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Financial sustainability of a public-private partnership for an agricultural development project in Sub-Saharan Africa

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Abstract: Land, water, sun, infrastructure, capital and know-how are needed for any agricultural development. Sub-Saharan Africa has immense natural resources, though often not immediately available altogether in the same place, but is generally short of the other inputs. That is why a public-private partnership can be an effective approach to deal the projects with modern agricultural development: public partner provides land, most of the infrastructure and finance; private partners provide the intensive farming practice, processing know-how and part of the equity. Financial analysis of lower and higher capital demanding scenarios and testing of the impact of changes in the critical drivers of costs and revenues shown that a combination of staple crops and cash crops can be found to balance national food security policy targets and financial appeal for private partners in a mutually satisfactory venture capital. The effect of environmental and infrastructural constraints was also considered, showing how likely-to-happen threats on the side of the implementation of the project may turn into challenging opportunity to climb the agribusiness value chain upward.

Keywords: agribusiness value chain, investment analysis, modern agricultural development projects, project financing

Total project-financed investment grew by a factor of 10 times in a decade: from USD 41.3 billion in 1994 to USD 415 billion in 2013. Esty and Sesia (2014) report that a record USD 57.8 billion in Project Financing funding was arranged in the Western Europe (WE) in 2006, which compares with USD 35.0 billion invested in the United States (U.S.). USD 260 billion funding was globally arranged worldwide during 2014 and in the same year the amount invested in the Project Financing was larger than the amounts raised through the Initial Public Offerings (IPOs) or venture capital funds (Pinto and Alves 2016).

While the use of the Project Financing *per se* for industrial projects such as mines, pipelines and oil fields has a relatively long history, it is applying the Public-Private Partnerships (PPP) approach that it was recently extended to infrastructure projects such as toll roads, power plants, telecommunication systems, as well as schools, hospitals and even prisons (Bayar et al. 2016).

The Project Financing involves the creation of a legally independent project company financed with the limited-recourse debt and with equity from one or more corporate entities (sponsoring firms) for the purpose of financing an industrial or infrastructure project (Esty et al. 2014). Its key ingredient is that the project, its assets, its contracts and its cash flows are segregated from those of the sponsoring company in order to obtain the credit appraisal and the loan for the project, independent from the sponsoring company (Chemmanur and John 1996).

Additionally, public-private partnerships implementing large projects under a Project Financing arrangement exhibit certain unique features (Brealey et al. 1996; Bruner and Langohr 1995):

– projects operate under a concession obtained from the host government;

– the sponsoring company provides a large portion of the equity for the project company and expertise in developing and running the project;

– the host government may provide equity and running capital for the project company, facilitation for authorizations, and fiscal agreements;

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– the sponsoring company and the government may enter into contracts regarding the long-run ownership and operation of the project.

According to Brealey et al. (1996), Esty (2003, 2004a, 2004b) and Corielli et al. (2008), Project Financing creates value and thus reduces funding costs by resolving agency problems, reducing asymmetric information costs and improving risk management. Despite the referred advantages, it is possible to identify the following main problems related to the use of the Project Financing (Esty 2004a, b; Fabozzi et al. 2006; Gatti 2013): complexity, in terms of designing the transaction and writing the required documentation; higher costs of borrowing when compared to conventional financing; the negotiation of the financing and operating agreements is time-consuming. Although these counter-intuitive features of the Project Financing, when compared to corporate financing, Esty (2004b) refer that in practice, the additional costs are more than compensated for by the advantages that arise from the reduction in the net financing costs associated with large capital investments, off-balance sheet financing and appropriate risk allocation.

Many papers studied investment projects using the Project Financing technique, in several areas (mainly in the energy sector, including the non-conventional financial instruments) (Kjærland 2007; Blanco 2009; Muzathik et al. 2012; Monjas-Barroso and Balibrea-Iniesta 2013; Sgroi et al. 2014; Squatrito et al. 2014; Biondi and Moretto 2015; Campisi et al. 2015; Campisi et al. 2016; Morea and Poggi 2016; Campisi et al. 2017; Morea and Poggi 2017) – but no studies were found in the agricultural sector.

