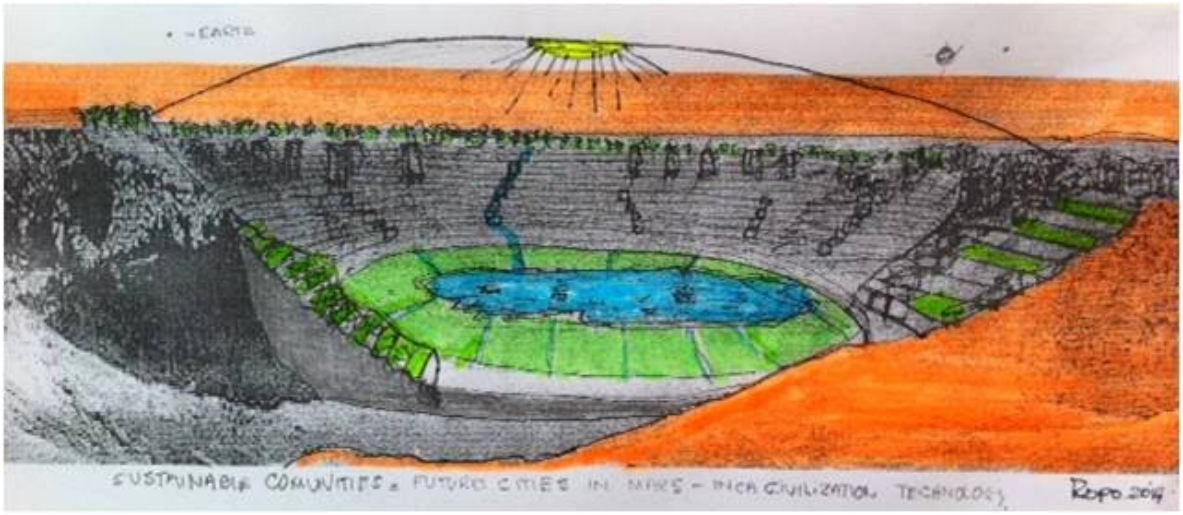
INCA TECHNOLOGY FOR SUSTAINABLE COMMUNITIES IN MARS.

Arq. Rodolfo Beltrán, MArch. CAP 807
Registered Architect in Perú and Venezuela.



Proposal for Sustainable Communities in future human settlements and Cities in MARS.

CONCEPT

The concept contemplates using successful historical INCA Technology solutions for Agricultural Crops, Hydraulic Infrastructure, horizontal and vertical transport, housing and use of renewable energies.

The INCA civilization of Perú which covered part of present Colombia, Ecuador, Perú Bolivia and Chile has a significant technological and cultural legacy. Of 190 countries in the world Perú is one of six that are classified as cradle of ancient civilizations.
It was the only civilization in which massive organized governmental works had a communitarian benefit objective with a sharing/ reciprocal work methodology (MINKA, MITA).

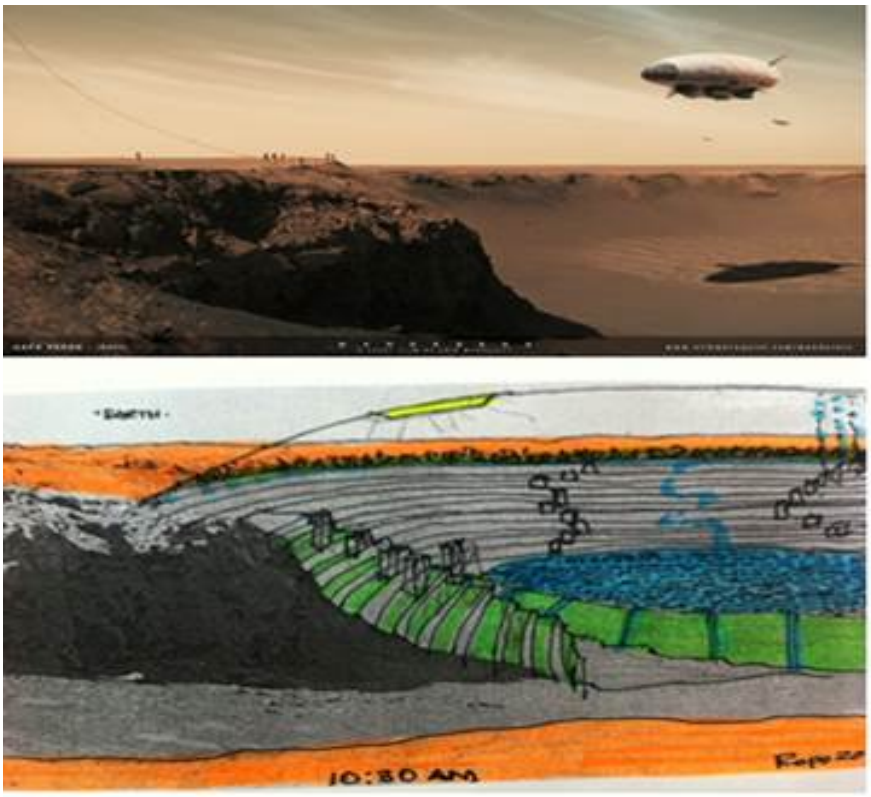
The agricultural ANDENES or terraces were a system of Vertical Agriculture and civil infrastructure that provided food security, vertical and horizontal transport, efficiency

