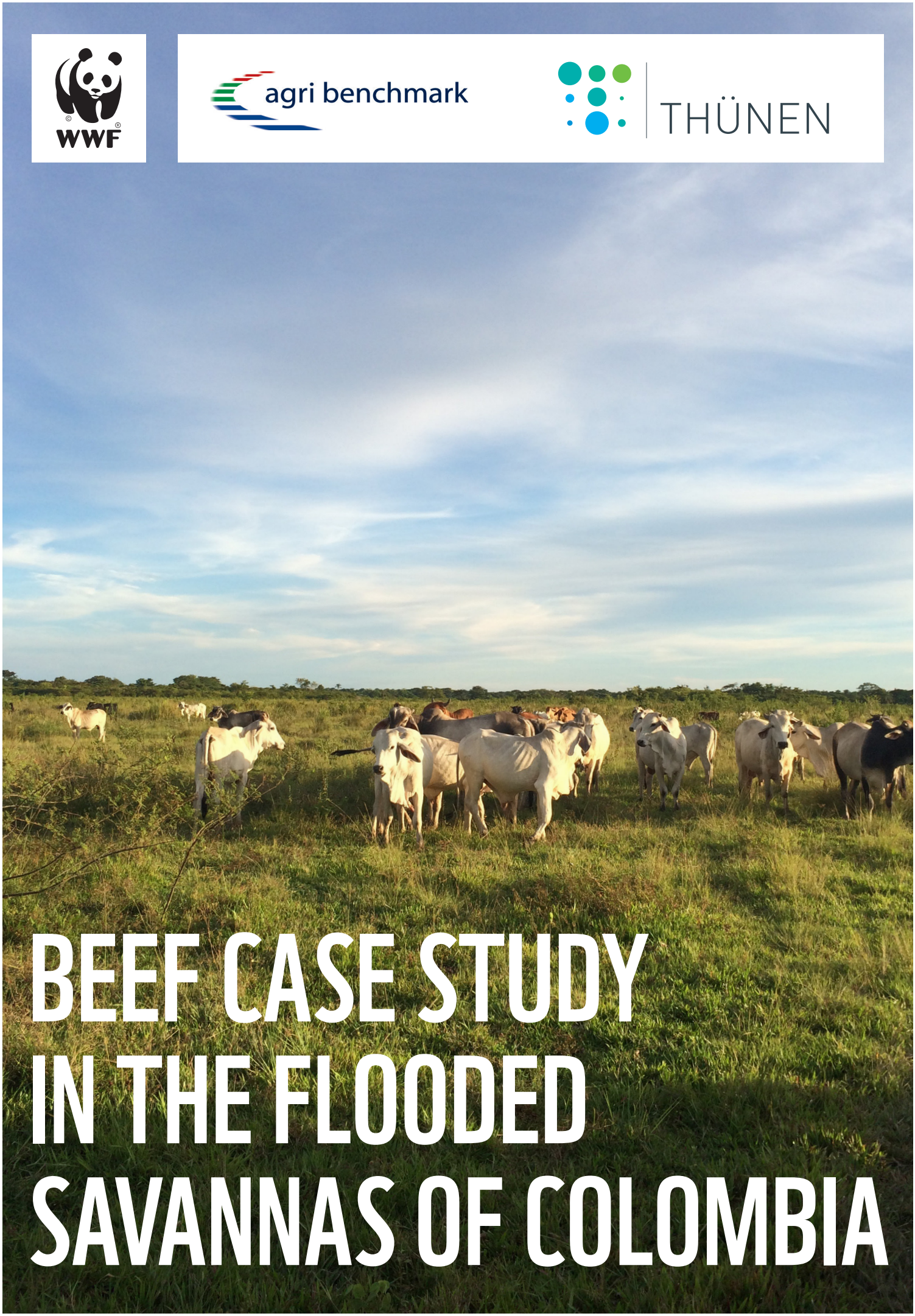

BEEF CASE STUDY IN THE FLOODED SAVANNAS OF COLOMBIA

Credits

We would like to express our thanks to the following contributors to the report:

- The producers, Eduardo Martinez, Libia Parales and Gilma Madrid
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1 Executive summary

Cattle ranching in harmony with nature

Cattle ranching in the flooded savannas can produce agricultural output while at the same time managing natural resources in a sustainable way. These systems are under threat from the expansion of crop production systems like palm oil and rice, which are usually more profitable on a per ha basis. Improving the profitability of cattle ranching by implementing Best Management Practices (BMPs) could reduce the risk of land use change and its negative impacts on biodiversity and the environment. A case study carried out in the Yopal region of Colombia, in close cooperation with producers and regional experts (focus groups), demonstrates the potential of such BMPs.

A cow-calf reference situation (status quo, "Baseline") was defined for cow-calf as well as for backgrounding systems and quantified in terms of land use, animal performance and economic results. The Baseline is characterised by relatively low animal performance and productivity as well as by low input ('low output – low input'). The medium-term profit (total returns less cash costs less depreciation) is USD 18-27 per ha, which provides an income of USD 35,000 – 54,000 for the owner (family). In the long-term, the opportunity cost also has to be taken into account and can influence profitability significantly. This is where the competition of crop-based land uses becomes relevant together with the related environmental impacts.