In this paper, a financial model based on a PPP approach applied to a major new irrigated agriculture development project in Sub-Saharan Africa is implemented to assess its financial performance from the different standpoints of the partnership partners and under different scenarios of implementation.

The paper provides rough highlights about the input data of the model (costs and revenues), to focus on the suitability and the peculiar aspects of the PPP approach and its background, namely:

– alternative implementation scenarios and sensitivity analysis;

– project authority, farmers and processing enterprises budgets;

– opportunities for fair sharing of costs and revenues among partners.

The study eventually provides a clear picture of the financial feasibility of the project as a whole and its appeal for private investors through the relevant project worth key indicators.

THE CHANCE OF A NEW IRRIGATION PROJECT

It is assumed that a country in the Sub-Saharan Africa has the chance to implement a new irrigated agriculture development project on an area of about 35 000 hectares (ha). It is also considered that, due to the severe environmental constraints preserving the wildland from any kind of unfair exploitation, the land could only be made available by the enlargement of an existing agricultural project, irrespectively to its actual suitability for irrigation: a detailed soil survey mapped out a Zone "A" rated as suitable for both rain-fed and overhead pivot irrigation (S2 and S3 FAO Soil Classification) and any crop extended on about 2/3 of the area, and a Zone "B", the remaining 1/3 of the area, found with a low water holding capacity and therefore rated as suitable for drip irrigation system and exotic crops only.

Centre pivot irrigation is a method of crop irrigation in which the equipment rotates around a pivot and the crops are watered with sprinklers, while drip irrigation allows water to drip slowly to the roots through narrow tubes that deliver water directly to the base of the plant driving water right where it is needed. The latter minimizes dispersion, but entails – higher costs of implementation and operation compared to the former.

Being an essential support for the financial analysis (Gittinger 1985), a cropping pattern is proposed (Table 1) according to many concurrent criteria, such as the soil conditions, water availability, crop rotation and diversification, market potential, food crop versus cash crop balance. It includes cereals, oilseeds, pulses and fodder crop on Zone "A", where the pivot irrigation was considered, and mango trees on Zone "B", with a lower irrigation suitability. The overall crop intensity is 200% in both the zones.

The relevant implementation works consist in head works (reservoir and pumping station), irrigation facilities (distribution pipes, pivot and drip irrigation system), roads, drains and fencing, with the preliminary land preparation works (land clearance and levelling) and complemented by the immigrant labourers' facilities.

COSTS AND REVENUES

The financial model compares revenues and costs taking into account their distribution along the study

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Table 1. Proposed crop pattern

	Crop	Coverage (%)	Zone
Wet season	sorghum	27	A
	sunflower	15	A
	beans	12	A
	alfalfa	6	A
	fruit trees	40	B
	total	**100**	**A + B**
Dry season	maize	24	A
	wheat	18	A
	soybean	12	A
	alfalfa	6	A
	fruit trees	40	B
	total	**100**	**A + B**
Year	**total**	**200**	**A + B**

Zone A – suitable for both rain-fed and overhead pivot irrigation and any crop extended; Zone B – suitable for drip irrigation system and exotic crops only

Source: Author's elaboration

horizon of 30 years, so that the financial inflows and outflows are paired according to the evolution of the implementation and of the relevant production capacity of the Project. Most of the investment costs are assumed to occur in the first four years with an S-curve mode, while the possible investments for the processing plants are extended to year six. On the other hand, production rises according not only to the project implementation, but also to the improvement in attainable yields before achieving soil, crops and cropping maturity. Consequently, a transition period of eight years is considered.

Eventually, in order to allow a separate accountancy into each Partner's budget according to the PPP attribution that will follow, the total amounts are split into "off farm/plant" and "on farm/plant", depending on whether the item lays outside or inside the farm/plant gate.

If considering 35 000 ha area irrigation project, 2/3 pivot and 1/3 drip irrigation equipped, the overall investment costs of about 350 millions of US dollars (M USD) can be assumed (based on market values), where processing plants have a minor share of the investment cost (3%), while on the farm costs alone, referred to field irrigation and field roads, sum up to 25% of the total investment costs.

