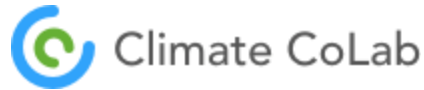


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FINALIST

Proposal: Land for Life: An alternative to slash-and-burn in the world's rain forests

**[Land for Life: An alternative to slash-and-burn in the world's rain forests](#) by Inga Foundation: Land for Life team**

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"Guama", an integrated agroforestry model, is transforming family livelihoods, saving rain forests; restoring degraded soils and landscapes.

### **Description**

This proposal outlines the implementation, in the world's humid tropics, of a revolutionary agroforestry technique, based on the ecology of tropical rain forests and tested over decades, which is transforming the lives and livelihoods of subsistence farming families. Inga Foundation's (IF)'s Land for Life Program directly addresses six of the UN Sustainable Development Goals (SDGs) with indirect benefits towards at least three others.

We will further outline how these goals are being achieved with no negative impacts or tradeoffs with the remaining SDGs. This outcome is possible because the core strategy is to restore soils degraded by decades of slash-and-burn agriculture and to restore tree cover to land no longer needed for future slash-burn operations. The strategy is both remedial and regenerative. **IF's** Land for Life Program and the "Guama" agroforestry model will be outlined below, together with the socio-economic impacts seen from the point-of-view of the family who, formerly having subsisted precariously using slash-and-burn, is now implementing this sustainable and climate resilient livelihood.

The Guama Model is based on the outcomes of many years' research, development and trials that began in the mid 1980's by collaborators from the University of Cambridge, RBG Kew, UCR and others. A group of those colleagues established **IF** in 2007 to extend and promote the ground-breaking discoveries of those R&D phases.

At the heart of the Model is **Inga alley-cropping**, a system of deep mulching using pruned green leaves from nitrogen-fixing Inga trees which are contour-planted in hedgerows. It has proved itself capable of achieving food-security in basic-grains for the family, upon a permanent plot which can be located near their dwelling. The system produces firewood for the kitchen and virtually eliminates the need for weed-control. Additional plots enable the whole family to be involved in their own cash-crop economy; located, for the first time, on their own doorstep.

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### **Proposals**

Inga -> Solve Carbon Contributions

Promote Agroforestry Technologies for Farmers to Shrink Climate Change

Developing an alternative to shifting cultivation in NE India

Forest and cropland rehabilitation through sustainable farming and agroforestry

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### What actions do you propose?

Inga Foundation proposes to establish demonstration centres and seed-banks in all the Central American countries, to expand sister projects in Madagascar, and to serve as a knowledge partner for additional interested communities throughout the world's humid tropics.

To accomplish these goals, we are seeking funders, especially government programs, to work with specific projects or whole regions, whether through economic or agricultural development, international climate funds, or other mechanisms. With applicability around the world, and impacts towards the majority of the SDGs, Inga Foundation stands ready to heal tropical ecosystems and livelihoods.

### Global Objectives

- An end to the destruction of the world's remaining primary and secondary rainforests by slash-and-burn agriculture.
- An end to the food-insecurity and poverty that is driving that destruction; and to the socially destructive rural-urban migration that results from slash-and-burn's failure to sustain rural subsistence agriculture in these environments.
- To introduce and facilitate the adoption of a proven, minimal-input rural livelihood with families who are presently enduring a precarious (and failing) struggle for subsistence by slash-and-burn.
- To promote and further to expand the highly encouraging beginnings of a grass-roots revolution in subsistence agriculture in the world's rainforest regions.
- Actively to promote the reforestation of those areas of the family holdings that are no longer needed for slash-and-burn.

### How ?

1. the introduction of **Inga alley-cropping** as the foundation of a low-input, debt-free and scientifically-proven model which is capable of yielding **food-security in basic grains**, together with a reliable income from **cash-crops** also grown in the alley system. A steady income from permanent **tree-crops** is a useful supplement and the system as a whole enables the long-term environmental security that springs from **reforestation** of land no longer needed in the destructive slash-burn cycle. The **Guama<sup>[1]</sup> Model** results from over 25 years' research and development and is Inga Foundation's response to the present and widespread problem of land degradation due to repeated slash-and-burn.

### The Guama model: an integrated rural livelihood – replicable and debt-free

A single hectare (ha.) has been found sufficient to provide the food security for a family to benefit from a **sustainable low-input rural livelihood**. The Guama model was developed with local non-Governmental (NGO) partners alongside Honduran farmers to provide:

- **1-2 ha. Inga alley-cropped basic grains**; e.g : maize, beans
- **1-2 ha. Inga alley-cropped cash-crop cultivars** e.g. vanilla, black pepper
- **1-2 ha. low-maintenance fruit trees**, (e.g. cacao, citrus) associated with Inga as their sole source of Nitrogen and shade.

