



NOTES ON THE ISSUES OF THE PROJECT OF ORGANIZATION AND MANAGEMENT OF FOREST PLANTATIONS IN CHILE



Notes on the arrangement and management of the project for forest plantations in Chile

These Notes are dedicated to the project of large-scale investment in the creation of forest plantations in Chile. The current document is completely devoted to several matters connected with the project implementation in order to justify its feasibility, profitability, as well as provide clarifications regarding the main features and peculiarities of its fulfillment.

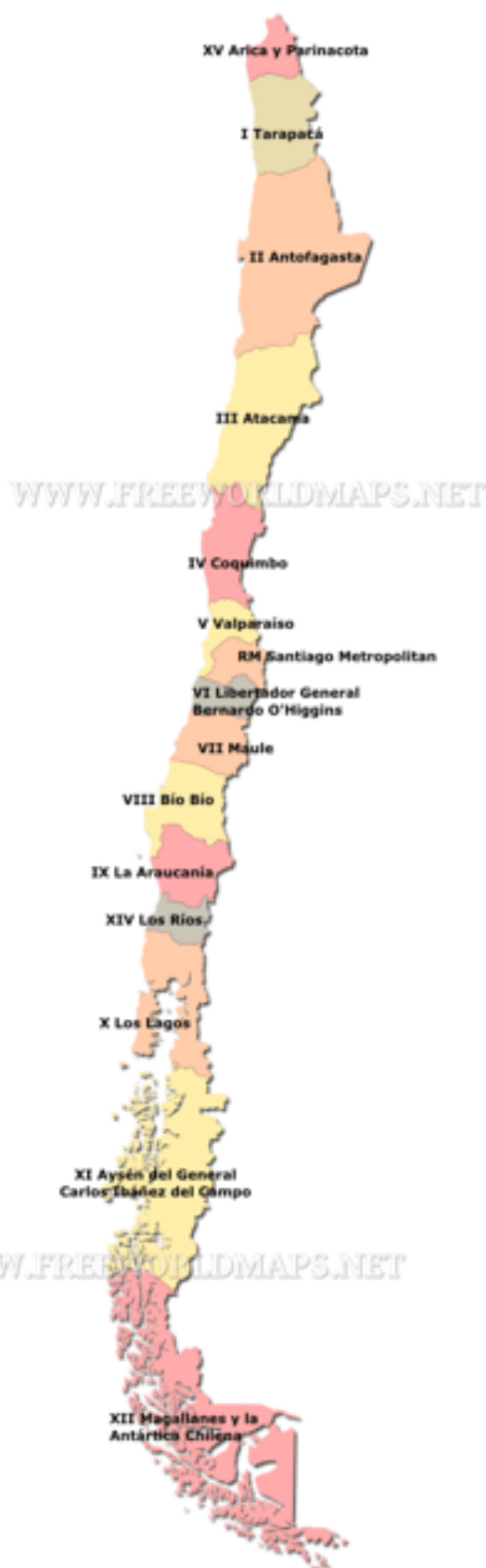
The Notes are intended to reveal the main aspects of the Project realization, which include geographical, economical, ecological, political, and as well as other aspects.

This document is a brief estimation of the prospective Project implementation conditions. And it should not be considered as a comprehensive and compulsory study of the subject.

1. Advantageous areas for forest plantations

The territorial organization of Chile exemplifies characteristics of a unitary state. The territory of the Republic has been divided into 15 independent regions pointed out on the map. Taking into consideration the safety and availability of land plots, and also natural, ecological, infrastructural, and economic trends taking place in Chile, the preferable areas for forest plantations are located in the Southern part of Chile. These are the following regions:

- **Region VII de Maule**
- **Region VIII del Bio-Bio**



- Region IX de Araucania
- Region XIV de Los Rios
- Region X de los Lagos

At that, it is necessary to take into account the political situation in some districts that might be affected by difficulties in interaction with indigenous people of Chile (Resistencia Mapuche).

Therefore, the better way to avoid large investments in the forest work is to implement the prospective project in the following areas:

- Collipulli
- Lanco

On the map below, one can see the Region of Araucania with the area of higher risk highlighted.



However this area might be somewhat risky only in frameworks of large longterm investments.

