00 0.00	0.00 0.00	0.00 0.00	000 '	1.00 11.00											
Irrigation																						
Well	meters	106.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	108.00
Management																						
Soraver	mm	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
Motorbike	mm	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00
Yields																						
Piglets	kg	5,950.00	5,950.00	9,500.00	9,500.00	13,050.00	13,050.00	13,050.00	13,050.00	13,050.00	13,050.00	13,050.00	13,050.00	13,050.00	13,050.00	13,050.00	13,050.00	13,050.00	13,050.00	13,050.00	13,050.00	109,200.00
Breeding females	ava	3.00	0.00	3.00	0.00	3.00	0.00	3.00	0.00	3.00	0.00	3.00	0.00	3.00	0.00	3.00	0.00	3.00	0.00	3.00	0.00	15.00
Dung	kg.	20,622.50	20,622.50	32,996.00	32,996.00	45,369.50	45,369.50	45,369.50	45,369.50	45,369.50	45,369.50	45,369.50	45,369.50	45,369.50	45,369_50	45,369_50	45,369.50	45,3 69 .50	45,369_50	45,369.50	45,369.50	379,454.00
Tatal Lab	or																					
Family labor	PD	140.05	134.05	191.97	191.97	249.89	249.89	249.89	249.89	249.89	249.89	249.89	249.89	249.89	249.89	249.89	249.89	249.89	249.89	249.89	249.89	2,157.35
Hired Labor	PD	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Labor	PD	140.05	134.05	191.97	191.97	249.89	249.89	249.89	249.89	249.89	249.89	249.89	249.89	249.89	249.89	249.89	249.89	249.89	249.89	249.89	249.89	2,157.35
Total labor (system life) Total family labor (system life)	PD PD	4,6 56.20 4,6 56.20																				

Intensive pigs: CH, Vietnam											Year										
Inputs/Outputs (I/O), by Year	Unit	1	2	3	4	5	6	7	8	9	10	n	12	в	14	15	16	17	18	19	20
System Establishment																					
Activities																					
Pen installation																					
Himdla how	USD /PD	0.84	1.00	154	1.89	223	1.07	2 93	3.78	3.62	3.97	4 32	4.67	5.01	536	571	606	6.40	675	710	8.08
Family labor	USD/PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Herd Management																					
Activities																					
Reeding																					
Hiredlabor	USD/PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Family labor	USD/PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Watering																					
Hiredlabor	USD/PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
F amily labor	USD/PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Pen cleaning and dung removal																					
Hiredlabor	USD/PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
.F armity labour	USD/PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Vaccination																					
Hirediabor	USD/PD	0.84	1.00	1.54	1.89	223	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Parnety labor	USD/PD	0.84	1.00	1_24	1.89	1.1.5	1.07	2.95	3.28	3.62	3.97	4.52	4.07	5.01	2.30	5.71	0.00	6.40	6.75	7.10	8.08
Himdleher	USD /0D	0.84	1.00	1.54	1 20	2.22	1.07	2 92	2.72	3.67	2.07	4 77	4.67	5.01	576	5.71	6.06	6.40	675	710	8.08
Karraliz labor	USD/PD	0.84	1.00	1.54	1.07	2.23	1.07	2 93	3.28	3.62	3.97	4 32	4.67	5.01	536	571	6.06	6.40	675	710	8.08
Antiviral spray	030,10	0.0	1.00	••	1.07		1.01		5.10	0.00	5.71			3.01	3.20	2.14	0.00	0.10	0.15	1.10	0.00
Hiredlabor	USD/PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
F amily labor	USD/PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Pen maintenance and repairs																					
Hiredlabor	USD/PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Family labor	USD/PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Laputs																					
Feed concentrate (young animals)	USD/kg	0.19	0.21	0.22	0.21	0.21	0.22	0.23	0.24	0.26	0.28	0.31	0.38	0.41	0.44	0.52	0.57	0.61	0.63	0.64	0.66