The annual maintenance costs were estimated as a percent of the replacement asset value (Wireman 2010), assigning specific maintenance ratios (from 2 to 10%) to each item. Maintenance costs for "on farm" works and for the processing plants were therefore estimated in about 4.5 M USD/year (M USD/y), being the remaining 6.6 M USD/y referred to "off farm" works.

The operational costs resume the staff costs of the project authority and any other general purchase of goods or hired services and are estimated as much as the 1% of the construction cost of the Project works plus energy costs for 250 millions m^3 water pumping, leading to the total cost of about 8.6 M USD/y.

The crop production costs are given by the combination of each input requirement (in terms of hours of mechanized or manual works, material inputs such as seeds/plants, fertilizers, pest control products, irrigation water and land) and the relevant unitary cost; due to the proposed approach, the cost for the irrigation water and for the rent of land from the farmers' standpoint is not a given input – differently from the remaining items – but will be assessed as one of the most significant outputs of the financial analysis.

Unlike farming, processing activities show extremely small investment costs compared to the production ones, being the cost of purchasing inputs (fruit, fodder and additional inputs) and operation costs more than 70 M USD/y, to be compared to the expected revenues of about 100 M USD. For these facilities, rather than a long-term return on investment, a short-term profit on revenues ratio is therefore representative of the year-by-year profitability and provision of the working capital results, as being the leading issue for the relevant financial feasibility.

As far as the whole Project is concerned, financial inflows are equivalent to the whole and only total revenues from the agricultural production. Farm gate prices for the crops (and plant gate prices for the processed goods) were figured out through the market and eventually combined with the expected production to give the expected annual revenues: roughly 95 M USD/y for the fully implemented Project and in the mature condition, half from Zone "A" production and half from Zone "B" one.

METHODOLOGY

The study is first of all aimed to assess the financial viability of the Project, i.e. if the inflows (revenues net of direct production costs) generated as a result of each project implementation scenario are able to recover the relevant operation and maintenance costs and capital investment through the elaboration of

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the constant prices discounted cash flow, based on the international guidelines provided by the World Bank (Gittinger 1985) and the European Union (European Commission 2014).

Once the financial performance of the project as a whole is assessed and the best option chosen, the main entities participating in the project (project authority and private partners) will be considered individually and the opportunity of the possible internal compensation to keep each of them on a fair balance is investigated.

For the evaluation of the profitability of the Project, the following indicators were taken into consideration (Thusen and Fabrychy 1993; Campisi and Costa 2008; Gatti 2013; Campisi et al. 2014):

– Net Present Value (NPV (WACC)) > 0;
– Internal Rate of Return (IRR) > WACC;
– Pay-Back Period (PBP) < 15 years.

The Weighted Average Cost of Capital (WACC, assumed 10% according to the market) is the rate that a company is expected to pay on average to all its security holders to finance its assets; therefore, it represents the minimum return that a company must earn on an existing asset base to satisfy its creditors, owners, and other providers of capital, or they will invest elsewhere (Campisi and Nastasi 1993).

FINANCIAL ANALYSIS OF THE PROJECT

In order to choose the best implementation option, the model was run referring to two alternative scenarios:

– a "basic" scenario, where only Zone "A" is implemented applying the relevant crop pattern;
– an "integrated" scenario, where also Zone "B" is cropped introducing mango trees and processing facilities are included.

The "basic" scenario considers infrastructures to irrigate the all and only Zone "A", neglecting Zone "B", unsuitable for the pivot water application. The total investment cost is about 260 M USD, significantly smaller compared to those related to the full implementation, and so are the production costs. Nevertheless, while the revenues and field works costs are linearly depending on the implemented area, a large part of the "off farm" costs (pipes, drains, roads) have to be referred to the overall command area irrespectively to the actual irrigated portion. Mainly for this reason, the estimated NPV (10%) eventually results below zero (–801 M USD), its Pay-Back Period is close to 20 years and the financial profitability in terms of IRR drops down to 5% (< WACC). A detail of the estimated relevant inflows (revenues net of production costs) and outflows (investment, operation and maintenance costs) and the resulting net cash flow for the first 8 years, being constant thereafter, is shown in Table 2.