of water resource, use of renewable clean energy for a 12 Million population (INCA Period from 700 to 1534 BC.). They developed the highest and most sustainable artificial structures in the world: The ANDENES or INCA Terraces that challenged high altitudes, and geographical defy have been with us for more than 1500 years and will be for at least 1500 years more.

Andenes Construction Techniques also will have applications for the construction of future cities in the areas housing and infrastructure due to the use of local materials and vertical concept.

The author Architect Rodolfo Beltran has a 30 year experience in the Private Sector and Government Cabinet posts and has specialized in Sustainable Rural development and Innovation Management-

In 2011 was awarded the International Green Award in London , UK-He is the author of the Book " Four Years Closer to Heaven" that describes his experiences y climate change mitigation and poverty reduction in the Andes of Perú and written the book four years more closely of the sky. This experience links are attached.



PROPOSAL

INCA Civilization Sustainable Development Technology for Future Cities in MARS .

Rodolfo Beltran
ECOARKI SAC
Lima, PERU
01/01/2015

PROPOSAL:

The legacy of the Incas will be very useful for future colonies of man in the space in the areas of family and Vertical agriculture, nurseries and use of sustainable crops species which over the centuries with sand climatic change, due to the efficient use of water resources, nutrition, and food production and conservation properties

The proposal considers an integral design and construction methodology for future and could be applied for future Martian Cities for the following reasons:

- Use of local material and resources
- Low Energy and Carbon and Ecological Prints
- Use Collective labor force by users
- One of the few solutions that could be started immediately on Martian Soil
- Infrastructure contemplated ifs for Vertical housing co existing with organized family farming.
- Appropriate for Self Sufficient and Sustainable communities
- Takes advantage of gravitational forces difference indoors and indoors
- Uses of renewable energies and water resource optimization
- **INITIAL URBAN PLANNING OF PROPOSED MARS CITIES**

Its initial urban and physical development is planned, but not limited, to Craters which are a natural existing floor –wall boundaries. It also could be applied to natural chains of cliffs and mountains scenarios. *List of Craters in MARS. Source WIKIPEDIA
Craters on Mars larger than 1 km exist by the hundreds of thousands, but only about 1000 of them have names. Names are assigned by the International Astronomical Union after petitioning by relevant scientists, and in general, only craters that have a significant research interest are given names. Martian craters are named after famous scientists and science fiction authors, or if less than 60 km in diameter, after towns on Earth. Craters cannot be named for living people, and names for small craters are rarely intended to commemorate a specific town. [1] Latitude and longitude are given as planet coordinates with west longitude.

Photo: Rodolfo Beltrán Galeria del "Mundo de los Andenes" MISTURA FAIR 2014 Lima PERU

AGRICULTURAL ADDED VALUE

INCA Crops were developed by a patient and long domestication process mainly by the ability and patience of Inca and Pre-Inca women. These crops resisted severe climate changes and used efficiently water resources and were adapted in the highlands of Perú for low oxygen consumption.

Plants will be the first settlers of Mars. The Potato, original from Peru that has saved several times humanity from famine and the Quinoa on the Andean Area would certainly be the first choices.

These crops adapted and domesticated by women in the highlands of Perú resisted severe climate changes and uses efficiently water resources and have low oxygen consumption and cope with low temperatures. Nutritional facts and conservation features make them very appropriate for cultivation in future space human settlements. Most likely, "The Last Crops of

the Incas" will be the "First Crops" in Space. *"The Last Crops of the Incas "National National Academies.

Roots, Tubes, Grains, medical and Nutraceutic species Low consumption of oxygen and efficiency in hydric resources were part of the INCA CIVILIZATION species domesticated in the highlands

Species and like the TUNA or NOPAL and Quinoa that require less oxygen and hydric resources

NASA has been working for years in selecting appropriate species for Mars and other Space Colonies. As expressed by Plant Physiologist Ray Wheeler in an interview
Source: There's A Real Human Mission to Mars – Here's What We Know About It (Part 2)
By Robin Seemangal |The Observer.com

Are potatoes really the future of space cuisine?

