INTERNATIONAL NETWORK FOR BAMBOO AND RATTAN
(INBAR)

TRANSFER OF TECHNOLOGY MODEL
(TOTEM)

LOW-COST BAMBOO-BASED HOUSES

Viviendas del Hogar de Cristo,
Guayaquil,
Ecuador

CONTENTS

TRANSFER OF TECHNOLOGY MODELS (TOTEMS)

Transfer of Technology Models (TOTEMs) are focused educational tools providing relevant information and distance training on one specific area of bamboo/rattan management, processing or utilization. They are a means of technology transfer between similar regions throughout the world, with the emphasis on South-South transfer for livelihood development. They enable those involved in the management and use of bamboo and rattan resources to more efficiently and effectively develop and use skills relating to these resources.

TOTEMs are primarily intended as practical information resources and teaching aids for those at the local extension level in their communities, who can utilize them to assist local community development. Each TOTEM consists of a detailed written report of the technology, a PowerPoint presentation, a film, and, where relevant, a set of technical photographs. They also include information on target users, financial analyses of sample set-ups from the partner country preparing the report and information on where to source particular technologies (such as equipment). The TOTEM thus provides all the information required for establishing similar technologies within interested countries and regions.

- The **report** contains all the technical details of the particular processes involved, as well as other relevant information for establishing the technology such as costs of business establishment, running costs and cash flows.

- The **PowerPoint** presentation contains details of the relevant technologies and their applications, and is intended to provide an overview of the potential of the technology for development.

- The **film** provides a visual guide to the processes involved and helps to bring them alive in the minds of the learners.

The different parts of the TOTEM are targeted at slightly different audiences, via the local extension workers. The report and film are intended to be the main means of extension to the individuals and communities who will implement the technology and who will directly benefit from it. The PowerPoint presentation is primarily intended as a tool for the extension worker to sell the technology and its role in development to those who provide the infrastructural, policy and financial support for its implementation, such as government departments, donors and NGOs. There is considerable flexibility, however. Local extension workers will be able to incorporate the TOTEMs in their own work as they wish and adapt and develop the TOTEM to suit their particular requirements and conditions.

This TOTEM on the production and distribution of **low-cost bamboo-based houses** has been produced by the charity Viviendas del Hogar de Cristo (Houses of Christ), Guayaquil, Ecuador. It is intended to illustrate not only the technology of house production, but Hogar de Cristo's successful experiences in making houses available to the poorest and most needy families at prices they can afford. Thus the model covers both house production and the selection and sales system for purchasers. The report part of the TOTEM describes the technology for establishing facilities and producing low-cost bamboo houses for rural development in regions where bamboo is available as a raw material. It is intended to be used in conjunction with the illustrative film included in this TOTEM package

The first part of the report introduces the technology, discusses its history, its development attributes, its benefits and it's applicability. The second part of the report provides detailed information on the technical aspects of producing low-cost bamboo houses. The third part of the

report details the means by which Hogar de Cristo distributes houses amongst the poor of Guayaquil.

Appendix I gives details of the history of Hogar de Cristo in Ecuador. **Appendix II** is a bibliography and reference list.

The drawings and posters for this TOTEM are given in the Diagrams and Posters PowerPoint presentation included on this CD. A standard Powerpoint presentation is not included with this TOTEM at present.

Note 1: This TOTEM has been edited at INBAR and differs from the form in which it was received from VHC, Guayaquil.

Note 2: The editor expresses grateful thanks to Mirjam Pronk for permission to freely use information contained in her draft report (Pronk, 2002) in this TOTEM.

LOW-COST BAMBOO-BASED HOUSES AT-A-GLANCE

What are low-cost bamboo-based houses?

Low-cost bamboo-based houses are a cheap and safe alternative to the shelters of plastic, wood and stone that are currently used by many homeless people. They are produced from natural materials that are abundant in tropical and sub-tropical regions and are safe in adverse weather conditions and earthquake prone areas. They can be produced in a range of standard sizes and can be adapted to different types of terrain. The production costs of the bamboo houses make them available too resource poor people for less than $ 450 US dollars and a good and efficient option for governmental and non-governmental NGOs concerned with social housing programs.

How are they produced?

The low-cost houses of VHC are prefabricated in the form of bamboo panels made of wooden frames, flattened bamboo mats and bamboo laths. The bamboo panels, the wooden frame and the corrugated roofing parts are sold to the owner as a kit of parts and transported to their plot of land. With the help of friends and family the house can be assembled in a single day using simple hand tools and materials.

What is the need for low-cost bamboo-based houses?

With millions of poor and homeless people in the world and the presence of extensive bamboo resources in many regions, the need for low-cost bamboo houses is extensive. Such houses are an adequate and necessary solution for rural and urban dwellers in need for an affordable, efficient and fast shelter, and particularly in cases of natural disasters and other emergencies. The potential to increase the manufacturing of low-cost bamboo houses is enormous in countries that have bamboo resources while their homeless live plastic or hardboard huts.