To view the physical map of Chile follow the link: <http://ww2.educarchile.cl/Portal.Base/Web/verContenido.aspx?ID=130639>

2. Types of territories and land plots suitable for organization of forest plantations.

Pursuant to the Chilean laws, all land plots are in free commercial turnover and hence might be purchased without any limitations and restrictions by any natural and legal person, being residents or not, for any private and commercial purposes. Nevertheless, the practical use of certain lands is regulated by the legislation, and thus it might be restricted.

For example, the use of native woods is limited by laws and all work involving harvesting and maintenance should be coordinated with the authorities. At that, the proper and legal use of native woods might be a ground for receiving the governmental financial support and funding. So, the native forests of Chile might not be used as commercial forests for wood harvesting, but the clearing and maintenance of woods are sources of additional profit, which might be reinvested into other types of applications, for instance, for touristic and restoration purposes. These considerations are clarified in details below.

By types of intended use and according to the physical and geographical structure the lands might be divided into the following groups:

Agricultural lands, which are used for purposes of fruits plantations, gardening, and so on. These lands are significantly expensive for purchasing, and commonly are pre- cultivated and prepared for vegetation purposes.



Silvopastoral lands with land plots that are not prepared for agricultural needs, the kind of wild uncultivated lands. For example, valleys and bushing/forests



Bosque nativo – native forests, the forests and lands included in the list (cadaster) of native woods. Thus many restrictions on the use of them are applied. Moreover, these are rather expensive too.



Cordillera – mounting and high hill lands that mostly cannot be used due to the inaccessibility and absence of infrastructure. Moreover, these lands might be included into the Cadaster as Bosques Nativos.

In reality, such kind of lands might be of some commercial interest only as some touristic attractions.

For the purposes of the current Project implementation, it is necessary to focus on the purchase of wild lands (silvopastoral type) only. One should also consider possibilities of purchase of some large plots of wild lands, some parts of which might be included into the Cadaster as native forests. These options are described in details below too.

One should keep in mind many large land plots available in Chile (in area of several thousand hectares) that might be purchased lump sum at a moderate level of prices as owners of these are not able to sell those during a rather extended period of time and also cannot duly maintain their properties.



3. Current property market environment in Chile.

At present, the property market environment in Chile is advantageous for purchasing land plots due to some signs of stagnation observed in the market. One of the most important aspects is that huge lots of large land plots acquired about 20-30 years ago are still not in use. By the time when the owners purchased those lands in preferable conditions they supposed to sell those properties after some years at the market rise. However, in reality, the growth of market stopped and since then it has been stagnating. At that, many of owners are seniors and often – acting by themselves or through their successors – would like to sell properties in order to gain profit from lands, which remain out of use. In such circumstances, a potential buyer has obvious advantages negotiating on the cost or other conditions.

4. Options for the purchase of land plots for further development as forest plantations

In view of the further development of purchased land plots as forest plantations, one needs to avoid lands intended for agricultural use as besides of significantly high price of such properties one might face serious difficulties with the alteration of the intended use type and neighborhood issues. The same relates to the bosques nativos. As it was mentioned above it is almost impossible to obtain permits for industrial forest cutting in such areas, which are included into the Cadaster as native forests. Few types of work allowed in such lands include cutting for cleaning purposes and maintenance under thorough supervision by forest management authorities.

In case of purchasing small land plots, a buyer is able to choose the certain land type in order to avoid complications caused by legal restrictions on the use. In case where a buyer (an investor) purchases large land plots, some partitions of those might have a status of agricultural lands or native forest areas (bosques nativos).

Nevertheless, the project team can arrange the proper use of land plots in such case the assistance of our high qualified and reliable lawyers and forest engineers. At the same time, Chilean authorities tend to respect the rights of free usage disposal and enjoyment of any private property.

5. Governmental support of forestation and forest operations.

In attempts to find suitable solutions for ecological problems and challenges, the Government of Chile provides forest operators with monetary support of fulfilled tasks on the “paid after performance” basis. At that, each year the Government updates the quotation of amounts spent and also selects the regions and areas of the highest importance. Thus taking into account the ecological trends and governmental support system one might gain an additional profit in the form of a remuneration of the incurred expenditures.