The "integrated" scenario considers infrastructures to irrigate 100% of the available area with the pivot and drip irrigation and the establishment of three processing plants: mango concentrate, dairy farm and animal feed. The relevant cash flow is illustrated in the Table 3.

Compared to the previous one, it is by far more capital demanding, but much more financially valu-

Table 2. "Basic scenario" cash flow of the project (constant values in millions of US dollars)

	Year							
	1	2	3	4	5	6	7	8
Inflows	1.7	8.0	16.4	24.0	28.3	29.1	29.1	29.1
Outflows	53.6	108.6	86.5	36.6	11.2	11.2	11.2	11.2
Cash flow	–51.9	–100.6	–70.1	–12.7	17.1	17.9	17.9	17.9

Source: Author's elaboration

Table 3. "Integrated scenario" cash flow of the project (constant values in millions of US dollars)

	Year							
	1	2	3	4	5	6	7	8
Inflows	1.7	9.5	20.9	31.3	43.2	64.5	83.0	95.5
Outflows	72.5	147.6	119.2	53.0	22.4	22.4	19.0	19.0
Cash flow	–70.8	–138.1	–98.3	–21.8	20.8	42.0	64.0	76.5

Source: Author's elaboration

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able as well, with the estimated NPV (10%), IRR and Pay-Back Period 151 M USD (> 0), 14.7% (> WACC) and 10 years, respectively. Production costs are significantly higher too, but it can be anticipated that nearly half of them are due to the internal trades among the participating partners (farmers selling goods to the processing plants) and can be therefore managed in the framework of the Project partnership agreements.

The financial analysis above is referred to the best estimate of many variables and parameters, whose possible variations may dramatically impact the performance of the project. To investigate the issue, the most critical drivers of costs and revenues in an irrigation project were tested (i.e. prices, yields, energy costs, investment costs, and implementation schedule) imposing a variation in a range from –30% to +30%, and the relevant value of the IRR of the project was estimated. A synoptic description of the results is given by Figure 1.

Based on these results, it can be said that the financial performance of the "Integrated" scenario is virtually un-elastic as far as the changes in the implementation schedule and in energy costs are concerned. Reduction in yields and sell prices or rising in construction costs have much larger, even though not ultimately compromising effects, being an IRR not far below 5% in the worse registered case. On the other hand, a positive trend in prices or yields may rise the financial internal rate of return of the investment close to or above 20%.

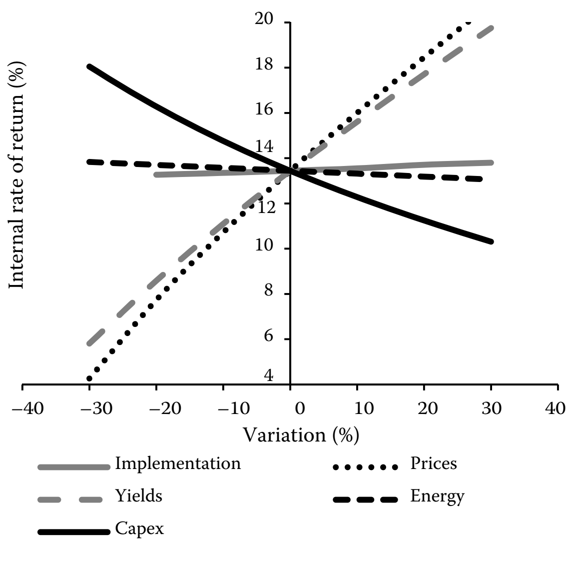

Figure 1. Sensitivity analysis of the financial performance (Internal Rate of Return)

Source: Author's elaboration

FINANCIAL ANALYSIS APPLIED TO THE PUBLIC-PRIVATE PARTNERSHIP APPROACH

The overall project cash flow supported a discussion on the most valuable financial opportunity as far as the whole Project is concerned, eventually leading to choosing of the "integrated" scenario.