What is the role of a low-cost bamboo-based house in livelihood development?

Low-cost bamboo houses are a basic contribution to poor peoples' livelihood development. A safe home is an important starting point for a family for further socio-economic development through social organization, education and employment. The manufacturing and distribution of low-cost bamboo houses itself will provide employment to a range of people and there will be extra employment generation in its forward and backward linkages, such as cultivation and harvesting of bamboos, primary processing, transport, marketing and retailing. A unit producing 50 houses a day will require a total workforce of over 150 people. The need for a sustainable supply of raw materials will encourage the proper management of bamboo stands, and the establishment of new plantations, with their associated environmental benefits.

How do I establish a bamboo-based house-making unit?

A manufacturing and distribution unit for low-cost bamboo houses requires a regular supply of bamboo culms processed into laths and opened bamboo mats, as well as wood for the frames, stairs and pillars. In addition, it requires electricity, a labour force and well developed administration.

INTRODUCTION

DEVELOPMENT ATTRIBUTES, TARGET GROUPS and BENEFITS of a

MANUFACTURING AND DISTRIBUTION UNIT FOR LOW-COST BAMBOO-BASED HOUSES

1. Low-cost bamboo-based houses

In Ecuador, low-cost houses are made from prefabricated panels of opened and flattened bamboo laths (*caña picada*) which are fixed on a simple wooden structure and on an elevated wooden platform supported on strong wooden pillars. Bamboo and wood are the main raw materials and the result is a low-cost, simple and cool house with a strong, light and flexible character and significant resistance to earthquakes. Although the estimated durability of the houses is not much longer than 5 years at present, its service life can be easily extended by adequate management of the primary material, simple preservation measures and improvements with additional materials such as stones and clay.

2. History of the development of low-cost bamboo-based houses in Ecuador

The popularisation and distribution of low-cost bamboo houses in Ecuador is due to the efforts of the charity Viviendas del Hogar de Cristo. In Ecuador 70% of the population lives in shanty towns in suburbs on marginal areas. This situation is most apparent in the coastal city of Guayaquil, which is one of the world's worst for housing. This is caused by an annual urban immigration of approximately 30, 000 people, which represents a population growth increase of 2.7% per year. There is a significant "poverty belt" around Guayaquil.

Viviendas del Hogar de Cristo (VHC) is a Non-Governmental Organization administrated by Jesuits, which started its work in Guayaquil in 1971 under the supervision of SELAVIP (Servicio Latinoamericano y Asiático de Vivienda Popular). The organization was set up according to the principles of Hogar de Cristo Housing in Chile which had run a successful program for social housing for many years. VHC is a not-for -profit organization that aims to give shelter to the homeless, strengthen the family unit and promote human and spiritual values at home. As a first step towards a better life, VHC offers migrants and other homeless people a temporary, affordable and cost-efficient house made of bamboo and wood which can gradually be improved or transformed into a permanent house. The Corporation's principle is that it is better to give a bamboo shelter today than a concrete house in five years, because the shelter addresses an immediate need and offers poor people more than just a roof above their heads. The house is the beginning of the social and economic development of the family. It offers stability and health, and gives better chances of obtaining work. Families are stimulated to improve their housing in time. The bamboo house is just the first step in acquiring a solid, long-lasting and decent home.

The origin of the design of the house is a copy of the model build by the countrymen in the rural areas. Their architectural and cultural patterns are now common to Guayaquil's slums. The original model has been optimized and a cheaper, higher quality prefabricated house of bamboo panels and wood has been developed. The house can be assembled in a single day with minimal instruction and the help of friends. Clients are offered credit, which means that they can spread repayment of the US$ 450 cost over three years. There is a social fund available for families who live in extreme poverty and aren't able to complete their payments.

The formula has been a success and during its 30 years of existence the corporation has provided more than 61,000 families with a roof over their heads. Currently VHC has 15 offices and 3 factories in the coastal region of Ecuador. In the early years an average of 160 houses per year was built. In 1984 production increased to 843 houses per year. Presently VHC produces a total of 50 houses each day in the Guayaquil factory and an additional 30 in its other branches. In 1996 VHC was awarded the World Habitat Award for best practice in solving the housing problem in Ecuador.

3. General development attributes and advantages

The main development attributes of the technology are:

Environmental

- Increase in area of bamboo plantations will benefit the environment and protect forest resources through substitution of bamboo wood for timber.
- Rehabilitation of degraded forests and other waste lands through increased bamboo plantations.
- Promotes the efficient management and use of natural bamboo resources.
- Houses are produced by non-polluting production methods.