When defining and analysing the possible BMPs, the focus groups showed that only moderate modifications of the production systems are appropriate, if the existing ecosystem is to remain intact. The main modifications include the management of herd fertility, the feeding of minerals, the introduction of a rotational grazing system, combined with the provision of nutritional blocks and improved water access, all of this in line with the implementation of advisory services. Significant investments are necessary for the implementation of BMPs, for which access to capital and loans is a precondition. For organisational reasons and in order to reduce risk, it is better to establish BMPs gradually. When fully established, BMPs clearly show significant improvement in animal performance (increased cow numbers, fertility, weaned calves per year, reduced weaning periods, increased weaning weights). This leads to an increase in profitability of between 85 and 300 percent. Thus, BMPs make it possible to maintain the productive system and make it more profitable on the same amount of land without negative ecological impacts, or to produce the same amount of agricultural products on less

land, allowing the remaining land to be used for conservation, as carbon sinks or to keep hydrological dynamics and avoid taking more land into production

Increase in profitability without negative ecological impacts

This publication is one of the results of the IKI project "Land Use Change in Savannahs and Grasslands – Approaches by Policy Engagement, Land Use Planning and Best Management Practices" briefly "Sulu" (for sustainable land use). It aims at strengthening land use planning and management in the Orinoco savannahs (Colombia) and the Pantanal (Paraguay) with climate criteria, as well as with the conservation and maintenance of carbon stocks, biodiversity and hydrological regimes, and at contributing to a more sustainable agro-industrial production.

Livestock farming in flooded savannahs can be a productive activity and at the same time manage natural resources in a sustainable way. However, these systems are under threat from the expansion of crop production systems, such as oil palm and rice, which tend to be more profitable per hectare. Improving the profitability of these livestock through the implementation of a range of practices and approaches could reduce the risk of land use change and the corresponding negative impacts on biodiversity and the environment. To show the potential of the above-mentioned practices, the following analysis was carried out in close cooperation with producers and regional experts. The results show that by implementing the proposed practices and approaches, a significant improvement in animal performance is evident, giving a clear opportunity to produce and preserve at the same time. This economic analysis is accompanied by other research and publications aimed at strengthening the traditional cultural practices that have been in place in the flooded savannah region for more than 500 years. Implementing these practices contributes to the reduction of GHG emissions, to the improvement of production parameters of livestock in flooded savannahs and conserves the biodiversity and hydrological dynamics of the ecosystem. The practical guide "Ganadería climáticamente inteligente: comprendiendo un modelo que convive con las sabanas de la Orinoquia", describes these management practices for producers and technicians.

2 Introduction

Cattle ranching in the Colombian flooded savannas can produce agricultural output while at the same time managing natural resources in a sustainable way (Peñuela, L., et al, 2017). These systems are under threat from the expansion of crop production systems like palm oil and rice, which are usually more profitable on a per ha basis. Improving the profitability of cattle ranching by implementing Best Management Practices (BMPs) could reduce the risk of land use change and its negative impacts on biodiversity and the environment.

The main objective of the study was to provide evidence regarding the feasibility and extent of such interventions as well as their expected results. For this, a detailed farm level analysis is required, which needs the following ingredients:

» To obtain realistic results: a cooperation with local producers and experts is required to a) quantify the status quo, b) identify, define and quantify the BMPs and c) crosscheck the results obtained.

» To perform the calculations and analysis: methods and tools are required to collect, process and present the farm-level information and results in a consistent, comparable and understandable way.

Through the global network *agri benchmark*, the Thünen Institute of Farm Economics provides the tools and the expertise to fulfil these criteria (see details in chapter 3 of this report).

3 Activities, workflow and methods

Together with WWF staff, the project region was selected. As the SuLu project has a focus on extensive beef production in flooded savannas and the related issues with biodiversity and sustainable land use, the region around the provincial city Yopal was selected for the case study.

Collecting local knowledge in the project region

Ernesto Reyes, responsible for the project implementation with *agri benchmark* carried out three visits to the project region. During those visits, three workshops were carried out: one to gather information, one to present results and one as a field visit. In order to contextualise and align national and regional visions, two experts on livestock production and sustainability were invited (experts from the Project on Mainstreaming Sustainable Cattle Ranching in Colombia, and the Regional Round table for Sustainable Beef). Local and detailed knowledge of applied research were provided by advisors from Fundación Horizonte Verde (FHV), as well as by local producers, who have conducted case studies and pilots on their farms with FHV technical assistance. The following activities were carried out:

April 2017: Data collection for the Baseline

August 2017: Discussion of the Baseline results and date collection for the scenarios

April 2018: Discussion of scenarios' results

September 2018: Final results discussion for Colombia and Paraguay *agri benchmark* methods and tools were provided for analysing and modelling the data (see Deblitz, 2018).

Data collection

The main source of data was farm level information. The information was gathered through field visits to the project region. A group of expert technicians and advisors gathered to discuss and complement the data supplied by the local producers. Available regional studies (Peñuela, L., et al, 2017, Peñuela, L., et al, 2014, Peñuela, L., et al, 2012, Peñuela L., et al 2011) were also consulted and discussed.

Data processing and analysis

The TIPI-CAL model from the *agri benchmark* Network was used to simulate the 10 year period of BMP introduction. TIPI-CAL is a production and accounting model and assessment tool. It has a 10 year dynamic-recursive structure and produces a profit and loss account, a balance sheet, a cash flow for the whole farm and all enterprises considered for each of the 10 years of simulation. It further provides very detailed information on activity levels, performance and productivity of the enterprises such as herd size, reproductive performance, milk yields, weight of animals, feed rations, mortality, weight gains, etc. For this project and in line with the standard operating procedure to define typical farms (Deblitz and Zimmer, 2018), real farms were taken as a basis and then 'typified', i.e. individual particularities were replaced by regionally typical data.

Illustrating the potential of BMPs of the production system

Assumptions for the calculations

This case study can serve as an illustration of the potential of a very common production system. It can show the effects of Best Management Practices on a given piece of land, which then provides the potential for a more productive and economically profitable system, creating a balance between conservation and production, making it a very special cattle ranching case. The study cannot provide a quantification of regional or national land use optimisation. With respect to data availability and quality, we found several specific situations. Particular observations can be summarised as follows:

- When discussing main baseline components, it was a challenge to define the feeding conditions for the region and farms: seasonal variations, a significant number of different native species (straws, grasses, legumes, etc.) and seasonal herd movements (from wet to dry regions) were the reasons.