Now we are ready to look into the project and focus on the participating partners, each one having its own operating tasks, kind of business to run, risk tolerance and return expectations, access to capital and eventually its own financial budget. Under the proposed public-private partnership approach:

– a project authority (PA) should be established under the public administration; it will own and be in charge of the operation, maintenance and replacement of the main infrastructure of the project, including the head works, the irrigation and drainage infrastructures down to the secondary level, the service roads and any facility outside the farm/plant gate; it will also supply the ready-to-crop land and the required general services for modern agriculture (pressurized irrigation water, rent of agricultural machines);

– the farmers will run the whole agricultural business within the farm gate, earning from the sale of the crops and paying for the relevant production cost such as the manpower hiring, purchasing of services from the PA and of inputs from the market (seeds, fertilizers, pesticides), and eventually the irrigation water, land rent and energy; additionally, the farmers will be responsible for the implementation, operation, maintenance and replacements of any facility within the farm gate (pipes, furrows and drains; pivot and drip irrigation system; field roads);

– the industrialists will process the goods coming from the farms (milk, fodder, and fruit) and will own and operate the relevant processing plants and facilities; they will buy inputs from the farmers and sell the products to the local, national or international market.

Now, revenues and costs will be therefore singled out and assigned to each Partner, according to its own role and responsibility. A "baseline budget" for each partner is initially estimated, assuming no charge for water, land or processing, so that – roughly – all the benefits from the project are withdrawn by the private partners and all the cost of the off farm infrastructure are charged to the PA. Table 4 shows the inflows (and where the PA inflows come from) and outflows, split into investment (capital expenditures

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Table 4. Baseline inflows and outflows of the project and of partners (real values in millions of US dollars/year)

	Year									
	1	2	3	4	5	6	7	8	9	10
INFLOWS										
Project	**1.7**	**9.5**	**20.9**	**31.3**	**43.2**	**64.5**	**83.0**	**95.5**	**95.5**	**95.5**
Project authority	1.2	3.7	5.5	6.1	6.1	6.1	6.1	6.1	6.1	6.1
– Water&Land	–	–	–	–	–	–	–	–	–	–
– Processing	–	–	–	–	–	–	–	–	–	–
– Services	1.2	3.7	5.5	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Farmers	–2.6	–3.7	0.4	7.5	18.0	34.4	48.3	57.8	57.8	57.8
Processing	3.1	9.6	15.0	17.6	19.1	23.9	28.5	31.6	31.6	31.6
CAPEX (capital expenditures)										
Project	**68.1**	**136.2**	**102.1**	**34.0**	**3.4**	**3.4**	**–**	**–**	**–**	**–**
– Project authority	50.1	100.1	75.1	25.0	–	–	–	–	–	–
– Farmers	17.3	34.6	26.0	8.7	–	–	–	–	–	–
– Processing	0.7	1.5	1.1	0.4	3.4	3.4	–	–	–	–
OPEX (operating expenditures)										
Project	**4.4**	**11.4**	**17.1**	**19.0**	**19.0**	**19.0**	**19.0**	**19.0**	**19.0**	**19.0**
– Project authority	3.4	8.6	12.8	14.3	14.3	14.3	14.3	14.3	14.3	14.3
– Farmers	0.9	2.8	4.3	4.7	4.7	4.7	4.7	4.7	4.7	4.7
– Processing	–	–	–	–	–	–	–	–	–	–

Source: Author's elaboration

Table 5. Baseline cash flow of the project and the partners (real values in millions of US dollars/year)

	Year									
	1	2	3	4	5	6	7	8	9	10
Project	–70.8	–138.1	–98.3	–21.8	20.8	42.0	64.0	76.5	76.5	76.5
– Project authority	–52.3	–105.0	–82.4	–33.2	–8.1	–8.1	–8.1	–8.1	–8.1	–8.1
– Farmers	–20.8	–41.2	–29.8	–5.8	13.2	29.6	43.6	53.1	53.1	53.1
– Processing	2.3	8.1	13.9	17.2	15.7	20.5	28.5	31.6	31.6	31.6

Source: Author's elaboration

– CAPEX), operation and maintenance (operating expenditure – OPEX).