Production

- Creation of employment opportunities for non-skilled and semi skilled staff at the manufacturing unit.
- Creation of employment for bamboo farmers and peasant splitters.
- Limited start-up capital investment required.
- Simple tools used throughout the production process.
- Rapid production with minimal waste of raw materials.
- The simplicity of the production process means factories with high, medium or low daily production can be established depending upon resources available and need, and these can easily be scaled-up or down as demand changes.

For owners

- Provision of a sturdy, earthquake resistant house.
- Low cost of the transportation to the construction site.
- Speed of house assembly (3 to 5 hours).
- Ease of assembly.
- Increase in community welfare and stability.

The main advantages of the technology over other types of housing are:

For producers

- Basic training is required to fabricate the modules of a house.
- Owners are responsible for construction *in situ*.
- Materials are usually available locally.
- Production costs are very low.
- Modular construction facilitating rapid production and flexibility of design.

For owners

- Houses are cheap and readily available.
- Favourable loan and repayment conditions are usually available.
- Houses are easily upgradable by the owners.

4. Suitable agro-ecological regions

The bamboos species used in Hogar de Cristo's houses is called *Guadua angustifolia*, and this species is widespread throughout the tropical and subtropical regions of Latin America. Outside Latin America it is expected that most regions of the world where it is possible to grow large-culmed bamboos would be suitable. The suitability of other bamboo species has yet to be tested, but since the bamboos are only split into laths, it is likely that many of the common, thicker-walled, large-culmed bamboos would be suitable.

5. Target groups

The main target groups of Hogar de Cristo's houses are the poor, homeless migrants living in shanty towns on the outskirts of many of Ecuador's large cities. Although the charity only works in Ecuador, the houses would be suitable for poor and disadvantaged families in many communities in the world. Hogar de Cristo particularly targets the female head of the family as the females are likely to be more responsible. Additionally, those involved in producing and distributing houses, including farmers, bamboo splitters, truck owners and their assistants, would benefit from the employment opportunities created, although they are not the main target beneficiaries of Hogar de Cristo housing.

6. Requirements for success

A renewable and reliable source of suitable bamboo is vital, as is a means of providing financial support via loans to the poor families who will purchase the homes. A few individuals with woodworking skills would be beneficial, particularly to train others to produce the houses, and to oversee the work. A proper system of keeping track of orders and deliveries would also be beneficial.

7. Limitations and potential for improvement.

Further investigations into the suitability of bamboos other than *Guadua* are required to ensure successful transfer of the technology to non-*Guadua* growing regions (Africa, Asia).

Significant efforts are required to investigate the possibilities of using greater quantities of bamboo in the houses to substitute for the mangrove and hardwoods used.

Viviendas del Hogar de Cristo's bamboo and wood demand is high, so it is necessary to start programs to re-forest bamboo and wood forests, by the State, private institutions and even by VHC to ensure the future supply of the material.

It is evident the necessity to implement preservation systems for the bamboo and wood to improve the useful life of the houses which at the present is between 5 and 10 years.

The design of the house needs to be revised so that new different designs be obtained, according to the needing and financial resources of the poor. The present architectural design needs to be re-designed to improve the aesthetic expression and to protect the material that forms the house.

It is necessary to incorporate the construction of washrooms, artisan manufacturing of toilets and bathroom accessories, etc. that allow the addition of sanitary services to the house.

Concluding remarks

The technology used in Viviendas del Hogar de Cristo to supply with a house to the homeless is the most logical and appropriate, considering the geographic, social and economic necessities of Guayaquil and the coastal area of Ecuador. The use of renewable natural resources like bamboo, the suitability of the production process for local untrained labor and the use of simple tools and equipment result in a low-cost and non-pollutant technology. These houses are readily accepted by the poor, who have no alternative options to obtain their own house because of their extreme poverty.