Feed concentrate (old animals)	USD/kg	0.13	0.14	0.14	0.14	0.14	0.15	0.15	0.16	0.18	0.19	0.20	0.25	0.27	0.29	0.35	0.38	0.41	0.42	0.43	0.44
Antiviral spray	USD/100œ	0.13	0.14	0.14	0.14	0.14	0.15	0.15	0.16	0.18	0.19	0.20	0.25	0.27	0.29	0.35	0.38	0.41	0.42	0.43	0.44
Deworming medicine	USD/unit	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04
Vaccination (piglets)	USD/2pp	1.93	2.07	2.16	2.12	2.11	2.20	2.27	2.44	2.64	2.84	3.07	3.79	4.05	4.41	5.24	5.71	6.09	6.34	6.39	6.60
Vaccination (BFs)	USD/app	1.55	1.66	1.73	1.70	1.69	1.76	1.81	1.95	2.11	2.27	2.46	3.03	3.24	3_53	4.19	4.57	4.87	5.07	5.11	5.28
Insemination fee	USD/terne	2.58	2.11	2.68	2.85	2.82	2.93	3.02	3.26	3.52	.5./9 28.70	4.10	5.05	5.4U	5.88	6.98	7.62	8.12 (0.99	8.45	8.52	8.80
Pen repairs	цэр	19.34	20.75	21.60	21.25	21.14	21.95	22.00	24.41	20.44	26.39	30.75	57.60	40.02	44.12	32.36	37.12	60.66	63.37	63.93	66.VU
Commercialization																					
Activities																					
Sales and Marketing																					
Farrily labor	USD/PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Farm Management																					
Kamiy labor	USD/PD	0.84	1.00	1.54	1.89	2.23	1.07	2.93	3.28	3.62	3.97	4.32	4.67	5.01	5.36	5.71	6.06	6.40	6.75	7.10	8.08
Capital costs																					
Establishment																					
Pigpen	USD	193.42	207.47	216.01	212.32	211.40	219_50	226.57	244.15	264.37	283.89	307.47	378.54	405.25	441.16	5 23 .55	571.17	608.82	633.70	639.26	660.00
Breeding females	USD	16.53	17.74	18.47	18.15	18.07	18.76	19.37	20.87	22.60	24.27	26.28	32.36	34.64	37.71	44.76	48.83	52.04	54.17	54.65	56.42
Inigation																					
Well	USD/meter	3.61	3.87	4.03	3.96	3.95	4.10	4.23	4.56	4.93	5.30	5.74	7.07	7.56	8.23	9.77	10.66	11.36	11.83	11.93	12.32
Management																					
Sprayer	USD	58.03	62.24	64.80	63.70	63.42	65.85	67.97	73.24	79.31	85.17	92.24	113.56	121.57	132.35	157.07	171.35	182.65	190.11	191.78	198.00
Motorbike	USD	147.85	158.59	165.12	162.30	161.60	167.79	173.19	186.63	202.08	217.01	235.03	289.36	309.77	337.22	400.21	436.61	465. 39	484.40	488.66	504.51
Yields																					
Dialata	ሀይወ ሌ-	0.72	0.24	0.45	054	0.79	0.66	0.70	0.04	0.07	1.04	1 10	1 01	144	154	224	2.00	1 0.2	217	207	204
rigero Breeding females	USD/animal	16 53	17.74	18.47	1815	18.07	1876	19 37	20,20	22.60	24.27	26.28	32.36	34.64	37.71	44.76	48.83	52.04	54.17	54.65	56.47
Dung	USD/kg	0.0025	0.0025	0.0028	0.0031	0.0034	0.0037	0.0041	0.0046	0.0050	0.0055	0.0061	0.0068	0.0075	0.0082	0.0091	0.0100	0.0111	0.0122	0.0135	0.0149_
U U																					86

Intensive pigs: CH, Vietnar	n	Year																			
Energy Inputs/Outputs (I/O),	by Yelinia	1	2	3	4	5	6	7	8	9	10	n	12	в	14	15	16	17	18	19	20
System Establishment																					
Activities Pen installation Construction/installation Hirsellabor Family Jabor	MJ/PD MJ/PD	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	1725 1725	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25
Herd Management																					
Activities Feeding Hirred labox Family labor Watering Hirred labox Family labor Pen cleaning and chang removal Hirred labox Family labor Vaccination Hirred labox Family labor Deworming medicine Hirred labox Family labor	мј/РD мј/РD мј/РD мј/РD мј/РD мј/РD мј/РD мј/РD	17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25	17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25	17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25	17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25	1725 1725 1725 1725 1725 1725 1725 1725	17.25 1725 1725 1725 1725 1725 1725 1725 17	17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25	