Plant Physiologist Ray Wheeler- "They are."

“I’m a botanist and specifically a plant physiologist and I’ve been working for NASA for close to 30 years now and I’ve spent most of my career studying plant growth in controlled environment systems. The intent of that is to really look at the potential for plants to provide life support for future space missions. Can they be used to produce food and through photosynthesis can they generate oxygen and remove CO2”

“As it turns out I ended up studying potatoes in particular for a lot of my research at the university of Wisconsin and then here at Kennedy Space Center. “

“Potatoes are a good choice=.

On the same subject recently in the Movie THE MARTIAN and NASA authorities have confirmed the feasibility of growing potatoes in MARS and with the Peru-based International Potato Centre (CIP) will start cultivating potatoes in Mars-like conditions on Earth in the deserts on LA JOYA, Arequipa, PERU. This report is reproduced b

NASA wants to grow potatoes on Mars

Nyshka Chandran | @nyshkac
Monday, 21 Dec 2015 | 10:08 PM ETCNBC.com

http://www.cnbc.com/2015/12/21/nasa-led-team-wants-to-grow-potatoes-on-mars.html

In Ridley Scott's science fiction drama The Martian, Matt Damon's character plays a botanist who discovers how to grow potatoes on the Red Planet. Now, scientists are conducting an experiment that will bring them a step closer to making that a reality.

NASA and the Peru-based International Potato Centre (CIP) will start cultivating potatoes in Mars-like conditions on Earth, with the hope of eventually building a controlled dome on Mars capable of farming the ancient crop.

The team will replicate Martian atmospheric conditions in a laboratory, using soil from Peru's Pampas de La Joya desert —reportedly nearly identical to that found on the Red Planet.

"The increased levels of carbon dioxide will benefit the crop, whose yield is two to four times that of a regular grain crop under normal Earth conditions. The Martian atmosphere is near 95 percent carbon dioxide," CIP explained in a recent press release.

By understanding atmospheric changes on the surface of Mars, the team hopes it will help build more dynamic and accurate simulation centers on Earth. If successful, the experiment

could see CIP and NASA pioneer space farming for future manned missions to not just Mars, but other planets and moons in the solar system.

Nyshka ChandranAssociate Producer, CNBC Asia-Pacific

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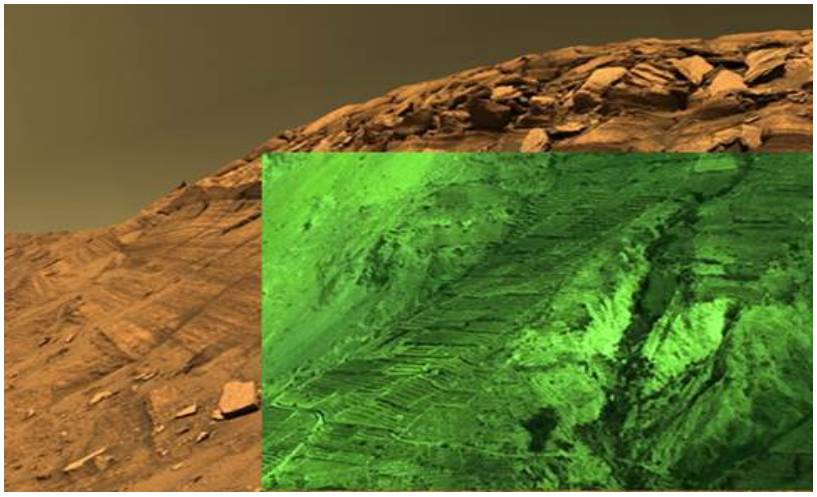
Source: Mars Society



Simulation of INCA TERRACES or Andenes in existing Crater of Scenarios of MARS
Source: Rodolfo Beltrán

CLIMATE, ENVIROMENT AND STRUCTURAL CHALLENGES

The concept considers human made habitat with artificial sun, rain and seasons. Structural roof challenges are also considerable. At present largest domes and single span roofs in the world are around the 220 meter limit. With present technology, challenges are great and initially small diameter crater sizes or chain of small craters should be considered. However existing floor and walls crater surfaces treated with INCA Andenes or Terraces for sustainable communities providing housing, renewable and clean energy, horizontal and vertical transport, agriculture and leisure make the concept feasible for consideration.


Huaytapallana Andenes scale Modell shows the Features of Inca Sustainable Cities

FUNCTIONAL & SUSTAINABLE CITIES:

A variety of independent and interconnected Functional, Season or Theme Cities are possible. Cities for: Food production, Leisure, Research, Housing and Leisure or a combination of functions and artificial climate scenarios. INCA Cities were one of the first examples of sustainable cities and use of renewable energies in the world. Hydric, carbon and ecological footprints were minimum.