PART TWO

MANUFACTURING LOW COST BAMBOO-BASED HOUSING

1. INTRODUCTION

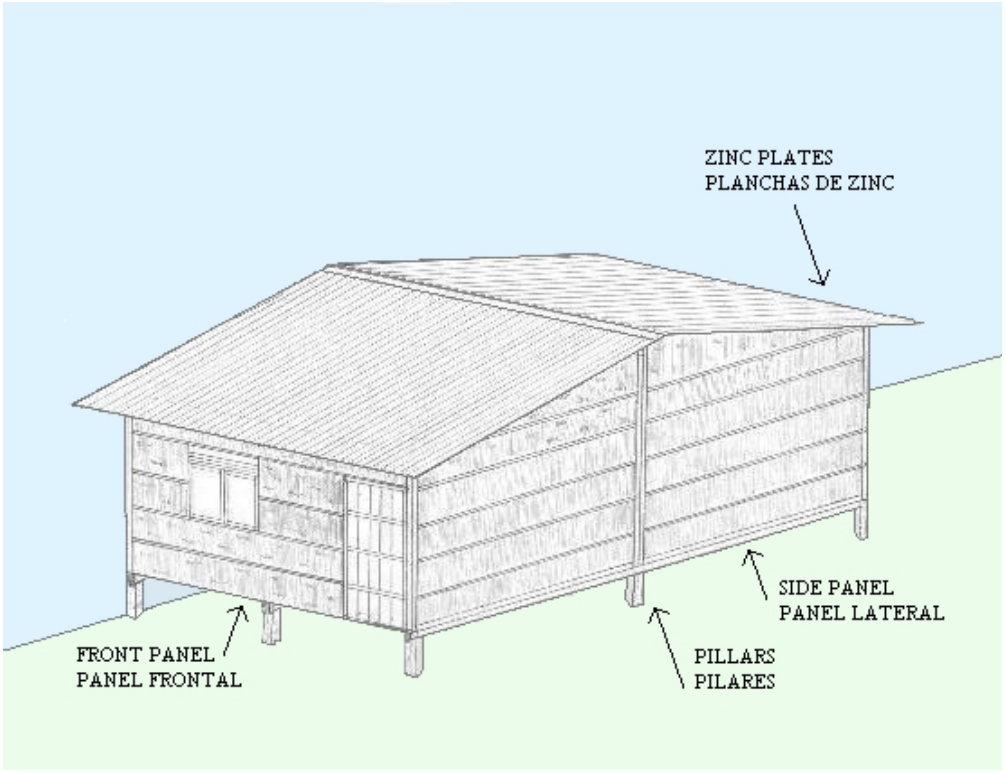
The technology used to produce low-cost bamboo-based houses in Viviendas del Hogar de Cristo utilises mostly cheap, readily available materials and produces lightweight, flexible houses that are easy for the purchasers to erect.

The construction system used in Viviendas del Hogar de Cristo can be considered as an ***Artisanal Manufacturing System***, which complies with technical conditions, assembly-line production and high levels of production reflected in the number of houses (50 houses/day) and low costs of production (approximately $400 each house).

The technology can be described as light and open prefabrication. Light because the construction is made of panels, which are easily transported and processed with simple tools. The technology is open because it offers great flexibility, which allows the use of the elements in many applications. In addition the construction can be applied with other systems in terms of horizontal or vertical extensions.

2. HOUSE DESIGNS

There are a number of different designs of houses, and these have evolved gradually over the years. Most houses are designed to fit in a lot 4.8 m x 4.8 m. The main division is between ground level houses (shown below) and those raised on stilts. The latter houses offer the opportunity for the homeowner to produce an additional ground-level accommodation or storage area using bricks, wood or bamboo to form the walls.



3. THE CONSTRUCTION PROCESS

3.1 Raw materials

Bamboo: The bamboo used for houses is called Guadúa angustifolia, locally known as *"caña guadúa*" or just *"caña",* and widely recognised as one of the best multipurpose bamboos in Latin America.

Wood: Mangrove wood is used for the pillars and other tropical hardwood used for other wooden parts.

Miscellaneous materials: These include metallic components (nails, sheets of zinc) and others such as thin cement sheets for the roof. The inorganic materials represent only 10% of the materials used in manufacturing the houses but their cost represent about the 45% of the total cost of the house.