17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25	17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25	17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25	17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25	1725 1725 1725 1725 1725 1725 1725 1725	1725 1725 1725 1725 1725 1725 1725 1725	1725 1725 1725 1725 1725 1725 1725 1725	17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25	17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25	17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25	17.25 1725 1725 1725 1725 1725 1725 1725 17	17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25 17.25	1725 1725 1725 1725 1725 1725 1725 1725
Hired labor Family labor	MJ/PD MJ/PD	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25
Pen maintenance and repairs Hired labor Family labor	MJ/PD MJ/PD	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25	17.25 17.25
Inputs Feed concentrate (young animals) Feed concentrate (old animals) Antiviral spray Dewarming medicine Vaccination (rights) Vaccination (BFs) Insernian fee Pen repairs	MJ/1+g MJ/100cc NA NA NA NA NA	7.70 7.70 14.09	7.70 7.70 14.09	7.70 7.70 14.09	7.70 7.70 14.09	7.70 7.70 14.09	7.70 7.70 14.09	7.70 7.70 14.09	7.70 7.70 14.09	7.70 7.70 14.09	7.70 7.70 14.09	7.70 7.70 14.09	7.70 7.70 14.09	7.70 7.70 14.09	7.70 7.70 14.09	7.70 7.70 14.09	7.70 7.70 14.09	7.70 7.70 14.09	7.70 7.70 14.09	7.70 7.70 14.09	7.70 7.70 14.09
Commercialization																					
Activities Sales and Marketing Family labor Fam Minagement Family labor Camital costs	MJ/PD MJ/PD	17.25 0.84 17.25	17.25 1.00 17.25	17.25 1.54 17.25	17.25 1.89 17.25	17.25 2.23 17.25	17.25 1.07 17.25	17.25 2.93 17.25	17.25 3.28 17.25	17.25 3.62 17.25	17.25 3.97 17.25	17.25 4.32 17.25	17.25 4.67 17.25	17.25 5.01 17.25	17.25 5.36 17.25	17.25 5.71 17.25	17.25 6.06 17.25	17.25 6.40 17.25	17.25 6.75 17.25	17.25 7.10 17.25	17.25 8.08 17.25
Establishment Pigpen Breeding females	NA. NA																				
Inigation Well	NA																				
Management Sprayer Motorbike	NA NA																				
Yields																					
Piglets Breeding females Duog	MJ/kg MJ/kg MJ/kg	9.81 9.81 15.57	9.81 9.81 15.57	9.81 9.81 15. <i>5</i> 7	9.81 9.81 15.57	9.81 9.81 15.57	9.81 9.81 15.57	9.81 9.81 15.57	9.81 9.81 15.57	9.81 9.81 15.57	9.81 9.81 15.57	9.81 9.81 15.57	9.81 9.81 15.57	9.81 9.81 15.57	9.81 9.81 15.57	9.81 9.81 15.57	9.81 9.81 15.57	9.81 9.81 15.57	9.81 9.81 15.57	9.81 9.81 15.57	9.81 9.81 15.57

																Year						
Intensive pigs: CH, Vietnam Inputs/Outputs (I/O), by Year	Umit	1	2	3	4	5	6	7	8	,	10	п	12	13	14	Ye: 15	ur 16	17	18	19	20	Total
System Establishment																						
Activities																						
Pen installation																						
Construction/installation	-																					
Hired labor Family labor	USD4 USD4	0.00 5.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00 5.05
Hent Management																						
Activities																						
Feedine																						
Hired labor	USDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	000	0.00	0.00
Family labor	USDS	31.77	37.72	92.61	113.54	184.74	88.52	242.26	271.02	299.79	328.55	357.31	386.07	414.83	443.59	472.36	501.12	529.88	558.64	587.40	668.49	6.610.21
Watering																						
Hired labor	USDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
F amily labor	USDS	31.77	37.72	92.61	113.54	184.74	88.52	242.26	271.02	299.79	328.55	357.31	386.07	414.83	443.59	172.36	501.12	529.88	558.64	587.40	668.49	6.610.21
Pen cleaning and dong removal	•																					