- Consequently, when modelling forage production, animal requirements were used as a basis, and according to the number of animals in each age group, the total requirements were calculated.

- Despite all these limitations, participants in the workshops were able to list most of the native species, and their particular predominance over the year; most of this information was based on the work carried out by Fundación Horizonte Verde (Peñuela, L., et al, 2011).

- For modelling the alternative scenario, all investment requirements were reflected, assuming commercial credit conditions available in the region. The analysis does not include the farm owner monetary requirements to cover living expenses.

- Input and output prices for 2016 were used, assuming average annual prices and a “normal” year (avoiding special conditions like drought, extraordinary diseases, etc.).

- For modelling the adoption of BMPs, a stepwise approach was selected, assuming time periods (usually between 1-2 years) to obtain first results for each strategy.

- This first approach to measure land use in terms of production system economics, could provide the basis for future analysis. As some of the information requirements have been based on several assumptions (due to lack of information), further improvements to this aspect are needed.

4 Main results

In the following, we are presenting the results for the Baseline and the Best Management Practices (BMPs, scenarios). We are not only showing the Baseline and the final year of BMP implementation, but also how the main indicators develop in the transition period from the Baseline to full implementation of the BMPs.

4.1 Baseline

The Baseline is the reference system for BMPs. Synonyms would be ‘status quo’ or ‘business as usual’. The Baseline is often – but not always – characterised by some deficits in the area of management, land use efficiency, performance, environment (mainly emissions, biodiversity, nutrient availability, water use, etc.), economics and animal welfare. These deficits are addressed when identifying, specifying, quantifying BMPs jointly with local producers and experts (advisors, researchers). We have identified two Baselines, which can be seen to reflect the typical farming situation in the project region:

Traditional cow-calf systems on natural savannnahs

1. **Cow-Calf only** on natural savannas

2. **Cow-Calf and backgrounders** on natural savannas. Backgrounding consists of feeding weaned calves to add weight before they are sent to a feed yard for grain-finishing or to another farm for grass-finishing. The backgrounders are then heavier than the weaned calves but lighter than finished cattle. This baseline, adding backgrounders, could be a seasonal decision based on the region selected with better conditions, cattle prices, and/or the forecasting of grass production according to the seasons.

Tables 1 and 2 provide an overview of the most important system characteristics of the two Baselines.

» In the **Cow-Calf only** Baseline all males and a proportion of females are sold to other farms for backgrounding and finishing. Productivity levels are rather low and each cow produces less than half a weaned calf per year. Weaning weights are low and mortality rates relatively high. There is no subdivision and cows graze on large paddocks with little supervision of staff. Feed supply is limited in terms of quantity and quality and there is a deficit of minerals.

» The **Cow-Calf plus Backgrounding** Baseline is more or less identical, h the difference being that 50 percent of the males are transferred to the own backgrounding enterprise, depending on the availability of additional grass. The **Backgrounding** Baseline is also characterised by low productivity of the animals in terms of long backgrounding periods of more than 2 years and associated low daily weight gains of less than 300 g per day. The reasons are similar to those for the cow-calf enterprise.

» Technical advisory assistance and advanced grassland management such as subdivision are not available in any of the Baselines.

Table 1 Production system description – Baseline Cow-Calf on natural savannas

Year of analysis	2016	
Production system	Cow-Calf only on natural savannas	
Land use (number of hectares)	2000 ha (1600 ha on natural savanna and 400 ha on forest)	
Labour	1 foreman + wife	
	2 cowboys	
	1 casual labour	
	No family labour	
Financial policy	No credits	
Feeding system	Grazing on natural savannas, moving herds according to grassland seasonal availability	
Supplementation strategy	Salt	
Technical advisory service	Not available	
Number of cows	600	
Age at first calving (months)	40	
Weaning rate **(No. of calves per 100 cows and year)***	43 %	
Number of weaners per year	258	
Weaning age female / male (days)	365/365	
Weaning weight female / male (kg LW)	160/160	
Weaners:	Only Cow-Calf	Cow-Calf + Backgrounding
Males sold (%)	100 %	50 %
Males transfered to backgrounding (%)	0 %	50 %
Females sold (%)	46 %	
Females kept (%)	54 %	
Cows mortality rate (%)	1 %	
Weaners mortality rate (%)	10 %	

* Weaning rate is a measure of the physical productivity of the farm. It is calculated as the number of calves weaned per 100 cows and year. It summarises in one indicator pregnancy rate, birth rate and calf mortality rate.

Source: Local expert focus groups and own calculations using the *agri benchmark* tools.

Table 2 Production system description – Baseline Backgrounding on natural savannas

Year of analysis	2016
Production system	Cow-Calf only and Backgrounding on natural savannas
Land use (number of hectares)	2000 ha (1600 ha on natural savanna and 400 ha on forest)
Labour	1 foreman + wife
	2 cowboys
	1 casual labour
	No family labour
Financial policy	No credits
Feeding system	Grazing on natural savannas, moving herds according to grassland seasonal availability
Supplementation strategy	Salt
Technical advisory service	Not available
Number of weaners transferred to backgrounding (50 % of male weaners)	58
Age at start of backgrounding (days)	365
Age at end of backgrounding (months)	38
Period of backgrounding (months)	26
Weight at start of backgrounding (kg LW)	160
Weight at end of backgrounding (kg LW)	380
Weight gained (kg)	220
Daily weight gain (grams per day)	282

Source: Local expert focus groups and own calculations using the *agri benchmark* tools.