For this purpose, the Government authorizes the institutions of Corma (Corporacion de madera) to perform the surveillance functions and to make decisions. The most important requirement is to work in tight connection with the Corma authorities and to follow corresponding guidances provided by them. No need to say, that all “lobbying” or “shady schemes” are inappropriate in Chile at any levels.

6. Geographical and ecological zoning and the most preferable territories for purchasing land plots for the further development as forest plantations

In view of purchasing land plots for purposes of further development as forest plantations, one should tend to select those according to the ecological zoning and geographical preferences provided by the Government for the organization of forest plantation intended for solving ecological problems and contributing to the natural environment perfection.

At that, the Government indicated preferable areas and territories for forestation and arrangement of forest plantations in Chile. The ones that are within the scope of this study are as follows:

- Droughty lands of VII Región in the communes of Hualañé, Rauco, Sagrada Familia, Péncahue, San Javier, Cauquenes, Empedrado y Curepto;
- Droughty lands of VIII Región including the communes of Ninhue, San Nicolás, Portezuelo, Ranquil, Florida, Hualqui, Yumbel, Santa Juana, San Rosendo, Laja y Nacimiento;
- Droughty and desert areas in Macrozonas No. 1, 2, 3, 8 in VI Región, as well as dry ughty territories and waste lands of VII Región;
- In the comunas of Lago Verde, Coyhaique, Río Ibáñez, Chile Chico, Cochrane y O'Higgins of XI Región;
- And also in the comunas of Torres del Paine, Laguna Blanca, San Gregorio, Punta Arenas y Primavera in XII Región.

All above-mentioned areas are places of preference, but the governmental support might be granted for other territories of the country too, because the Government annually amends the list of territories to which special attention is given. Such amendments are intended for the improvement and perfection of the ecology situation in the country as a whole.

7. State financing backing of forest operators for encouraging the forestation and native forest maintenance

Every year the Government provides forest operators with the financial support as a remuneration of the incurred costs and expenditures intended for the forestation in preferable areas. For these purposes, relevant state bodies elaborate the plan of remuneration and financial support of forestation activities every year. Payments of the remuneration of incurred expenses are settled in the year following the year when such activities take place. The same is applied in connection with the legitimate work performed in native forests (bosques nativos).

During last years, the attention of the government was primarily drawn to the forestation of several regions and territories, and also to arrangements of forest screening facilities along fields to prevent winding degradation (in most cases such measures are out of the scope of the present Notes).

For instance, some indicative data are summarized in tables included in the Document named: FIJA COSTOS DE FORESTACION, RECUPERACION DE SUELOS DEGRADADOS, ESTABILIZACION DE DUNAS, PODA Y RALEO, POR HECTAREA, Y ESTABLECIMIENTO DE CORTINAS CORTAVIENTOS POR KILOMETRO, AL 31 DE JULIO DE 2011, PARA LOS EFECTOS DEL DECRETO LEY No 701 DE 1974 Y SUS MODIFICACIONES POSTERIORES.: (http://www.conaf.cl/wp-content/files_mf/1368117546TablaCostos_2012.pdf). Documents of this type are updated annually, in order

to maintain the information on the legal basis of remunerations and the rates thereof up-to-date.

For the purposes of rating of costs and remunerations, the total area of the country is divided to “macro-zones” pointed out in Table 1 below.

(*Note: It should be highlighted, that all of this is for estimation purposes and clarification only, the values differ a bit from year to year.)

As the most noteworthy areas pursuant the Project estimations are within the range from VII - till X and also Region XIV (de Los Rios) one should consider macro zones 4, 5 and 6. Abbreviations RD and RC mean species with open roots and ones with closed roots respectively.

TABLA I.- COSTOS GENERALES DE FORESTACION POR HECTÁREA, PARA LA TEMPORADA DE FORESTACION 2012.