- **2-5 ha. Reforestation** of degraded land enabling carbon-capture.
- an **environmental education program** underpinning the whole strategy.

**The model assumes a holding of about 8ha. and is completely flexible**; a family can adopt any component, or combination of components, on any area, that it sees fit.

#### 1. **Research validation & local credibility (Completed)**

The earlier Cambridge Inga Projects saw the basic research into those aspects of soil ecology and chemistry necessary for the development of a sustainable solution to the problem. Later phases saw the Inga system through pilot trials with families in the buffer zone of the Pico Bonito National Park (PNPB) in Honduras. During this time, the whole approach gained credibility with those NGOs and institutions who would be involved in future extension of the whole Guama Model there.

1. IF's Land for Life program is demonstrating the Guama Model's unique ability to restore degraded soil to fertility and is now proving its credibility at landscape scale. The program is well on the way to beginning the transformation of the two river catchments that form the boundaries of the PNPB; one of Honduras' last remaining tracts of virgin rain forest. The ultimate ambition is to deploy the Model to restore links between isolated blocks of such forest and thus to provide the first example of such restoration along the length of the Meso American Biological Corridor. The Model can achieve this because it addresses the fundamental cause of the original deforestation that is seen in today's fragmentation.

#### 1. **Demonstration and education at regional level**

We have included in our overall 10-year budget estimates an element for running open courses for groups of visiting government and non-government agencies, farmer groups, etc. from all over the Central American region. These 4-5-day courses are held at our demo centres and also with willing families who have adopted, and are successfully implementing, the Guama Model. A teaching facility at our Centre at Las Flores will be needed in support of this; in addition to those facilities available to us in the University (UNAH/CURLA) at La Ceiba.

#### 1. **Replication at regional level in Honduras**

Farmer groups and individuals from all over the South and Central American and Caribbean regions have already come to us to gain experience of the Guama Model. They have come from countries including: Nicaragua; Belize; Haiti; Guatemala; Peru; Bolivia and Mexico; as well as many groups from Honduras itself. Moreover, a number of projects are in the early stages of establishment.

Replication of the Model requires the establishment of Demo-centres and seed-banks, however small, in the target localities; together with a somewhat intensive extension effort along the lines of the present Cuero/Cangrejal operations. We foresee perhaps a dozen smaller centres in Honduras alone, as a minimum for success nationally. From about 2018 our own centre will be capable of supplying millions of Inga seeds annually in support of such replication until the centres grow the capability for themselves.

#### 1. **Replication in global contexts (simultaneous with 3)**

Wider dissemination of the Model will be achieved by adopting the same approach that is currently yielding success in Honduras. We propose concentrating resources in specific areas with strong networks of governmental and community partners, many of whom are already established with Inga Foundation. A thin, widespread scatter of localities would be an ineffectual waste of resource.

Our long experience in Honduras since the end of the Cambridge Inga Projects convinces us that this concentrated approach is the only one with any chance of success. This is not because the Inga system is flawed, but because it is a dramatic shift for the subsistence farming families at whom it is aimed and not a "quick fix" to the serious problems confronting them - it requires an investment of time, money, and trust.

Having its roots in the Cambridge Alley-cropping studies in the 1990s, and having concentrated on demonstrating and extending the Guama Model for many years, IF has a wealth of insight and experience to share with others confronting the same set of problems in other rain forest realms of the world. We are willing to welcome visits from any of them as we are already doing for groups from Central and South America and the Caribbean.

### **Central and South America**

Depending on available funds, there is immediate potential to expand groundwork projects in:

Honduras; Belize; Guatemala and Nicaragua.

New projects in Costa Rica and Panama.

Dominican Republic: Highly eligible in its wet zone and potentially important as a logistic base for work in neighboring Haiti.

### **South America**

Existing projects in Peru; Bolivia and Ecuador.

**Madagascar:** Subjected to devastating deforestation in the present day. We propose a major strengthening of the existing Homaray and RBG Kew COFAV projects. New collaboration with Marojejy-Anjanaharibe reserves proposed.

**Africa** Huge potential in many Central and West African countries.

**SE Asia** Proposed collaboration in Sabah (Sepilok). Huge potential for the Guama Model across the whole SE Asian – PNG – Melanesian region.

### **Reforestation in the Guama model and Biological corridors**

The creation of low-input, sustainable livelihoods, on an expanding front, opens the barriers to the final component of the Guama Model; and one which is capable of transforming whole degraded landscapes: **Reforestation.**

Once the remorseless imperative driving subsistence farmers to repeated slash-and-burn is nullified, the family can turn its energies to planting trees for the future. At its simplest, well over half of the family's degraded land; often on steep hillslopes, will no longer be needed for survival. Our experience is that they might need a little additional incentive to begin planting trees that will be valuable timber some 20-30 years into the future.