Table 3 Profit and Loss Account of the Baselines (USD total values per hectare and year 2016)

	Cow-Calf only		Cow-Calf and Backgrounding	
	USD per farm	**USD per ha**	**USD per farm**	**USD per ha**
1 Total Returns				
1.1 Market receipts of the enterprises				
Cow calf market receipts	64,157	32.1	64,157	32.1
Beef finishing market receipts			33,653	16.8
Total market receipts	64,157	32.1	97,810	48.9
1.2 Other returns				
Interest on savings	720	0.4	1,063	0.5
Sum other returns	720	0.4	1,063	0.5
1.3 Total Farm Returns	64,877	32.4	98,872	49.4
2 Total Input				
2.1 Total variable costs crop and forage	1,640	0.8	1,640	0.8
2.2 Cow calf				
Purchase feed costs	2,153	1.1	2,153	1.1
Other fixed and var. costs	492	0.2	492	0.2
Total expenses cow calf	2,645	1.3	2,645	1.3
2.3 Beef finishing				
Animals			14,268	7.1
Purchase feed costs			270	0.1
Other fixed and var. costs			535	0.3
Total expenses beef finishing			15,073	7.5
2.4 Total fixed expenses	1,460	0.7	1,460	0.7
2.5 Total labour expenses	20,270	10.1	20,270	10.1
2.6 Total interest on liabilities				
2.7 Depreciation				
Machinery econ. accounting	1,939	1.0	1,939	1.0
Buildings econ. accounting	1,282	0.6	1,282	0.6
Total farm depreciation	3,221	1.6	3,221	1.6
2.8 Total Farm Input	29,236	14.6	44,309	22.2
3 Farm profit	35,640	17.8	54,563	27.3

Source: Local expert focus groups and own calculations using the agri benchmark tools.

Table 3 shows the profit and loss account of the two Baselines on the whole-farm level (USD per farm) and on a per ha basis (USD per ha).

» The profit and loss account reflects all returns and all costs except opportunity costs. Opportunity costs for these farms are only land because the owner does not work on their own farm and all labour is hired. Thus, land costs are not included in this statement, as all land is owned by the producer. The profit is the difference between the total returns and the costs stated and can be considered a medium-term profitability.

» In economic terms, the system can be labelled 'low output – low input'. Total returns per ha are only USD 32 for the Cow-Calf only Baseline and USD 49 for the Cow-Calf plus Backgrounding Baseline, which is 50 percent more. Costs as well as profits are also 50 percent higher in the Cow-Calf plus Backgrounding situation.

» The medium-term profit – calculated as total returns – expenses – depreciation – per farm is USD 35 000 and USD 54 000, respectively, in the two Baselines (USD 17.8 and 27.3 per ha, respectively). The profit margins (profit divided by returns) are 55 percent in both Baselines. This constitutes a relatively high level and provides a relatively low incentive to make changes to the system in the short to medium-term.

Profit margins of 55 percent in the baselines

For a long-term consideration of profitability, the opportunity costs of own production factors (family labour, own land and capital/equity) have to be considered.

» It reflects the fact that family labour could earn a salary outside of the farm, own land could be rented out to other producers or investors and instead of investing in equipment; the money could be taken to a bank to earn interest. In the case studies analysed, opportunity costs for labour are zero (only employed, paid labour) and capital is negligible.

» Thus, the main opportunity cost of both Baselines is land. This was valued by the producer and expert groups with a rental price of USD 39 per ha. In an international context, this is exceptionally low. However, multiplied by the 2,000 ha the total opportunity cost for land add up to USD 78,000 in both Baselines.

» Deducting the opportunity costs from the medium-term profit, results in the return to management. The return to management for the farm owner is only USD –43,000 (USD –21.5 per ha) and USD –24,000 (USD –12 per ha), respectively. This means that when applying the

above rental price and from a long-term perspective, the businesses are significantly less profitable.

However, two aspects that should be mentioned in this context are:

» The above calculations only reflect the pure economic situation. That would not be an issue if all deliverables of the system were reflected and priced-in. However, environmental and biodiversity benefits are not priced and therefore not reflected as returns to the system, thus reducing the profitability.

» The producers usually do not consider the long-term and it is not an exception that the return to management can be negative. In the long-term, however, low profitability creates an incentive to change land use to a more profitable option, if available, for example rice production.

Table 4 Elements of the 10 years BMP strategy

Strategy	2017	2018	2019	2020	2021	2022	2023	2024	2025
Information management system	X	X	X	X	X	X	X	X	X
Herd fertility management program	X	XX	XXX	XXX	XXX	XXX	XXX	XXX	XXX
Technical advisory service + (information system, herd fertility and health programs, grassland management)	X	X	XX	XX	XX	XXX	XXX	XXX	XXX
Formulated mineral salt	X	X	X	X	X	X	X	X	X
Implementing rotational grazing programs	X	X	XX	XX	XX	XXX	XXX	XXX	XXX
Supplementing programs (nutritional blocks only for cows)		X	XX	XX	XX	XXX	XXX	XXX	XXX
Water management (wells, wind mills, drinking points)	X	X	XX	XX	XX	XXX	XXX	XXX	XXX
Land units for crop production and soil improvement (banana trees)	X	X	XX	XX	XX	XXX	XXX	XXX	XXX

Note: The number of ‚x' indicates an increasing level of the intervention
Source: Local expert focus groups

4.2 Best Management Practices (BMPs)

The term 'Best Management Practices' was chosen to illustrate the more sustainable scenario(s) compared to the Baseline(s).

BMPs are the result of local and international expertise

- BMPs are not necessarily limited to changes in management but can also include investments, inputs, genetics, grass varieties, etc.
- The BMPs are not a result of some theoretical model approach, their identification, specification and quantification and validation were carried out jointly between Fundación Horizonte Verde previous work, local producers and experts as well as *agri benchmark* staff.

Table 4 shows a list of the elements identified for the BMP strategy. The main BMP interventions to the Baseline address are of relatively 'low-invasive' character and comprise the following elements:

- establishment of technical advisory services,
- management of the herd fertility in terms of individual animal identification, classifying animal groups according to their physiological condition (e.g. pregnant cows, heifers, calves, etc.), implementing a regular pregnancy test detection and using fertility individual indicators for discarding cows.
- introduction of feeding minerals using formulated mineral salts,
- introduction of a rotational grazing system for better use of forage availability,
- provision of nutritional blocks for pregnant cows and an improvement of water access, and
- use of specific small paddocks for cash crops (bananas, cassava and maize) for own consumption and generation of additional income.