It shall be noted that, even though the private partners pay for their production costs and direct investment, the operation and maintenance costs (processing plant OPEX are already included into the processing production costs for budgetary reasons), a large part of the expenditures still lie on the project authority, who will be actually building and running the largest part of the assets without receiving any direct benefit from them. The cash flow originated by the combination of the estimated inflows and outflows (CAPEX + OPEX) for the whole project and for each single participating entity is shown in Table 5, and the relevant cumulated discounted cash flow (WACC = 10%) and the financial performance in the baseline conditions

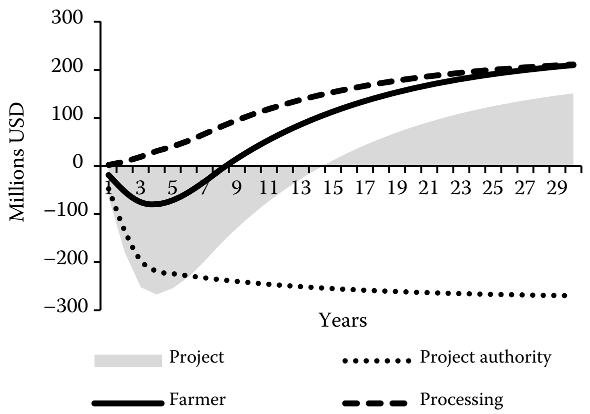

Figure 2. Cumulated baseline cash flow of the project and of the partners (discounted values, 10%)

Source: Author's elaboration

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Table 6. Baseline operating margins of processing and farmers (real values in millions of US dollars/year)

	Year									
	1	2	3	4	5	6	7	8	9	10
Industrialist (%)	71	72	73	74	56	39	33	30	30	30
– Operating profit	3.1	9.6	15.0	17.6	19.1	23.9	28.5	31.6	31.6	31.6
– Revenues	4.3	13.3	20.6	23.8	33.9	62.1	87.4	104.6	104.6	104.6
Farmers (%)	–50	–25	–7	9	27	45	55	59	59	59
– Operating profit	–2.4	–4.3	–2.2	3.4	13.2	29.6	43.6	53.1	53.1	53.1
– Revenues	4.8	17.4	30.4	39.6	49.5	65.9	79.8	89.3	89.3	89.3

Source: Author's elaboration

for the project as a whole and of each one of the partners is elaborated (Figure 2).

It is apparent that farmers and industrialists gain an outstanding return, the most of the cost being borne by the PA: while the private partners jointly have an IRR higher than 40%, no IRR can be calculated for the PA because no positive return is expected. Moreover, the PA is expected to have more than 270 M USD losses (discounted present value) due to the balance constantly remaining in the negative area and no payback opportunity, while the farmers and plant owners gain more than 200 M USD each.

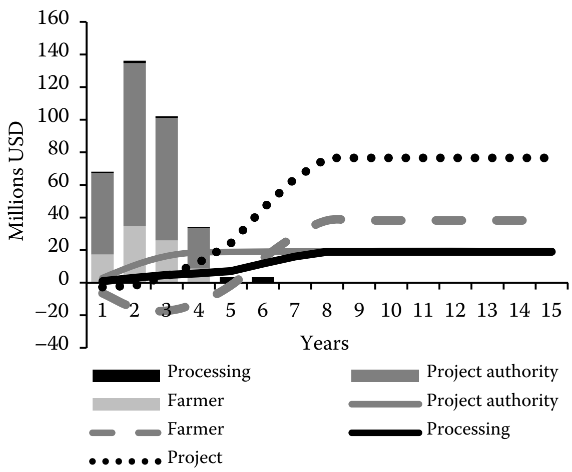

Figure 3. Yearly operating profits (lines) against investments (bars) of the project in the balanced conditions

Source: Author's elaboration

Setting aside the long-term investments return, a complementary understanding on the profitability of the businesses is given by the portion of revenues left over after paying for the variable costs of production. The operating margin is elaborated in Table 6 for both the farmers and industrialists, comparing the relevant yearly operating profits (revenues net of production, operation and maintenance costs) with the corresponding revenues, showing values from 30% to close to 60% from year eight onward.