FUTURE DEVELOPMENT OF THE PROPOSAL

Concept proposal has to be further developed and has many challenges. Among others are:

A) Feasibility of using existing craters or chain of mountains in Mars for INCA technology ANDENES infrastructure for habitation and Agricultural purposes
B) Inca Crops implementation. NASA has done this research before but in this case the proposal covers the implementation of vertical greenhouse solutions using the ANDENES concept of using existing local materials and taking advantage of existing topography. Main advantage is a short term implementation of the proposal
C) The need of innovative infrastructure to cover and protect long spans in existing Craters in Mars. At present, with existing technology, spans are at 220 LM Limit between supports.
D) Urban Planning concept proposed is to have interconnected craters each one with different functions and emblematic features

RESEARCH EXPERIMENT at the MDRS

VIDEO ANDENES IN MARS: https://vimeo.com/133210462

A Research project was proposed in early 2015 for the 150th MDRS mission. Unfortunaly and due to professional activities the author of this proposal could not attend. This is a summary

1) Clearly state what you are going to do

A representative prototype of an ANDEN structure (terraces for Agricultural and housing purposes) using local materials and the existing topography scenario in the UTAH Station.

Main objective was to present some basic elements for future Sustainable Communities for Mars using concepts of Inca Civilization Technology and the value of INCA CROPS

a) Construction of a short representative 2 level ANDEN (terrace) outside the Habitat). Ideally in a similar crater Scenario at the MDRS
b) Planting of INCA SEEDS in a simulated " Dome Structure- "Garden Igloo kit"

2) How you are going to do it

Will need on site the resources listed in item 3. For the Construction phase will need 2 people crew help in the construction phase and operation of small pay loader

3) What resources you need.

The following equipment, materials and seeds would be required and provided by the MDRS at the site

A) Shovels and digging tools. Gloves, Helmets
b) Small pay loader (montacargas) with an Operator
c) Existing local materials (stones)
c) Gravel, sand and carbon (the same materials of a modern filter
d) Organic Soil and water for irrigation
e) Available seeds of Inca Crops available in the US. (Quinoa, kiwicha, Chia or similar)
f) Garden Dome kit 3LM diameter available in the US Market
g) permits- for seeds and earth work

Conclusions

Project Feasibility of using Inca Technology in sustainable cities in MARS is feasible and should consider:

INCA Seeds

As consulted with MDRS taking seeds to USA for was complicated and also in my opinion a 3 week period will not be representative, in this particular case.

Protection Dome Structure in Craters

Radiation protection and Research on Roof Structure with long spans between Crater Walls is one of the biggest Challenges. Gravity scenarios would be an advantage in some aspects. The Country in Peru has one of the highest radiation UVL levels scenarios on earth.

Examples of structural domes in Water Parks. Source Internet :Aircrafw

In any case there is local interest to conduct these experiments in the short range in the short range- in coordination with MARS SOCIETY in similar desert scenarios in the

desert of Chilca/ Huarochiri, Community of Cuculi/Villa Pampilla Perú. (Picture attached at the end of this document

Rodolfo Beltrán, M.Arch

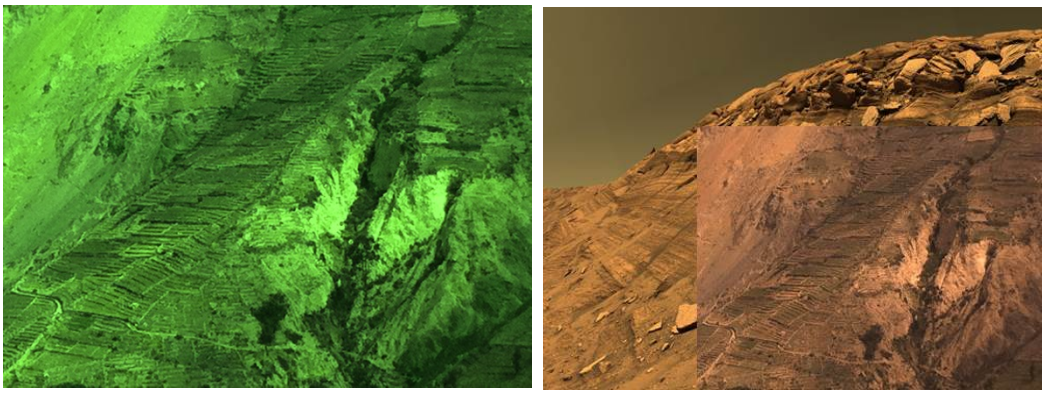
LINKS AND REFERENCES

A PROPOSAL: INCA CIVILIZATION TECHNOLOGY for Future Cities in Mars
http://lahoradelachalina.blogspot.com/2014/09/propuesta-tecnologia-inca-para-las.html
THE INCA TERRACES PROJECT / PROYECTO ADOPTA UN ANDEN
http://www.youtube.com/watch?v=I0u929BGIGY&list=UU4ucShLvgYydptyrGbLigrw
AMIGOS DE LOS ANDENES DEL PERU/ FRIENDS OF THE INCA TERRACES
https://www.facebook.com/pages/Amigos-De-Los-Andenes-Del-Per%C3%BA-AAP/1405941002997945
BOOK: "FOUR YEARS CLOSER TO HEAVEN" in AMAZON
VIDEO ANDENES IN MARS: **https://vimeo.com/133210462**