Table 4 also shows that the elements are introduced stepwise and not all in one go. The reasons are

a) capacity limits of the management, b) restrictions on capital and loan availability and c) not all elements are required immediately and at the same time.

BMPs and change of management have multiple benefits

A total of approximately USD 22,000 in investments (slightly more than USD 10 per ha) is needed, most of it in the first and second year of implementation. This amount corresponds to approximately 60 percent of the annual profit for the Cow-Calf only Baseline and 40 percent of the annual profit of the Cow-Calf plus Backgrounding Baseline. It is financed through credits with a nominal interest rate of 12 percent. Table A.1 in the Annex shows the amounts and the timing of the required investments.

The following pictures illustrate some of the elements of the Baseline and are introduced in the BMPs

1. *Water tanks + land subdivision*
2. *Mineral salt supplementation*
3. *Corrals for herd management*
4. *Small paddocks for cash crops*

Table 5 illustrates the changes of all performance and technical parameters from the calculations for the BMP implementation phase. Tables 6 and 7 show the economic results for the implementation period in total USD and USD per ha. The change in management has multiple benefits.

» The *additional labour* requirement is provided partially through the employment of another cowboy and the input of one of the family members.

» The improvement of herd management gradually leads to a significant increase in productivity from 43 to 70 percent weaned calves in the last year of implementation. This increase is made possible by the increase in cow fertility, better management, improvement of the forage quantity and quality (through subdivision and better use of the grassland), the introduction of mineral salt and nutritional block feeding and the reduction of mortalities among weaners and cows, all

of which is accompanied by a technical advisory service.

- The introduction of the rotational grazing system combined with additional feeding allows a gradual increase in the number of cows from 600 to 640.

- The measures also allow the weaning period to be reduced, while at the same time the weaning weights are increased, thus further contributing to the amount of live weight produced by the system.

- The replacement rates and therefore the proportion of heifers kept remain the same. 50 percent of all male weaners and still 46 percent of all female weaners are sold. This leads to a cow surplus after replacement, generating additional sale returns.

- In the backgrounding enterprise the only differences were the increased entry weights from the improved cow-calf enterprise (from 160 kg to 180 kg LW) and increased final weights (from 380 kg to 400 kg). At the end of the BMP implementation period, the entry weights at start of backgrounding increase but so do the final weights. As a consequence, and due to the fact that backgrounding periods remain unchanged, the daily weight gain does not change. Further possible changes were discussed but not included.[1]

- With the changes described above, it is not surprising that returns, costs and profits increase significantly. The main driver of the system is the increase in total returns which go up from roughly USD 99,000 in the Baseline (Cow-Calf plus Backgrounding) to USD 175,000, i.e., an increase of 75 percent. Costs increase by around 70 percent to USD 75,000, resulting in an increase in farm profit of almost 83 percent to almost USD 100,000.

Per ha profit increases from USD 27 to 50

- The per ha profit increases from USD 27 to USD 50.

- Considering the opportunity costs for land and the 'new' opportunity costs for family labour, the return to management is almost USD 13,000. This remains a low value but it is at least positive when compared with the Baselines.

1 If we analyse all major changes, they are focused on BMPs to the cows (herd management, mortality, strategic feeding and so on). Improving backgrounding conditions was out of the scope of this exercise (agreed by the focus group) but will be possible at a later stage. There are some farms that introduce pasture management and other species (mainly brachiarias), which can reduce finishing periods, but we believed that this change was too complex and monocultures of introduced species have the potential to significantly change the ecosystem's balance. Further, backgrounding is always a decision depending on seasonality and prices (weaners) and therefore is not the main focus.

Table 5 Technical results of the BMP implementation (from baseline / year 0 to year 9 of implementation)

Year of analysis	**2016**	**2017**	**2018**	
Year of implementation	0	1	2	
Production system	Cow-Calf + backgrounding			
Labour				
Foreman + wife (units)	1	1	1	
Cowboys (units)	2	3	3	
Casual labour (hours)	2,400	2,400	2,400	
Family labour (hours)	0	2,100	2,100	
Financial policy / credits				
Credit amount taken in the year	no	12,989	6,560	
Feeding system	Grazing natural savannas	Rotational grazing		
Supplementation strategy	Common salt	Formulated salt		
Technical advisory service	no	yes		
Cow-Calf				
Number of cows	600	605	610	
Age at first calving (months)	40	40	40	
Weaning rate (No. of calves per 100 cows and year)	0.43	0.50	0.55	
Number of weaners per cow and year	258	303	336	
Weaning age female / male (days)	365/365	365/365	365/365	
Weaning weight female / male (kg)	160/160	160/160	160/160	
Male weaners sold (%)	50 %	50 %	50 %	
Males transfered to backgrounding (%)	50 %	50 %	50 %	
Females sold (%)	46 %	46 %	46 %	
Females kept (%)	54 %	54 %	54 %	
Cows mortality rate (%)	0.5 %	0.3 %	0.3 %	
Weaners mortality rate (%)	10 %	8 %	6 %	
Backgrounding				
Weaners transferred to Backgrounding (no.)	58	58	70	
Age at start of Backgrounding (days)	365	365	365	
Age at end of Backgrounding (days)	1145	1145	1145	
Period of Backgrounding (months)	26	26	26	
Weight at start of Backgrounding (kg LW)	160	160	160	
Weight at end of Backgrounding (kg LW)	380	380	380	
Weight gained (kg)	220	220	220	
Daily weight gain (grams per day)	282	282	282	

Source: Local expert focus groups and own calculations using the *agri benchmark* tools.