MACROZONAS		REG. XV - I - E - S Y PROV. ELQUI EN Y REGION, EXCEPTO COMUNA DE COQUIMBO		RESTO N. Y EXCEPTO PROV. VALPO. Y SAN ANTONIO Y PROV. CHACABUDO R.M.		RESTO Y REGION Y R.M. (EXCEPTO PROV. CHACABUDO)		VI Y SEGUNDO INTERIOR DE REGIONES VI Y VII		RESTO DE REGIONES VI Y VII		DE XIV Y X REGION EXCEPTO PROVINCIA DE PALENA		XI - XII REGION Y PROVINCIA DE PALENA X REGION		ISLA DE PASCUA		SUELOS DE RADIS	
		SALARES	OTROS																
MACROZONA N°		1	2	3		4		5		6		7		8		9			
N° PLANTAS POR HA (2)	TIPO DE PLANTA	EXOTICAS O NATIVAS	EXOTICAS O NATIVAS	NATIVAS	EXOTICAS	NATIVAS	EXOTICAS	NATIVAS	EXOTICAS	NATIVAS	EXOTICAS	NATIVAS	EXOTICAS	NATIVAS	EXOTICAS	EXOTICAS O NATIVAS	NATIVAS	EXOTICAS	
100	RC	454.986	145.803	144.349	137.030	117.352	131.622	137.790	133.387	146.776	132.857	170.678	156.839	278.254	294.590	90.188	196.105	180.337	
250	RC		244.227	188.757	171.398														
400	RC		366.944	279.175	229.777	237.434	220.708	241.280	223.669	255.789	232.415	279.957	224.604	429.179	374.483	182.456	314.969	251.900	
500	RC		419.062	294.528	253.741														
700	RC		608.978	391.018	351.908	327.333	313.231	344.770	313.951	364.794	267.894	389.237	292.368	582.105	484.386	290.630	433.834	323.463	
830	RC					365.454	355.296	389.615	363.674	411.993	297.135	436.592	321.733	645.507	532.011	337.018	485.343	354.674	
937	RC					411.597	389.373	426.527	385.274	452.898	321.203	475.568	345.902	699.337	571.210	376.062	527.738	379.996	
1.100	RC					490.064	442.215	482.756	434.328	510.088	357.865	534.944	382.721	781.340	630.924	435.574	592.321	418.882	
1.250	RC					544.415	490.400	534.501	479.469	564.585	391.005	589.584	416.604	858.803	685.876	488.957	651.754	454.663	
1.400	RC									642.881	438.841	666.079	464.038	962.451	782.808	567.111	734.960	504.757	
1.668	RC									716.451	485.626	741.846	497.441	1.067.093	839.008	639.685	906.578	540.031	
100	RD								131.651	142.224	131.300	166.127	155.103	270.512	282.672				
400	RD								216.722	237.585	193.469	261.753	217.657	398.215	366.852				
700	RD								301.795	332.906	256.798	357.381	280.213	525.917	471.032				
830	RD								308.660	374.221	282.721	399.619	307.319	581.255	516.177				
937	RD								369.002	458.236	304.930	432.926	329.630	626.802	553.325				
1.100	RD								415.225	480.028	338.763	484.883	363.618	696.167	609.940				
1.250	RD								457.762	527.698	388.868	532.695	394.695	782.038	682.030				
1.400	RD								517.311	574.437	413.486	589.635	438.684	848.430	734.956				
1.668	RD								576.295	642.541	456.658	665.936	482.055	937.970	807.188				

According to the Table, the average remuneration for common plantations in the mentioned regions might be about 400 - 600 thousand pesos per one hectare, i.e. USD 700 - 1000 per one hectare of forest plantations of the medium planting density.

Further, in the article C. PLANTACIONES CON FINES DENDROENERGÉTICOS (Plantations for wood-energy purposes) one can read: *“Para estos efectos sólo se bonificaran plantaciones con especies del género Eucaliptus y en las Macrozonas 5 y 6, aplicándose un costo único de \$ 806.980 por hectárea, para una densidad mínima de 3.000 plantas/ha, en distanciamientos máximos de 3 metros entre líneas por 1,1 metros sobre la línea.”*

That means that for plantations intended for the purposes of biomass production for power generation, and in macro-zones 5 and 6 (the regions of interest), where the density of planting is 3000 trees per Ha, the lump sum remuneration is about thousand 807 pesos

per one hectare (approximately USD 1100 – 1200 per hectare). These values correspond to such species as the eucalyptus globulus and others. For instance, the planted tree of eucalyptus of 20 years old is about 50 meters in height with the diameter of approximately 60 cm.

Even rough calculations shows that the productivity of one hectare of such Eucalyptus plantation of 10 years old will have the following parameters:

For purposes of the biomass production, the value of each tree cut makes not less than 1,5 - 2,0 m³ (including branches and other parts). At that, there are about 3000 trees per one hectare, so the productive capacity of such plantation is up to 6000 m³/Ha providing the turnover of about 10 years.