3.2 Initial processing of raw materials

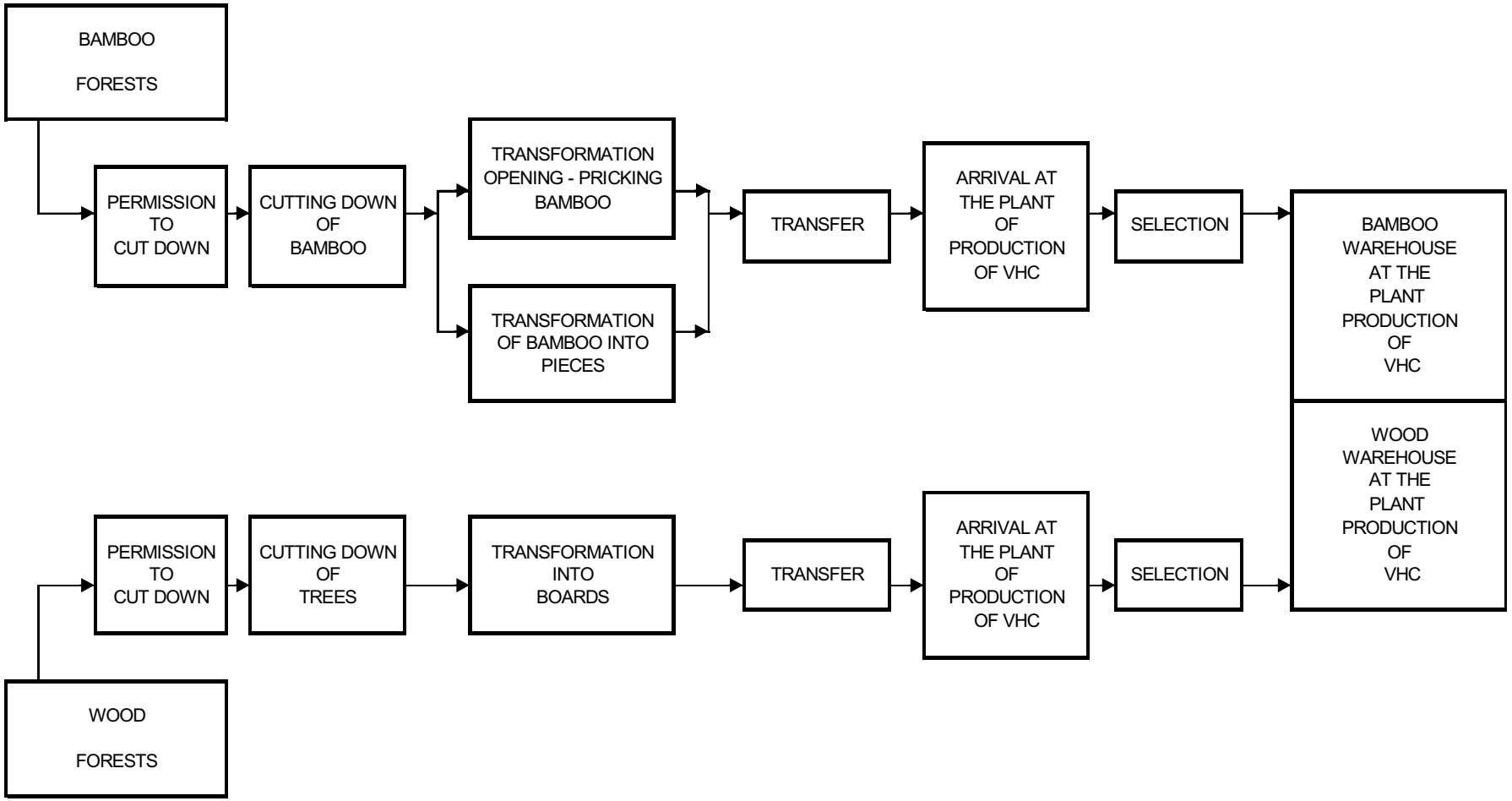
Three or four year old **bamboo** culms are harvested from the forest and then split longitudinally into laths on site. To produce a lath an axe or a heavy knife is used to cut through the culm on one side only, before making longitudinal incisions most the way through the culm wall from the inside and opening the culm out slightly. Further incisions can be made followed by gradual opening out, and the process continues until a flat lath of bamboo culm is produced, all joined together by the non-cut parts on the outer side of the culm. The lath is locally known as "caña picada" or "tabla de caña"(board of cane) and is easier to transport than round culms.

Wood is extracted from the forests in coastal areas of Ecuador. Certificates are given by forest institutes to guarantee the sustainability of the exploitation of the forests. The tropical hardwood is sawn into planks and transported to the VHC factory. The wood is then classified and dried for between one and two months. Subsequently the seasoned wood is processed into floor elements, frames for the bamboo panels, doors, windows and roofing support beams. The mangrove wood for the pillars is purchased from small merchants who exploit it from the mangrove forest in the estuary and bring it by boat or canoe to the small river port of the VHC factory.