	2019	2020	2021	2022	2023	2024	2025
	3	4	5	6	7	8	9
	1	1	1	1	1	1	1
	3	3	3	3	3	3	3
	2,400	2,400	2,400	2,400	2,400	2,400	2,400
	2,100	2,100	2,100	2,100	2,100	2,100	2,100
	no	1,082	no	no	1,082	no	no
	Nutritional blocks (only lactating cows)						
	615	620	625	630	635	640	640
	40	38	38	36	36	36	36
	0.55	0.60	0.60	0.65	0.65	0.70	0.70
	338	372	375	410	413	448	448
	240/240	240/240	240/240	240/240	240/240	240/240	240/240
	180/180	180/180	180/180	180/180	180/180	180/180	180/180
	50 %	50 %	50 %	50 %	50 %	50 %	50 %
	50 %	50 %	50 %	50 %	50 %	50 %	50 %
	46 %	46 %	46 %	46 %	46 %	46 %	46 %
	54 %	54 %	54 %	54 %	54 %	54 %	54 %
	0.3 %	0.3 %	0.3 %	0.3 %	0.3 %	0.3 %	0.3 %
	6 %	6 %	6 %	6 %	6 %	6 %	6 %
	79	80	88	89	97	98	106
	365	365	365	365	365	365	365
	1145	1145	1145	1145	1145	1145	1145
	26	26	26	26	26	26	26
	160	180	180	180	180	180	180
	380	400	400	400	400	400	400
	220	220	220	220	220	220	220
	282	282	282	282	282	282	282

Table 6 Profit and Loss Account during the BMP implementation period (USD total values)

	2016	2017	2018	
1 Total Returns				
Tree returns				
Cow-Calf market receipts	64,157	64,157	72,645	
Beef finishing market receipts	33,653	33,653	33,653	
1.3 Total Farm Returns	98,872	98,585	107,071	
2 Total Input				
2.1 Total variable costs crop and forage	1,640	1,640	1,640	
2.2 Total expenses Cow-Calf	2,645	10,095	10,417	
2.3 Total expenses beef finishing	15,073	15,304	18,353	
2.4 Total fixed expenses	1,460	3,428	3,034	
2.5 Total labour expenses	20,270	24,669	24,669	
2.6 Total interest on liabilities	0	1,559	2,257	
2.7 Total farm depreciation	3,221	5,025	5,681	
2.8 Total Farm Input	44,309	61,719	66,051	
3 Farm profit	54,563	36,866	41,020	

Source: Local expert focus groups and own calculations using the *agri benchmark* tools.

Table 7 Profit and Loss Account during the BMP implementation period (USD per ha)

	2016	2017	2018	
1 Total Returns				
Tree returns				
Cow-Calf market receipts	32	32	36	
Beef finishing market receipts	17	17	17	
1.3 Total Farm Returns	49	49	54	
2 Total Input				
2.1 Total variable costs crop and forage	1	1	1	
2.2 Total expenses Cow-Calf	1	5	5	
2.3 Total expenses beef finishing	8	8	9	
2.4 Total fixed expenses	1	2	2	
2.5 Total labour expenses	10	12	12	
2.6 Total interest on liabilities	0	1	1	
2.7 Total farm depreciation	2	3	3	
2.8 Total Farm Input	22	31	33	
3 Farm profit	27	18	21	

Source: Local expert focus groups and own calculations using the *agri benchmark* tools.

	2019	2020	2021	2022	2023	2024	2025
	3,638	3,638	3,638	3,638	3,638	3,638	3,638
	78,845	80,937	88,416	89,328	96,412	97,324	105,590
	33,653	42,882	52,825	57,797	62,769	63,390	64,012
	116,943	128,425	146,279	152,280	164,477	166,099	175,098
	1,640	1,640	1,640	1,640	1,640	1,640	1,640
	10,753	10,032	10,151	10,360	10,489	10,709	10,775
	20,800	21,262	23,382	23,714	25,708	25,972	27,958
	3,034	3,034	3,034	3,034	3,034	3,034	3,034
	24,669	24,669	24,669	24,669	24,669	24,669	24,669
	2,113	1,951	1,770	1,567	1,470	1,208	915
	5,681	6,042	6,042	6,042	6,403	6,403	6,403
	68,689	68,630	70,687	71,026	73,412	73,635	75,393
	48,254	59,795	75,592	81,254	91,065	92,464	99,705