Hiredlabor	USDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Family labor	USDS	2.54	302	7.41	908	14 78	708	19.38	21.68	23.98	26.28	28.58	30.89	33 19	35.49	37.79	40.09	42.39	44.69	46.99	53.48	528.82
Vaccination	-																					
Hired labor	USDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
F amily labor	USDS	696	8.27	20.30	24.89	40.49	19.40	53.10	59.40	65.71	72.01	78.31	84.62	90.92	97.23	103.53	109.83	116.14	122.44	128.75	146.52	1.448.81
Descorring medicine																						
Hiredlabor	USDS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
F amily labor:	USD	870	10.33	25.37	31.11	50.61	24.25	66.37	74.25	82.13	90.01	97,89	105.77	113.65	121.53	129.41	137.29	145.17	153.05	160.93	183.15	1.811.0
Antiviral soray																						
Hired labor	USDA	0.00	000	000	000	0.00	000	0.00	0.00	0.00	000	000	ით	0.00	000	000	0.00	0.00	000	000	0.00	0.00
Family labor	USDA	168	200	308	377	4 47	214	586	6 55	725	794	864	9 33	10.03	1072	11.42	1211	1281	1350	14 20	1616	163.66
Pen maintenance and repairs	0																					
	USDA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
F annihr lalber	USDA	4 21	500	769	943	11.16	5.35	14 64	16.38	1812	1986	21 59	23.33	2507	2681	2855	30.29	32.02	33.76	35.50	40.40	409.16
,																						
Inputs																						
Feed concentrate (source animals)	USIN	345.25	370 34	615.64	605.11	827 64	859 35	887.01	955.84	103500	1 111 44	1 203 73	1 481 99	1 586 54	172713	204971	223612	2 383 53	249092	2 502 72	2 583 90	77 848 89
Feed concentrate (old animals)	USDA	2723.80	2 921 71	4 860 29	4 777 16	6 536 03	678641	7 004 93	7 548 45	817357	8 777 25	9 506 09	11 703 55	12 529 19	13 639 47	1618698	1765906	18 823 19	19 592 29	1976443	2040555	219.919.35
Antiviral soray	USDS	671	719	749	7.36	7.33	7.61	785	846	916	984	10.66	1312	14.05	1529	18 15	1980	21 11	21 97	22.16	22.88	258.20
Devormine medicine	USDS	1.53	1.65	2.74	2.69	3.68	382	3.94	4.25	4.60	494	535	6.59	7.05	7.68	911	9.94	10.59	11.03	11.12	11.48	123.77
Vaccination (nislets)	USDA	23017	246.89	410.42	403.41	551.76	572.90	591.34	637.23	690.00	740.96	802.49	987 99	1057@	115142	136648	149075	1 589 02	1 653 95	1.668.48	1 722 60	18 565 93
Vaccination (EFs)	USDA	15.47	1660	27.65	27 18	37.21	3863	39.88	42.97	46 53	49.97	5411	6662	71.32	77.64	92.15	100 53	10715	111 53	112 51	11616	1,251.80
Insemination fee	USDA	32.24	34.58	57.60	56.62	77.51	8048	83.08	89 52	96 93	104 09	11274	138.80	148 59	161.76	191 97	209.43	223 23	232.36	234 40	242.00	2.607.93
Pen repairs	USDS	0.00	20.75	21.60	21.23	21.14	21.95	22.66	24.41	26.44	28.39	3075	37.85	40.52	44.12	52.36	57.12	60.88	63.37	63.93	66.00	725.46
	•																					
Commercialization																						
Activities																						
Sales and Marketine																						
Family labor	USDS	842	1000	15.38	18.85	22.33	1070	29 28	32.76	36.24	3971	43 19	46.66	50.14	53.62	57.09	60.57	64.05	67 52	71.00	80.80	818.31
Farm Management																						
F anniby labor:	USD\$	16.85	20.00	30.75	37.71	44.66	21.40	58.56	65.52	72.47	79.42	86.38	93.33	100.28	107.23	114.19	121.14	128.09	135.05	142.00	161.60	1,636.63
Capital costs																						
Establishment																						
Pigpen	USD	193.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	193.42
Breeding females	USD\$	82.67	0.00	55.40	0.00	54.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	192.28
Irrigation																						
We	USD\$	389,93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	389.93
Management																						
Sprayer	USD4	58.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	58.03
Motorbike	USD\$	147.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	147.85