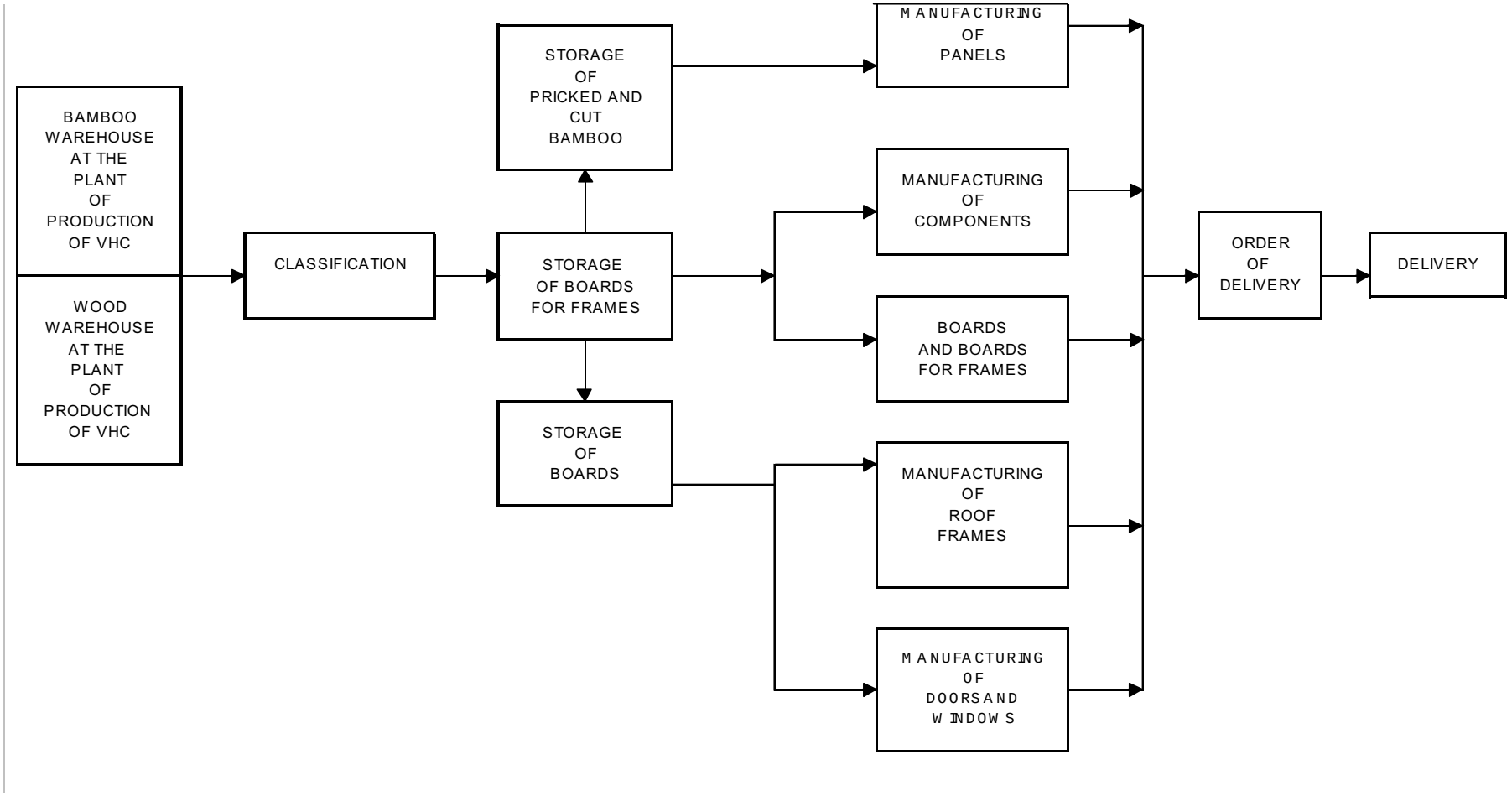
3.3 The Manufacturing Process

The technological process, shown in diagram 1 and 2 and illustrated in the attached photographs, starts in the warehouses of wood and bamboo, in the production plant. Houses are produced on a modular basis, utilising some of a range of different standard panels produced at the factory. A suitable set of panels is then put together as a kit of parts to produce one house, along with other attachments such as roofing sheets, pillars and fittings.

Schematic diagram of the process of manufacturing the components of a low-cost bamboo-based house: 1



Schematic diagram of the process of manufacturing the components of a low-cost bamboo-based house: 2



3.3.1 Manufacturing the panels.

The most important area of the factory is the site where the panels for the walls of the house are manufactured. There are a range of standard designs for the panels, and these are given in the Diagrams and Posters PowerPoint presentation. The reader is recommended to refer to these during the production process.

Metallic moulds called *formaletas* are used to form uniform components and permit assembly-line production. *Formeletas* should be produced by the manufacturer for each of the different panels to be produced. Each worker works on one mould to manufacture a specific panel. Each worker requires from 16 to 18 minutes to manufacture one side panel, about 23 minutes to manufacture one simple front panel and about 28 minutes to manufacture one medium front panel. Within an 8 hour working day one worker can manufacture an average of 18 panels. The components of an Hogar de Cristo house can be manufactured in two and a half man-hours. Higher productivity can be achieved by employing two workers per mould, or by working shifts. The only stage of the process that requires two people is lifting the panel out of the mould at the end of the production stage.

Panel manufacturing process

1. The wooden framework beams, 5 x 5 cm, are placed in the mould.
2. All beams are fixed together with pneumatic nail guns.
3. Bamboo laths are affixed to the wooden framework with nail guns.
4. The edges of the bamboo laths are trimmed with a chain saw to ensure they are flush with the beams and the edges do not protrude.

Once the panels have been manufactured, they and the other components of the house (floor, doors, windows, frames and other structures) are put together into kits, ready to be loaded onto lorries and delivered to the purchaser. For a 4.80 x 4.80 m house one kit contains eight 3.2 x 2.5 m wall panels wooden boards for the floor, nine wooden pillars, roofing materials and nails.