http://www.amazon.com/Four-Years-Closer-Heaven-testimony/dp/612000386X/ref=sr_1_5/183-1735547-6507840?s=books&ie=UTF8&qid=1406269586&sr=1-5

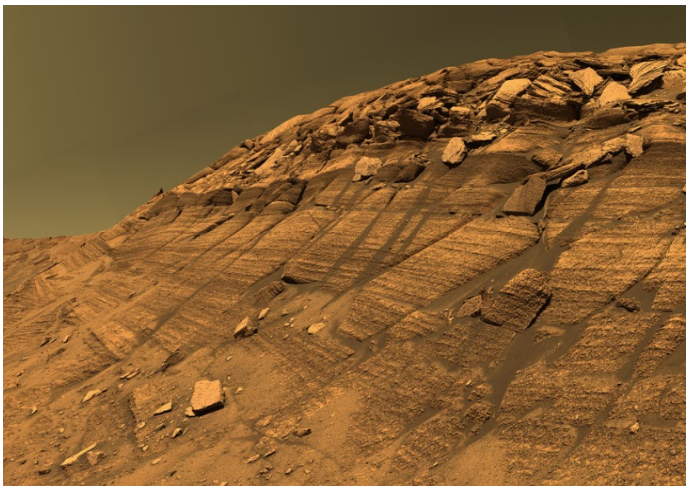
PROJECT CONCEPT PICTURES

Andenes World replica at the MISTURA 2014 Fair



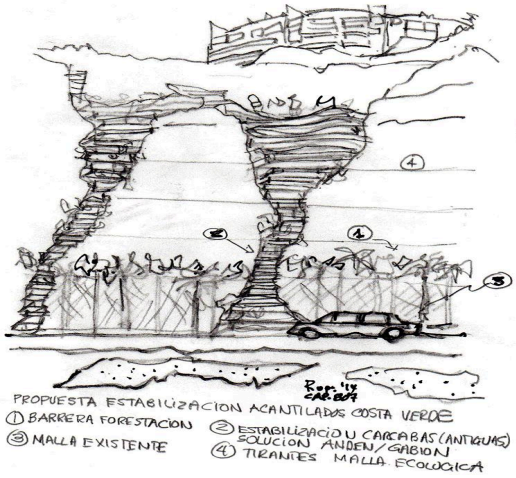
Simulation of Andenes terraces in Existing Craters and scenarios in Mars

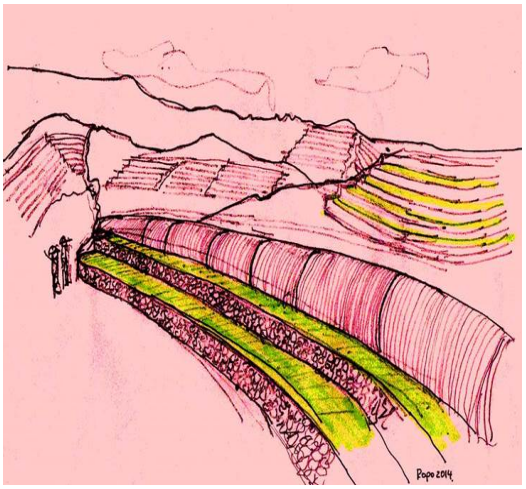
Use of existing MARS craters formations is proposed