According to documents provided by the Government in the view of providing the financial support for maintenance of native forests, the clearance and maintenance operations performed in the native forests are remunerated in the next year after the year of such work performance in the amount of approximately CLP 400.000 per one hectare. That means about USD 600 - 650 per one hectare depending on the current rate.

Please draw your attention that all wood produced by the operator in the course of maintenance work becomes the operator's property and might be used according to the operator's sole discretion.

For instance, in the situation of native forests, the average output from clearance and maintenance operations is about 1000 m³ of wood per one hectare. In case of biomass production, this value should increase at least up to 1500 m³.

Note: all estimations provided above and below are based on a pessimistic scenario.

To sum up all mentioned above, the minimum values of the project vital parameters are as follows:

- 1) Remuneration of maintenance operations performed in native forests is about CLP 400.000 (USD 700) per one hectare.
- 2) Remuneration of work connected with the creation of forest plantations is at least CLP 400.000 (USD 700) per one hectare, too.
- 3) Medium productivity of a ten-year Eucalyptus plantation is at least approximately 5000 m³ for timber of various types of the intended use and quality; at that, the value for biomass might be around 7000 m³ for the total cutting and recuperation of soils.
- 4) Medium productivity of a twenty-year Pine plantation (medium density) is at least about 2000 m³ for timber of various types of the intended use and quality; at that, the value for biomass might be around 3000 m³ for the total cutting and recuperation of soils.

8. Prices of land plots and methods of purchasing

In Chile, lands are objects of free sales without any restrictions and limitations like any other private property.

There are several possible ways of purchasing land plots. The first option is to buy lands from direct owners without any intermediates. And the second one is to purchase property through the public trade (auctions). The second option might foresee some preferences for the new owner in terms of the payment schedule. However, a buyer should be ready to purchase such property in conditions of absolutely free competition with other buyers. Practically, both ways should be combined, where appropriate.

Prices of land plots depend on the certain region, geographical situation, existence of infrastructure, size of a certain land plot, factors of risk, market situation, etc. Of course, each certain deal is specific.

Specifically, the price of 1 hectare might vary in the range from CLP 300.000 to CLP 3.000.000 (from USD 450 to USD 4.500). For purposes of pessimistic estimations, the indicative price of USD 2.000 per hectare (about CLP 1.200.000) should be used.

At this point, the following features should be observed:

- all purchased lands might be secured by insurance policies;
- bank leverage is available in the form of mortgaging. For instance, normally for the long periods (up to 20 years) with 2-4 quotas per year.

For purposes of this Project we suggest to use the permanent purchasing of land during the period of about 9 years. At that the Project owners might gain additional preferences in banks as permanent investors. Moreover, during the project implementation owners can get permanent profits and remunerations on yearly basis. And then, in the 10-th year of the Project fulfillment the owners will receive their own planted wood for sales and processing.

9. Species of trees and density of planting

For purposes of organization of forest plantations the most preferable and most popular species are the Eucalyptus Globulus and Pinus Radiata.

Eucalyptus Globulus:

- Average period of growth/maturity - 10 years
- Plantation density - 1600 units per Hectare
- Plantation costs (plant and work) - \$ 70 (CLP) = about USD 0,12
- Pessimistic estimation of volume of wood per one tree - about 2 m³ (including biomass)
- Pessimistic productivity of plantation 3200 m³/Ha



Pinus Radiata:

- Average period of growth/maturity - up to 30 years
- Plantation density - 1200 units per Hectare
- Plantation costs (plant and work) - \$ 50 (CLP) = about USD 0,09
- Pessimistic estimation of volume of wood per one tree - about 1 m³ (including biomass)
- Pessimistic productivity of plantation 1200 m³/Ha

**Notes on the use of biomass**

Participants of this project should understand that at least by today there are no stable and sustainable markets for biomass as in Chile so in Latin America as a whole.

On the other hand, the following considerations should be taken into account:

- the emergent growth of biomass consumption and particularly pellets as a fuel for the power generation matches the overall trend of growing application of renewable energy sources;
- there is a sustainable market for pellets in Latin America that is in the stage of fast growth;
- the preferable approach to the biomass disposal is its processing into pellets both for wide market and for permanent consumers.
- owners of forest plantations should consider additional investments into equipment and machinery for biomass processing.