The purchaser of the house is informed of the day and time it will be ready for collection. Transporting the house is the responsibility of the homeowner. In the case of Hogar de Cristo there are many private trucks parked outside the VHC factory, and the truck owners have agreed with VHC to deliver each house for US$6, payable by the house purchaser. The purchaser enters the factory with one of the private trucks, the house kit is loaded on by fork-lift truck and the house then taken to its new location.

3.3.2 Assembling the house

House assembly is illustrated in the Hogar de Cristo assembly guide, which is shown in the “Diagrams and Posters” PowerPoint presentation and is intended to be self explanatory. In some neighborhoods of Guayaquil the assembly procedures are already widely known.

It is first necessary to set in place the vertical wooden beams that will support the structure firmly in the ground. The floor is then installed and the side panels fixed in place. The roof is placed on top, and the doors and windows installed. Full details are given in the guide.

3.4 Costs of producing a standard 4.8 x 4.8 m house.

Elements	**Number**	**Price/unit**	**Total price US$**
2.4m side panel (wooden frame and bamboo lath)	4	18.32	73.28
Front panel with window	3	20,82	62,46
Front panel with door	1	18,19	18,19
Wooden flooring	1	74,44	74,44
Zinc roofing	1	105,78	105,78
Wooden door	1	16,52	16,52
Window	3	7,88	23,64
Base of the house	1	35,20	35,20
Subtotal materials			**409,51**
Labour time			14,44
Overhead of the factory			26,05
Total Costs			**450**

PART THREE

DISTRIBUTION OF HOUSES

1. The Hogar de Cristo solution

Viviendas del Hogar de Cristo is a Christian charity in Ecuador with headquarters in Guayaquil. VHC specialises in supplying cheap bamboo/wood houses to needy people in Guayaquil and a number of other cities in Ecuador. VHC operates by providing interest-free loans to families to purchase their houses, which can be repaid over a period of three years. Houses are sold at cost price, and VHC makes no profit from the venture. Special needs are dealt with on a case-by-case basis.

VHC is financed by a rotary fund that has been in existence for over 30 years, thanks to the financial contributions of various international charity organizations such as MISEREOR (Germany), MANOS UNIDAS, INTERMON and HERES (Spain). This fund is used to finance the cost of the houses that are delivered to their beneficiaries. There is also a Social Fund that has been created from sporadic donations. This fund allows VHC to subsidize the cost of the house if necessary and thereby prevents the rotary fund from being affected by default of payments or by inflation.

Viviendas del Hogar de Cristo works with people on unstable and irregular incomes, with salaries up to approximately USD$80 per month. In recent years this has been exacerbated by the loss of value of the local currency due to high inflation.

The main groups of people VHC serve are:

- Marginal population living in precarious conditions.
- Families affected by fires, natural disasters or economic difficulties.
- Abandoned mothers.
- Women with many children, often born from different fathers.
- Young couples who wish to start a family.
- Handicapped persons.

Ninety percent of the people that come to VHC are women. Women are often victims of a culture and society that rejects them. The housework performed by women inside her home is not recognized nor remunerated, and is considered as something normal for her gender. Women working outside the home are not paid the same as their male colleagues, despite the constitutional a Law that guarantees “for equal work, the same remuneration”.

The average age of the women who come to VHC is 36 years old, but there is a fairly even spread of ages between 18 and 46. Less than 10% are married - most are either single mothers or are living with a partner. Almost 50% have between 3 and 4 children, and 77% have monthly incomes of less than US$20. A few are unemployed, but most work in poorly paid, irregular jobs such as being a housekeeper or doing informal trade when they can find it. Male applicants are predominantly construction workers.

Activity	Approximate %
Female	
House keeper	65%
Informal or street saleswoman	20%
Washerwomen	5%
Workwomen	8%
Seamstress	1%
Housewives	1%
Male	
Construction assistants	70%
Informal merchants	20%
Workmen	10%

2. Procedure for obtaining a house

2.1 General

The first step in the application process for a VHC house has to be taken by the family itself. It has to visit the VHC office, where information is given about the procedure and requirements. To qualify for an application, people need to have the legal rights to a building plot and a person who stands surety for the payments. In order to ensure the future stability of the family the title to the dwelling is given to the mother and her children. After collecting the necessary papers for the application, a socio-economic questionnaire is completed for the family by the social worker. Important questions asked include the income of the family, the number of family members and their occupations, the current housing situation and health conditions of the family. These data are checked in a visit by the social worker to the family's current accommodation as well as to the plot of land where the family would like to build their new house. The social worker delivers the documents to a committee for the approval of the credit. The following step is the payment of the first deposit of US$20 and the signing of the contract. Later, VHC decides the type of house most appropriate for the family according to the number of family members. Within several weeks the family can collect their house and construct it.