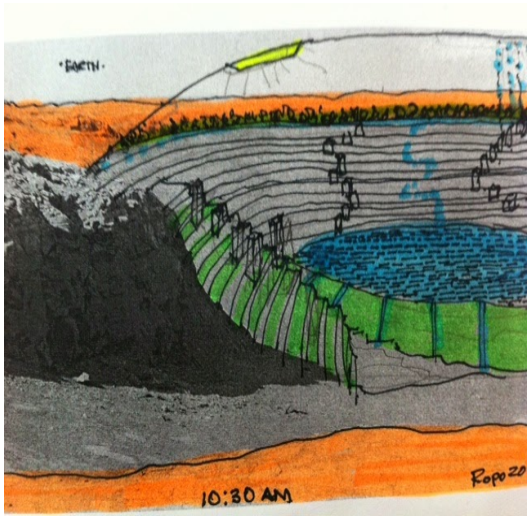
Tuna Plantations in PERU

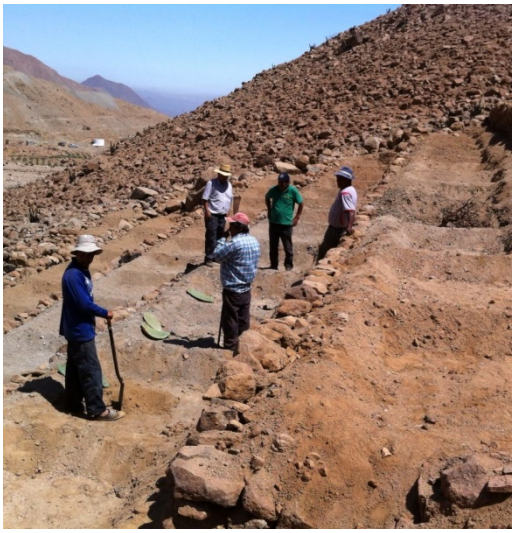
Moringa Plants in High Tech nurseries in Peru



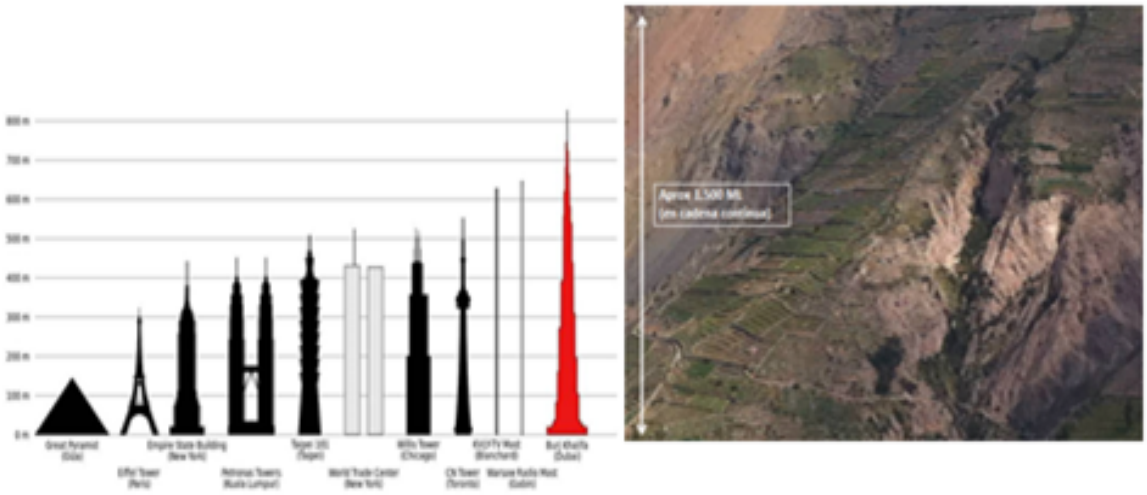


Some examples in PERU of INCA Andenes Technology used in Modern Rural Infrastructure
Source: Internet; Seminario Obras por Impuestos, Lima PERU

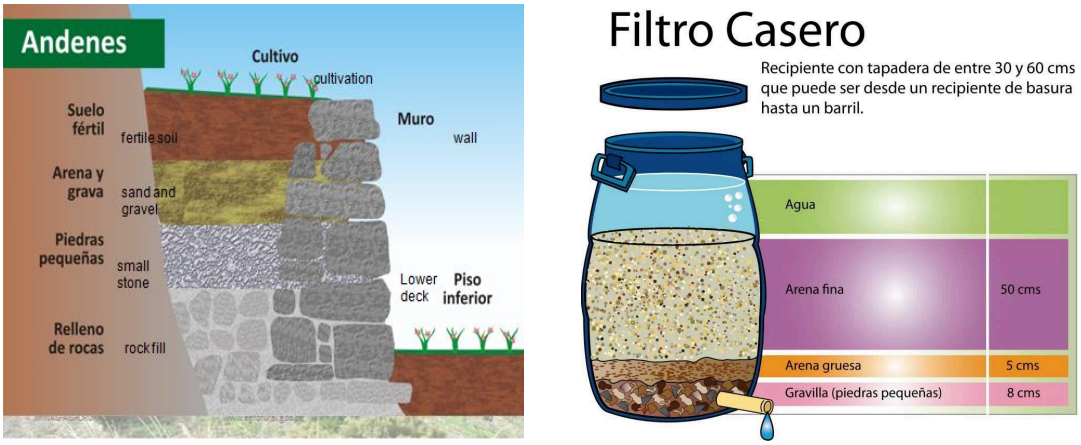




Workers in Cuculi/Villa Pampilla in ANDENES TERRACES Construction selected for one Research Station in Perú and Original INCA builders