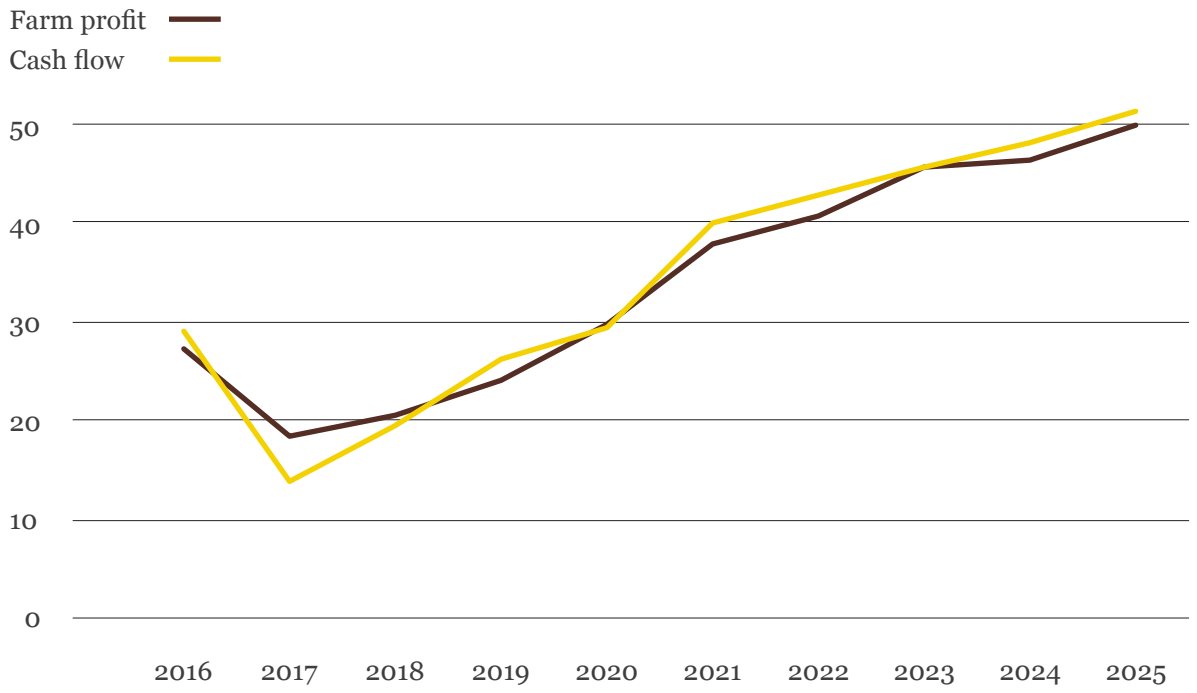
	2019	2020	2021	2022	2023	2024	2025
	2	2	2	2	2	2	2
	39	40	44	45	48	49	53
	17	21	26	29	31	32	32
	58	64	73	76	82	83	88
	1	1	1	1	1	1	1
	5	5	5	5	5	5	5
	10	11	12	12	13	13	14
	2	2	2	2	2	2	2
	12	12	12	12	12	12	12
	1	1	1	1	1	1	0
	3	3	3	3	3	3	3
	34	34	35	36	37	37	38
	24	30	38	41	46	46	50

Figure 1 shows farm profit as well as cash flow in the implementation period.

» Cash flow decreases as does farm profit in the first two years of the implementation period, before the increase in returns starts to over-compensate the increase in costs.

» The risk involved in the implementation of BMPs appears to be quite manageable. The main reason for this is a) the relatively profitable situation in the Baseline with low levels of debt and interest payment and b) the relatively low amount of investment required.

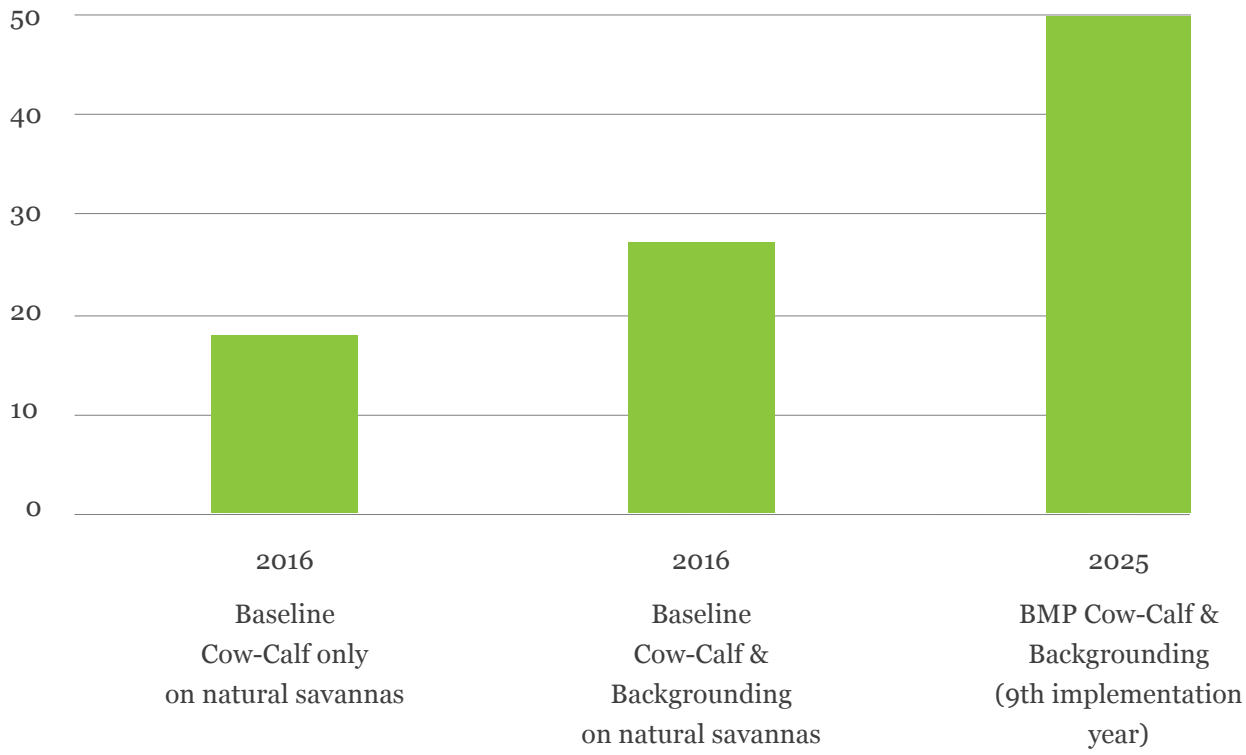
Figure 1 Profit and Loss Account and Cash Flow during the BMP implementation period (USD/ha)



Source: Local expert focus groups and own calculations using the *agri benchmark* tools.

Figure 2 illustrates the situation of the two Baselines and the BMP, measured as farm profit per ha. The profit of the BMP is almost three times higher than the Cow-Calf only Baseline and 85 percent higher than the Cow-Calf plus Backgrounding Baseline.

Figure 2 Comparing Baselines and BMP profits (USD/ha)



Source: Local expert focus groups and own calculations using the *agri benchmark* tools.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5 Conclusions and recommendations

The case studies provided a clear picture of the present production system and its development options. Beyond the case study level, the following remarks can be made.