2.2 Special cases

Very often, there are some cases in which families cannot afford any form of credit. The family situation is studied by the social workers on a case by case basis, and they decide if the house is to be totally or partially subsidized. The most common reasons are:

- Serious and terminal illnesses (tuberculosis, cancer, AIDS, brain diseases, physical and mental handicaps, epilepsy and so on).
- Common illnesses that particularly affect the infant population, caused by poor general health.
- Emergency situations like fires, landslides and floods, which principally affect poor families.

- Unemployment. This situation is very common these days as the country is in an unstable economical condition.

To finance subsidies or special credits VHC uses the Social Fund that is supported solely by financial contributions from local and foreigner benefactors. This fund allows the provision of a house to families affected by disasters, provides a partial subsidy of the cost of the house, and gives donations in installments in default for families in extreme poverty.

2.3 Collection of credits

The collection of credits is essential for this program to remain viable. The credits collected are invested in new houses and consequently, new credits are granted. Credits are collected every month, according to the installments agreed at the time of the sale of the house. These installments are paid in our offices and differ according to the particular situation agreed with the family. Credits are usually repaid over 3 years. There are cases of families that become unable to afford the payment of the agreed installments due to several social problems after purchase of their house. These cases are solved using the social fund.

APPENDICES

APPENDIX 1.-

INFORMATION ABOUT THE VIVIENDAS DEL HOGAR DE CRISTO CORPORATION

Needs

It has been estimated that in Ecuador 1,400,000 people live in precarious houses made of residues of boards, bamboo and plastic. The city of Guayaquil on the southern coast of Ecuador suffers from a particularly serious housing problem due to the tremendous flow of immigrants. The city is surrounded by a poverty belt that includes 75% of the population. The housing deficit there is 150,000 houses, and is increasing by 12,000 every year. About 30,000 people immigrate from the countryside to the city every year. Many migrants are in search of a better life but it has been calculated that in 1997 and 1998, during the disastrous weather of the climatic phenomenon El Niño, more than 300, 000 people migrated from the countryside to the cities in Ecuador.

In Guayaquil settlements have been constructed on marginal lands on mountains or hills to the northeast of the city and on the shore of the estuary in the southeast, causing damage to the ecosystems of the region. Many people have settled on swampy and dangerous lands without any authorization and with no water and sewage system. Living conditions are far from adequate. 60% of the houses in Guayaquil lack basic services (water and sewage system) whilst 30% do not have access to electricity.

Settling on these marginal lands is a consequence of the fundamental necessity of a house for a new immigrant. At the present, hundreds of families live squeezed in small rooms. Two or three families often live in one rented room about 12 m^2 in the city, with no basic services. Migration to different cities in the country have caused serious social problems and increased the existence of marginal sectors where it is possible to find "houses" of 6m^2, where people live in abject misery and poverty. Thousands of people are forced to sleep on the streets.

Viviendas del Hogar de Cristo

In 1971 Father Josse van der Rest, S.J. Founder of SELAVIP (Latin American and Asian Popular Housing Service), decided to continue the housing work started by father Alberto Hurtado, Hogar de Cristo in Chile.

Father Josse van der Rest first used Seminar yards that were ceded provisionally by the Archbishop. In June 1973 1,181m^2 of land was purchased from the Junta de Beneficencia close to the Guayas river, where the manufacture of 3 bamboo-wooden houses per week commenced. Father Francisco García, locally known as "Uncle Paco" offered his help to the poor everytime there was a fire, flood or any other misfortune.

With the increase of immigrants and a consequent increase in the number of houses needed, it was felt necessary to purchase a bigger place. Part of the land of the cigarette factory of El Progreso was acquired in 1981 and the new offices of Hogar de Cristo were built there. At the present time production is 40 houses per day in the Guayaquil factory, 12 houses in the factory at Manabi and 3 houses per day in the factory at Esmeraldas. Also, an office in Machala has just opened but the houses are transported

there by trucks from Guayaquil. At the moment offices are being opened in Santa Elena and Babahoyo.

Viviendas del Hogar de Cristo received the World Habitat Awards 1996 for the best project for popular housing, granted by the United Nations through the Building and Social Housing Foundation of England. This acknowledgment of VHC's 27 years of work on behalf of the homeless was received on October 7, 1997 in Budapest – Hungary. The Ecuadorean Congress also recognised the work of VHC with a medal received by father Francisco García Jiménez, founder of Viviendas del Hogar de Cristo. The Municipality of Babahoyo (province Los Ríos- Ecuador) has honored VHC with an insignia for the work they are doing in that province on behalf of the homeless.

It is estimated that at present in Ecuador there are 25,000 ha of uncultivated bamboo stands and 2000 ha of cultivated stands. VHC also owns a 32 ha bamboo plantation near Santo Domingo.

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APPENDIX 2

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