The Andenes sequence of ANDENES Chains in Peru are considered the tallest man made artificial non self-supported structures in the world- Rodolfo Beltrán, Lima PERU



Water efficiency and quality of ANDENES Terraces. Modern filters have incorporated all the basic elements of INCA ANDENES

Many modern Architectural Projects are inspired in the INCA ANDENES . We believe that a mention or credit should be mentioned in these projects - Arq. Rodolfo Beltrán , PERU

Existing Topographical scenarios in Mars similar to Inca Andenes.
Credits . MARS SOCIETY and Arq. Rodolfo Beltrán , PERU

Examples of the possibility of prefabricated Domes of initial Pilot Programs in Perú

INCA Cities. An Example of Sustainable Cities for Humanity

APENDIX I: The Book "Four Years Closer to Heaven": My testimony on the Fight Against Poverty and Climate Change in the Highlands of Peru (Spanish Edition) (Spanish) Paperback– Large Print, July 1, 2014

by Mr Rodolfo L Beltran MArch (Author

http://www.amazon.com/Four-Years-Closer-Heaven-testimony/dp/612000386X

A book in Spanish with sub Titles in English, Chinese and Quechua with more than 600 pictures describes a 4 year Experience of the Author in the Andes of Peru conducting projects and solutions in Climate Change and the War against Poverty. Successful Co Participation and Self-help Projects in Forestry, Landscape terraces, irrigation, animal protection shelters , Market access. First hand testimonies of rural community Inca descendant's peasants and natural and ecological tourism scenarios . Re incarnations experiences are also described. Successful co participation in Forestry and animal Shelter Construction. Landscape terraces reconstrucción and maintenance Programs. "CUATRO AÑOS MÁS CERCA DEL CIELO" un libro en español con subtítulos en Inglés, Chino y Quechua con más de 600 fotos recoge mis experiencias en las alturas de los Andes del Perú en una emocionante e intensa época de mi vida, compartiendo angustias, sueños y esperanzas con miles de hermanos y hermanas de las organizaciones campesinas alto andinas. Muchos de ellos habitantes de ese espacio mágico tridimensional de los andes peruanos: LA CUENCA. Dicen que una fotografía vale más que 1000 palabras. Gracias a Dios el Perú es un país privilegiado que puede mostrar miles de imágenes que reflejan la belleza de su geografía y el calor y la pujanza de un pueblo trabajador que ya se expresaba a través de adelantadas culturas prehispánicas y que se consolidó en el Tahuantinsuyo de los Incas. Las ilustraciones también implican un lenguaje universal. Es por eso que en el presente libro se ha dado gran importancia a las fotos y gráficos y la razón por la cual, prescindiendo que los textos estén solo en español, algunos títulos aparezcan también en inglés, quechua y chino. Abordaré principalmente actividades desarrolladas durante un periodo de 4 años durante los cuales participé con el apoyo de mis colegas del Sector Agricultura y del Programa AGRORURAL en la ejecución de más de 100,000 obras en el sector rural. Todas ellas concebidas en un esquema de demanda y realizadas con la coparticipación

de los beneficiarios. La mayoría de ellas desplegadas durante ciclos cortos no mayores a lapsos de 4 a 6 meses de ejecución. En los primeros capítulos hago un recuento de las principales obras y servicios realizados y al final expongo algunos lineamientos que en nuestro concepto son exitosos en la reducción de la pobreza. Se incluyen también experiencias paranormales de reencarnación