Yields																						
Pieleta	USDS	1,376.72	2,034.67	4,299.16	5,349.68	9,371.94	11,543.48	9,100.00	12,556.34	12,688.37	13,600.74	15,380.14	23,577.63	21,707.58	20,365.63	29,276.46	27,126.59	25,536.36	28,360.16	26,998.51	26,649.72	326,899.88
Breeding females	USD	49.60	0.00	55.40	0.00	54.22	0.00	58.10	0.00	67.80	0.00	78.85	0.00	103.93	0.00	134.27	0.00	156.13	0.00	163.94	0.00	922.24
 Dung	USDS	51.97	5 1.9 7	91.78	101.29	153.72	169.66	187.26	206.68	228.11	251.76	277.87	306.69	338.49	373.59	412.33	455.09	502.28	554.37	611.86	675.31	6,002.08
Annual Benefits																						
Total annual costs	USD4	4.345.03	3,753,75	6,354,01	6.262.67	8.674.49	8.638.52	9,372,41	10.129.72	10.987.69	11,819,21	12805.12	15.602.60	16,707,90	18,164,33	21,393_59	23,296,29	24,819,14	25.854.70	26153.91	27,189,65	
Total Annual revenue	USDS	1,478.29	2,086.65	4,446.33	5,450.97	9,579.87	11,713.15	9,345.36	12,763.02	12,964.28	13,852.50	15,73686	23,884.32	22,150.00	20,739.23	29,823.06	27,581.68	26,194,78	28,914.53	27,774.31	27,325.03	
Annual net income	USDS	-2,866.74	-1,667.11	-1,907.68	-811.70	905.38	3,074.62	-27.05	2,633,30	1,996.59	2,033.29	2,931.74	8,281.72	5,442.10	2,574,90	8429.47	4,285.39	1,375.64	3,059.82	1,620.40	135.38	
Annual discounted net benefits	USDS	-2866.74	-1,515.55	-1,576.59	-609.84	618.39	1,909.10	-15.27	1,351.30	931.42	862.31	1,130.31	2,902.69	1,734.02	745.86	2,219.74	1.025.89	299.38	605.37	291.44	22.14	
						/																
Economic Indicators Net Present Value of Sy	stenNSD\$	10,065.37																				

 Returns to land USD\$/hz
 100,653.66

 Returns to family labor
 USD/PD
 2.16

 Returns to family labor/market wage rate
 0.53

Intensive pigs: CH, Vietnam Inputs/Outputs (I/O), by Year	Unit	ı	2	3	4	5	6	7	8	,	10	п	12	13	14	15 15	ear 16	17	18	19	20	
System Establishment																						
Activities Peninstallation																						
Construction / ans catalition Hired labor Family labor	мJ	0.00 103-50	0.00 0.00	0.00 0.00	0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00	0.00	0.00 0.00	0.00 0.00	0.00	0.00	0.00	0.00	0.00 0.00	0.00 0.00	0.00 0.00	0.00	
Hend Management	-																					
Activities																						
Feeding																						
Hiredlabor	мg	0.00	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Pannary labor	м	63.050	030.03	1,036.91	1,038.91	1,427.19	1,427.19	1,427.19	1,427.19	1,427.19	1,427.19	1,427.19	1,427.19	1,427.19	1,42/.19	1,427.19	1,427.19	1,427.19	1,427.19	1,427.19	1,427.19	
Hired labor	м	0.00	0.00	0.00	000	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Family labor	M	650.63	650.63	1,038.91	1,038.91	1,427.19	1,427.19	1,427.19	1,427.19	1,427.19	1,427.19	1,427.19	1,427.19	1.427.19	1,427.19	1,427.19	1,427.19	1,427.19	1,427.19	1,427.19	1,427.19	
Pen cleaning and dung removal	2																					
Hired labor	мј	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Family labor	мј	52.05	52.05	83.11	83.11	114.17	114.17	114.17	114.17	114.17	114.17	114.17	114.17	114.17	114.17	114.17	114.17	114.17	114.17	114.17	114.17	
Vaccination																						
Hired labor	мg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Pannity labor	му	142.60	142.60	227.71	227.71	312.81	312.81	312.81	312.81	31281	31281	312.81	312.81	312.81	31281	31281	.31281	312.81	.312.81	312.81	31281	
Hindlabor	м	0.00	0.00	000	0.00	0.00	0.00	0.00	000	0.00	0.00	ით	ით	0.00	0.00	0.00	0.00	ით	0.00	0.00	0.00	
Family labor	M	178.25	178.25	284.63	284.63	391.01	391.01	391.01	391.01	391.01	391.01	391.01	391.01	391.01	391.01	391.01	391.01	391.01	391.01	391.01	391.01	
Antiviral spray	,																					