A system already well adapted to natural conditions

» One of the key conclusions of the focus group was that the current regional production system is already well adapted to the natural ecosystems, and coexists together with its own ecological processes (e.g. water dynamics), so it represents a conservation opportunity (not only ecological, but also cultural). Farmers have learnt to manage seasonal water flows and use a great variety of native forage species (legumes, grasses and straws).

Improving a well adapted system to compete with alternative land uses

» Nevertheless, and in order to improve the current low land productivity, there is still a "gap to close" on natural resource use efficiency. This situation is of relevance if the current land use is to compete with other alternatives.

Moderate interventions for the BMPs

» The BMP scenarios consider measures aiming to improve nutrition and herd reproductive performance. This improvement can be achieved by applying an integral programme of water management, paddock subdivision, strategic supplementation and the provision of an integral and regular advisory service.

» Most of the measures proposed tend to improve basic managerial factors in terms of herd, water, forage and feeding management as a first stage in this efficiency programme. Once other key processes, such as integral advisory services, and value chain consolidation are strengthened, further efficiency improvements should be explored, e.g., increasing stocking rates, reducing production periods, increasing number of productive cycles per year, increasing and, or adding beef finishing units.

Regional research and advisory services needed

Advisory services are key

» Advisory services are the most important factor for accompanying the adoption of BMPs. Supporting and funding of advisory services is certainly a role for governments and public institutions.

» Advisory service programmes should have an integrated approach in terms of sustainability and production system economics and the ability to link all the production system factors to this vision.

» In the future, it is important to promote regional applied research programmes that quantify forage production in terms of main species contributing to cattle diets, density distribution of these species and protein and energy content for each identified species.

Practice change usually has long-term transition periods

» BMP implementation requires a relatively long period because of the significance, long-term character and interdependency of many measures. Some of the major strategies are based on improving managerial abilities and these changes usually take time.

» When implementing BMPs, it is important to consider that during the first 3 years of adoption, profits decrease by 32 %, 25 % and 12 %, respectively, compared to baseline (year 0). This is a characteristic of most transitions of production systems, which require investments in land, buildings, machines, fences, equipment and livestock.

» The long transition periods impose a liquidity component on the decision making of the producers. It is therefore important, especially for advisory services, to create awareness with the producers about the medium to long-term advantages of such interventions. Without advisory services, it is likely that the majority of producers will not make the change, due to the perceived risk.

Potential threats and land competition

Traditional cattle ranching competing with rice and palm oil

» In general terms, the opportunity cost for land seems to be low. This may lead to the conclusion the current land use could be easily replaced by other production systems providing a higher return to land. However, as we did not measure other land uses (crops) in the project region, is difficult to analyse land competition.

» The two main competing land uses appear to be palm oil and in particular rice production. The expansion of rice production can already be observed in neighbouring areas.

» The BMPs' proposed aim is to improve efficiency and profitability with the main objective being the reduction of risk for land use changes into crops. On the other hand, one of the main threats to regional beef production systems is when native forage alternatives are replaced by monocultures of introduced species (mainly *Brachiarias*). Both the crop and the monoculture option will significantly change the ecosystem's balance.

» The BMPs analysed will not require additional areas for further expansion. However, if the BMPs proposed shall be applied on a wider scale, regional land use policy planning is required in terms of incentives for its adoption or to restrict land use changes.

Funding requirements

- The BMPs show an improvement of the productivity and economic result compared with the Baseline. At the same time, there seems to be a low level of financial risk, i.e. all investments could be covered with own cash.

Extreme climate conditions as a risk for implementation

- Thus, the measures considered in the BMPs do not require a big credit programme: the total investment is only USD 10 per ha. Nevertheless, the first 3 years of implementation can constitute a financial risk (profit can be reduced substantially by 32 %, 25 % and 12 % in the first three years).

- In case the region and stakeholders would like to apply a BMP programme on a wider scale, there are some factors to be considered:
  - A number of advisory services organizations are required, who are able to accompany the adoption process.
  - A policy environment has to be created that could facilitate continuity of the current production systems (to avoid land use changes) and parallel to this a certain type of incentive for adopting the BMP programmes. This also possibly implies setting up a financial programme for the facilitation of the adoption process.
  - In the future, one of the major constraints for farmers to adopt such a programme, is the risk implied (mainly climatic conditions) during the adoption period. As this region has recently suffered extreme climatic conditions, possible programmes should consider insurance schemes that could cover the critical period of BMP implementation (first 3-4 years).
  - Financial programmes facilitating the adoption of BMPs should consider supporting the advisory services provision as well as the consolidation of such organizations (capacity building).

Conclusions on working level

Together possible

This project represents the first joint piece of work between WWF and *agri benchmark*. In the beginning, we had to create a common understanding of the work ahead of us, mainly because we were approaching the tasks from different angles – agricultural production vs. nature protection. However, the project provided a great learning experience for both parties and the overall assessment of the cooperation is very positive.

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7 Annex

Table A.1 BMP strategy – Investments required for implementing BMP (USD total values and /ha)

	Year of		USD	
	analysis	implementation		
Paddocks subdivision	2018	2	6,560	6,560
Water well 1	2017	1	656	
Water well 2	2017	1	656	
Water well 3	2017	1	656	1,968
Wind mill 1	2017	1	1,968	
Wind mill 2	2017	1	1,968	
Wind mill 3	2017	1	1,968	5,904
Water tank 1	2017	1	656	
Water tank 2	2017	1	656	
Water tank 3	2017	1	656	1,968
Mineral feeder 1	2017	1	492	
Mineral feeder 2	2017	1	492	984
Banana trees 1	2017	1	2,165	
Banana trees 2	2020	4	1,082	
Banana trees 3	2023	7	1,082	4,330
Total				**21,714**

Source: Local expert focus groups and own calculations using the *agri* benchmark tools.

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