About the Author

Rodolfo ROPO Beltrán born in Lima, Peru graduated in Texas A&M with a Master's Degree in Architecture. Areas of expertise include Sustainable Development Projects, Rural Development, Food Security, Global Warming Mitigation and Family Agriculture. Has an extensive private and governmental experience in Perú, Venezuela, USA and Brazil. Fluent in Spanish, English and Portuguese Appointed as Commercial Attaché for Venezuela and The Caribbean. Has held Governmental cabinet posts of Minister of the Presidency, President of the Institute of Foreign Commerce Exterior, and Board Director of the Central Reserve Bank of Peru. (BCRP). Decorated by the Government of Perú with the Order of Merit for Distinguished Services, "Comendador Grade" and INDECI Medal, National Civil Defense System, and The Cruzeiro do Sul Big Cross of Brazil Conducted The Peruvian National Forestation campaign recognized by The United Nations Environmental Program (UNEP) in the 8th place of its World Reforestation Campaign. Won the "6th INTERNATIONAL GREEN AWARD" in London , UK, "Best Collaborative Initiative" in the "PERU: 230 Million Tree Campaign" He was a member of the Delegation of PERU to the World Congress CARBON EXPO and in 2011 the SUN MOVEMENT, WORLD CONGRESS in New Delhi Conference on Agriculture, Health and Nutrition . Participated in turning successful sustainable development projects to governmental public policy. In 2010 directed the team that designed the Inter-American Development Bank, BID - Government of Peru - AGRORURAL PE-T1165 TERRACE RECUPERATION IN THE ANDES - ANDENES. He is the author of many technical publications in Foreign Commerce and Rural development and of the book "FOUR YEARS CLOSER TO HEAVEN" that describes his experiences in rural development, global warming strategies and poverty reduction actions in 10 departments of the Sierra of Perú. He was considered by the GENTE magazine in Peru as one of the best public figures in 2010. At present he Directs the "ADOPT an INCA Landscape Terrace", an Ecological and Food Safety program of the APEGA, Gastronomy Society of Perú and directs the Page AMIGOS DE LOS ANDENES DEL PERU- FRIENDS OF INCA TERRACES. In sports he has been a member of the National Swimming Team of Peru, Bronze Medal in the US. Swimming NCCA South West Conference, Texas A&M Varsity team, and in 2004 and 2008 was the South American Swimming Championships in Master Cat55 in backstroke style.

APPENDIX II. Correspondence with Mars Society

THE MARS SOCIETY

The Mars Society
11111 W. 8th Ave., Unit A
Lakewood, CO 80215
www.marssociety.org

September 30, 2014

Rodolfo Luis Beltran Bravo
Calle Parque Principal 121 #401-A
San Miguel, Lima, Peru

Dear Mr. Beltran:

This letter is to inform you that you have been selected as Commander for Crew 150 at the Mars Desert Research Station (MDRS), established and operated by The Mars Society. Crew 150 will take place from February 21st – March 15th, 2015.

The purpose of the Mars Society is to further the exploration and settlement of the planet Mars. The Mars Society is a fully registered non-profit tax-exempt 501(c)(3) charitable organization in the United States, with federal tax identification number 31-1585646.

The focus of MDRS is to enable crew members to participate in immersive full-scale simulations of living and working on Mars at MDRS. Operations are conducted in the same style and under many of the same constraints as they would on Mars.

Based on your extensive and accomplished professional, academic and leadership experience, you have been selected to command Crew 150 (Team Peru III), which is composed entirely of Peruvian university students. Team Peru I and II performed valuable research on the area of EVA emergency procedure development, and we look forward to the research you will perform at MDRS.

For more information, please refer to the MDRS website (http://www.marssociety.org/home).

Sincerely,

Robert Zubrin, Ph.D.
President
The Mars Society
Tel: (303) 980-0890

Human Exploration and Settlement of Mars

Designation Letter as Commander of MDRS Mission 150 . The author is very grateful to MARS Society and his President Robert Zubrin, PHD for this honor and designation. Unfortunately due to professional conflict conferences agenda it was not possible to Participate.

Your Mars Society Convention Presentation

Mark Francis <mfrancis@marssociety.org> 07/09/15 at 1:15 PM

To ropobeltran@yahoo.com

CC Carie Fay

Dear Mr. Beltran

The 18th Annual International Mars Society Convention will post a preliminary schedule later this week. Your presentation "Proposal For Sustainable Communities in the Future" is tentatively slated to take place with the track talks on Thursday, August 13 at 4:00PM and you will have approximately 25-30 minutes to present.

Please contact us to confirm this is the proper title of your presentation.

Our records indicate you have yet to register for the convention and we suggest you do so at your earliest convenience.

We would also love to see you at the Saturday night banquet, which is one of the biggest highlights of the convention.

Convention registration and banquet tickets can be purchased using the following link: http://members.marssociety.org/convention-registration/

You are responsible for your own lodging and transportation and are free to stay anywhere in the greater Washington, DC area; however the Phoenix Park Hotel is offering special rates to convention attendees–if you book by July 13th–. The Phoenix Park hotel is conveniently located near the Catholic University of America. More information regarding this special rate and other lodging/transportation information can be found here: http://www.marssociety.org/conventions/18th-annual-international-mars-society-convention/hotel-and-transportation

If you have any further questions please do not hesitate to contact us at cfay@marssociety.org

Once again, congratulations and we look forward to seeing you in Washington

Letter of Approval of the Presentation "Proposal for Sustainable Communities in the Future" for the MARS SOCIETY CONVENTION in Washington DC , August 2015. . The author is very grateful to MARS Society and his President Robert Zubrin, PHD for this honor . Unfortunately due to personal family extraordinary causes the author could not attend con August 13th , 2015 .