Once these "baseline" cash flows are found, the opportunity to introduce the internal correction (i.e. financial flows among the Partners) shall be investigated, eventually resulting in a balanced budget. Tariffs, rentals and duties are therefore introduced to divert a fair share of the earnings towards the PA to pay for the investment and running costs it is in charge of, without reducing the private partners' profits below an appealing convenience threshold. In this way, the PA will recover from the farmers and the industrialists part of the benefits they have from the sale of the raw or processed agricultural goods, whose production is eventually a consequence of the combination of the producers' ef-

Table 7. Balanced inflows and outflows of the project and of partners (real values in millions of US dollars/year)

Inflow	Year									
	1	2	3	4	5	6	7	8	9	10
Project	1.7	9.5	20.9	31.3	43.2	64.5	83.0	95.5	95.5	95.5
Project authority	6.4	19.3	29.2	32.9	33.0	33.3	33.5	33.7	33.7	33.7
– Water&Land	3.0	8.9	13.4	14.9	14.9	14.9	14.9	14.9	14.9	14.9
– Processing	2.1	6.6	10.3	11.9	12.0	12.2	12.5	12.7	12.7	12.7
– Services	1.2	3.7	5.5	6.1	6.1	6.1	6.1	6.1	6.1	6.1
Farmers	–5.6	–12.7	–13.0	–7.4	3.1	19.5	33.4	42.9	42.9	42.9
Processing	0.9	2.9	4.7	5.7	7.1	11.7	16.0	19.0	19.0	19.0

Source: Author's elaboration

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Table 8. Baseline cash flow of the project and the partners (real values in millions of US dollars/year)

	Year									
	1	2	3	4	5	6	7	8	9	10
Project	–70.8	–138.1	–98.3	–21.8	20.8	42.0	64.0	76.5	76.5	76.5
– Project authority	–47.1	–89.4	–58.7	–6.4	18.7	19.0	19.3	19.4	19.4	19.4
– Farmers	–23.8	–50.1	–43.2	–20.7	–1.7	14.7	28.7	38.2	38.2	38.2
– Processing	0.2	1.5	3.6	5.3	3.7	8.3	16.0	19.0	19.0	19.0

Source: Author's elaboration

Table 9. Balanced operating margins of processing and farmers (real values in millions of US dollars/year)

	Year									
	1	2	3	4	5	6	7	8	9	10
Processing (%)	21	22	23	24	21	19	18	18	18	18
– Revenues	0.9	2.9	4.7	5.7	7.1	11.7	16.0	19.0	19.0	19.0
– Operating costs	4.3	13.3	20.6	23.8	33.9	62.1	87.4	104.6	104.6	104.1
Farmers (%)	–111	–76	–51	–29	–3	22	36	43	43	43
– Revenues	–5.4	–13.3	–15.6	–11.5	–1.7	14.7	28.7	38.2	38.2	38.2
– Operating costs	4.1	17.4	30.4	39.6	49.5	65.9	79.8	89.3	89.3	89.3

Source: Author's elaboration

Table 10. Financial performance indicators (balanced)

	NPV (10%) (M USD)	IRR (%)	Pay-Back Period (years)
Project	151	14.7	10
Project authority	–44	7.0	15
Farmers	86	16.0	10
Processing	109	n.a.	n.a.

IRR – internal rate of return; n.a. – not available; M USD – millions of US dollars; NPV – net present value

Source: Author's elaboration

forts and of the facilities the PA is actually providing (water, land management).

Being these flows internal to the project, the consolidated cash flow at project level will not change, but a soft up to dramatic change can be operated to the distribution of the costs and the benefits of the project among players.