Hired labor	мј	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
F amily labor	мј	34.50	34_50	34_50	34_50	34_50	34.50	34.50	34.50	34_50	34.50	34.50	34.50	34.50	34.50	34_50	34.50	34.50	34.50	34_50	34_50	
Pen maintenance and repairs																						
Hired labor	мg	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Pannity labor	м	80.25	80.20	80.20	80.20	80.25	80.25	80.25	80.20	80.25	80.25	80.25	80.25	80.25	80.20	80.25	80.25	80.25	80.25	80.20	80.25	
Inouts																						
Feed concentrate (young animals)	м	13,744,50	13,744.50	21,945.00	21,945.00	30,145.50	30,145.50	30,145,50	30,145,50	30,145,50	30,145.50	30,145.50	30,145,50	30,145.50	30,145,50	30,145.50	30,145.50	30,145.50	30,145.50	30,145.50	30,145.50	
Feed concentrate (old animals)	мý	162,652.88	162,652.88	259,875.00	259,875.00	357,097,13	357,097.13	357,097.13	357,097.13	357,097.13	357,097.13	357,097.13	357,097.13	357,097,13	357,097.13	357,097.13	357,097.13	357,097.13	357,097.13	357,097.13	357,097.13	
Antiviral spray	мj	732.73	732.73	732.73	732.73	732.73	732.73	732.73	732.73	732.73	732.73	732.73	732.73	732.73	732.73	732.73	732.73	732.73	732.73	732.73	732.73	
Dewoming medicine	NA																					
Vaccination (piglets)	NA																					
Vaccination (BFs)	NA																					
Insemination fee	NA																					
Pen mpans	NA																					
Commercialization																						
Activities																						
Sales and Marketine																						
Family labor	м	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	172.50	
Farm Management	-																					
Family labor	мј	168 5	20.00	30.75	37.71	41.66	21.40	58.56	65.52	72.47	79.42	86.38	93.33	100.28	107.23	114.19	121.14	128.09	135.05	142.00	161.60	
Capital costs																						
Establishment																						
Pig pen	NA																					
Breeding females	NA																					
Inigation																						
Well	NA																					
Management																						
Spraver	NA																					
Motorbike	NA																					
Yields																						
Pielets	M	42 MR 71	42 (008 71	67 07272	67 072 73	92 1 36 74	92 136 74	9213674	92 136 74	92 136 74	92 136 74	92 1 36 74	9213674	9213674	92 136 74	92 136 74	92 1 36 74	92 136 74	9213674	9213674	92 136 74	
Breeding families	M	21 18	000	21 18	000	21.18	0.00	21.18	0.00	21.18	000	21.18	0.00	2118	000	21.18	0.00	21.18	0.00	21.18	0,00	
Dung	M	321,092.33	321,092.33	513,747.72	513,747.72	706,403.12	706,403.12	706,403.12	706,403.12	706,403.12	706,403.12	706,403.12	706,403.12	706,403.12	706,403.12	706,403.12	706,403.12	706,403.12	706,403.12	706,403.12	706,403.12	
	,																				-	
Annual Energy Balance																						
Total annual energy inputs	мј	179,217.88	179,117.53	285,550.01	285,556.96	391,985.64	391,962.38	391,999_54	392,006.49	392,013.45	392,020.40	392,027.35	392,034,31	392,041.26	392,048.21	392,055.16	392,062.12	392,069.07	392,076.02	392,082.98	392,102.58	
Total annual enery outputs	мј	363,122.21	363,101.03	580,841.63	580,820.45	798,561.04	798,539.86	798,561.04	798,539.86	798,561.04	798,539.86	798,561.04	798,539.86	798,561.04	798,539.86	798,561.04	798,539.86	798,561.04	798,539.86	798,561.04	798,539.86	
Annual net energy output	мј	183,904.34	183,983_50	295,291.62	295,263.49	406,575.40	406,577.48	406,561.50	406,533.36	406,547.59	406,519.46	406,533.69	406,505.55	406,519.78	406,491.65	406,505.88	406,477.74	406,491,97	406,463.84	406,478.06	406,437.28	
Total energy input (system life)	м	7,202,029.31																			-	20
r own energy output (system are)	EROIMJ	2.04																			8	39