11. Project resources

Such complex projects demand participation of a number of specialists and employees collaborating in one project team. Some of them should be permanent team members and others might work independently on the conditions of outsourcing. For now there is a team including all necessary qualified specialists for the Project implementation.

The core stuff of the Project consists of 4-6 members: - chief executive officer of the Project;

- assistant/secretary;
- chief manager/manager of the territory where the Project headquarters are located;
- field/regional managers (according to the Regions where the Project is implemented)

Outsourcers:

- Forest engineer(-s) – certain tasks and assignments;
- Lawyers dealing with properties; insurances; bargains;
- Accountant;
- Translators – project documentation, communication and negotiations; - Company performing work in forest plantations;
- Cutting troops;
- Sawing plant teams in regions and territories;
- Transport companies.

Preliminary negotiations have been already conducted with all outsourcers who might be engaged in the future for the project implementation.

12. Sample estimation for possible working conditions of the Project

Projects of such type demand very thorough studies and estimations of the certain conditions in each case by various specialists and experts.

For purposes of estimation of the Project feasibility, the pessimistic scenario of the creation and maintenance of eucalyptus plant of 1000 hectares has been studied.

There are several land plots of 100 hectares each, consisting of 80% of silvopastoral and 20% bosque nativo area. As it was mentioned above, it is acceptable if a land plot of more than 100 hectares includes several types of lands.

At that, each hectare of the bosque nativo can produce at least about 500 m³ of wood and/or biomass by means of maintenance and clearance operations (according to Corma, normally up to 1200 m³).

Average price for eucalyptus globulous delivered to a sawing plant is about CLP 50.000 per m³ (logs of 2, 3, 4, and more meters long). In order to optimize transport costs, some part of the total volume of the harvested timber is used as a payment for transportation services (depending on the certain distance and other circumstances). On average, the part handed over as a payment for transportation does not exceed 30% of the total amount.

The indicative pessimistic wholesale prices for wood fuel are as follows:

- wood fuel - 50 CLP/kg (USD 0,08/kg)
- pellets - 100 CLP/kg (USD 0,15/kg)

Summaries for raw estimations of plantations

The main values of the sample estimation are summarized below; all figures are approximate and correspond to the pessimistic scenario. The calculations have been prepared for the simplest situation of an eucalyptus plantation. The figures below should just illustrate the approach :

Conventional area of each plot for consideration (Ha) -	1000,00
Share/area of native forest in the land plot, max (Ha) -	200,00
Share/area of spare land (silvopastoral) in the plot, max (Ha) -	800,00
Average density of wood (mt/m3) -	0,6
Amount of wood from clearance/maintenance work (m3/Ha) -	500,00
Amount of biomass from clearance/maintenance work (m3/Ha) -	500,00
Density of planting for eucalyptus (trees/Ha) -	1600
Volume of wood/biomass for each mature tree in plantation (m3) -	2,0
Volume of wood/biomass for each hectare of plantation (m3/Ha) -	3200,0
Amount of wood for sawing (%) -	30
Amount of wood for fuel wood (%) -	40
Amount of wood for biomass (%) -	30
Additional biomass of branches, stumps, others (+ surplus, %) -	30
Additional biomass of branches, stumps, others (m3/Ha) -	960,0

Economic figures, in CLP:

Price of purchasing of land (CLP/Ha) -	\$ 2.000.000
Remuneration of native forest maintenance (CLP/Ha) -	\$ 400.000
Remuneration of foresting/planting (CLP/Ha) -	\$ 400.000
Costs of cutting (CLP/m3) -	\$ 9.000
Costs of clearance (CLP/m3) -	\$ 11.000
Costs of planting for eucalyptus (CLP/tree) + plant	\$ 70
Cost of transportation of wood (50 km) (CLP/m3) -	\$ 3000
Price of the wood for sawing (CLP/m3) -	\$ 100.000
Price of fuel wood (CLP/mt) -	\$ 50.000
Price of pellets (CLP/mt) -	\$ 100.000

The Table below reveal itself as a sample to illustrate the profit potentials of the Project. All the estimations included in it are approximate and those are for example only. The estimation was elaborated considering the most pessimistic scenario.