It was found – by trials and among the many possible combinations – that if applying a tariff of 0.05 USD/m^3 for the pressurized water (repaying both the water supply and energy cost), a rent of 40 USD/ha/year for land and an average 12% duty on the processed goods revenues, the farmers and industrialists keep on having a fair IRR and operating margin, while the PA is eventually able to generate earnings that can be returned to the national budget or used to pay for the water supply to the head reservoir of the project.

The expected inflows for the whole project and for each partner after the above-mentioned corrections are introduced and eventually the cash flow originated by their combination with the outflows (CAPEX and OPEX, unchanged in respect to the basic scenario), are shown in Table 7 and in the subsequent Figure 3 comparing operating profits and investments.

It can be noticed that the private partners are not paying directly for the infrastructure (CAPEX and OPEX distribution remains unchanged), but they generate a positive inflow towards the PA. The cash flow originated by the combination of the estimated inflows (net of production costs) and outflows (CAPEX + OPEX) for the whole project and for each single partner is shown in Table 8.

Similarly to the previous case, the operating margin of the Private Partners, with balancing charges included in the operating costs, is shown in Table 9, while the discounted cash flows in the balanced conditions and eventually the financial performance and of the project as a whole and of each one of the partners are shown in Table 10.

Comparing the "baseline" and "balanced" annual cash flow, it is apparent that, while the overall project performance has not changed, the inflows are now shared among the PA, farmers and industrialists. More in details, the farmers and plant owners still share a profit gain close to 200 M USD [NPV (10%)] and keep on having an IRR and an operating margin far

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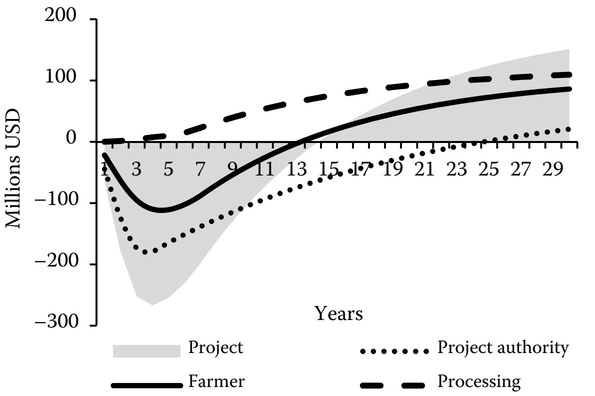

Figure 4. Cumulated balanced cash flow of the project (discounted values, diversified discount rates)

Source: Author's elaboration

beyond 15%. On the other side, the net present value of the PA is much more satisfactory than the one in the baseline conditions, but still below zero. Nevertheless, considering the WACC for the PA is likely to be one half of those for private companies, the expected NPV (5%) turns to positive, reaching 20 M USD. The cumulated balanced cash flow is seen in Figure 4.

CONCLUSION

The project proved to be a promising and financially viable venture and a profitable way to take advantage of the available inputs through the involvement of public and private partners and balancing the relevant, potentially un-aligned, targets: a mixed pattern of staple crops, cash crops and fruit trees, intensively farmed on a large portion of the project area and partially processed on site, eventually shows a satisfactory financial performance, complying at the same time to the food security and to improve the import/export national commercial balance.

The proposed public-private partnership business model engages three different kinds of entities, naturally committed in an integrated environment: the project authority, in charge of the construction and the management of the infrastructure, the commercial farmers, focused on farming, and the processing industrialists. A reasonable setting of charges will enable the project authority to recover from the Farmers and the Industrialists part of the benefits they receive from the sale of the raw or processed agricultural goods, but at the same time, it leaves in the hands of the commercial enterprises an attractive profit.

Finally, the need to introduce a large amount of untraditional crops (mango trees above all) due to specific suitability of the soils in the Project area calls for a careful management of the selection of the best fitting species and of the processing and logistic issues. The analysis showed apparently that processing is crucial to trading efficiently most of the production and to overcome the disadvantages of being far from the market and shipping place and within a wildlife area. On the other hand, the commercialization of the processed goods rather than raw ones and staples is a challenging opportunity to climb the agribusiness value chain upwards, gaining to the local economy a larger share of the added value from the agricultural production.

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