### **Recapturing invasive grassland for forestry.**

This is where the soil restorative properties of Inga find another use. The problems to be overcome relate to soil condition and the environment experienced by tiny trees struggling to survive the ferocious competition from invasive grasses. Most broadleaf species in the rainforest that are desirable as fine timber evolved to regenerate in gaps in the natural forest and in the sheltered, rich conditions of a biologically vibrant soil created under millennia of forest. Few of these species thrive well in fire-climax grassland.

We are planting and demonstrating the use of Inga species as the intermediate, "nurse" trees that can begin the transformation of such grassland back towards the condition of the forest that we intend eventually to create.

A "matrix" of Inga is established into the grass and the eventual timber trees are interplanted within it once the Inga has begun to recapture the site. This it achieves by progressive shading and slowly enriching the soil by leaf-fall. This planting strategy has the huge benefit of providing firewood by branch-loppings to reduce side competition from the Inga. A planting such as this will provide kitchen fuel for 365 days a year; within 2-3 years of planting.

[1] "Guama" is the local name for trees of the genus *Inga* in Honduras.

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### **Who will take these actions and which types of actors are involved?**

The primary actors will be community-based extension workers and Inga Foundation staff, with new locations seed-funded by external actors. At present (2018), Inga Foundation is concentrating its resources in the two river catchments - the Cangrejal and Cuero - which form the East and West boundaries, respectively, of the Pico Bonito National Park in Atlantida on the Honduran North coast. There is therefore a strong conservation dimension to this strategy. Our Land for Life Program began in 2012 with the target of recruiting about 40 families per year to the Model up to about 200 by the end of 2016. This target was exceeded in mid-2015. The whole operation is supported by our demonstration farm at Las Flores in the Cuero valley and by the old Cambridge Inga plots at CURLA near La Ceiba. The latter are also the location of an investigation into the long-term responses of Inga alleys to mineral supplements.

Replication of the Model requires the establishment of Demo-centres and seed-banks, however small, in the target localities; together with a somewhat intensive extension effort along the lines of the present Cuero/Cangrejal operations. We foresee perhaps a dozen smaller centres in Honduras alone, as a minimum for success nationally. From about 2018 our own centre will be capable of supplying millions of Inga seeds annually in support of such replication until the centres grow the capability for themselves.

The early stages of introducing a radical and revolutionary set of techniques such as Inga alley-cropping will require as intensive an attention-to-detail as we are currently applying in Honduras. It is envisaged in our own 10-year program that potential project directors and extension workers would be embedded into our own extension operations for, perhaps, a month at a time, as part of their own induction into how to implement the Model.

Our present partners in Honduras include: Fundación Hondureña de Investigaciones Agrícolas (FHIA); Centro Universitario del Litoral Atlántico (CURLA) of the Universidad Nacional Autónoma de Honduras (UNAH); Fundación Parque Nacional Nombre de Dios; Panthera (Honduras); Mosquitia Pawisa (MOPAWI);

Elsewhere: Fundación del Río; Envoi Vert (Nicaragua). EcoLogic; Parlamento Centroamericano (PARLACEN) (Guatemala). IUCN (Central America).

Ya'axche (Belize). Ashaninka and Awajún Communities and Cool Earth (Peruvian Amazon).

Royal Botanic Gardens Kew (Madagascar and Congo); Royal Botanic Gardens Edinburgh (Honduras); Homarary Project (Ifarantsa, Madagascar).

The resources built up by IF are well-placed to become the training base for a much more widespread operation in the region. We would expect to establish many small centres in Honduras itself, as well as greatly expanded operations in Nicaragua, Belize and Guatemala.

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## **Where will these actions be taken and how could they scale?**

The Cambridge projects of the 1980s and 90s deliberately chose to investigate the ecology of the problem on a rain forest site typical of the wider humid tropics. The soil there is a highly-weathered, leached and acid Ultisol. The Ultisol/Oxisol soil groups form 75% of the available land in the humid neotropics. The solution that emerged was based on our knowledge of rain forest ecology and exploits some of the highly adapted characteristics of trees in the genus *Inga*. This neotropical genus contains over 300 species and offers site-specific qualities for a wide swathe of the Central and South American rain forest zones. In an attempt to avoid exotic introductions elsewhere we have made concerted efforts with RBG Kew to identify analogue species for the SE Asian and African wet forest biomes. In the former, we see promise in a genus closely related to *Inga*; whereas in Africa we need to apply more resources. However, it emerges that a few *Inga spp.* have been introduced to all these zones; even including Queensland. Efforts in Madagascar have failed to find analogue legume species and the Homaray Project is deploying the exotic *Acacia mangium*. There and in West Africa, a strong case for a controlled introduction of *Inga spp.* can be made.

### **Scaling up**

In Honduras, the valuable coastal and riverine flood plain land is all taken by corporate interests and the vast majority of subsistence farmers are marginalised to steep, rocky hillsides in the incised Cordilleras. The landscape units that we are dealing with are therefore the catchments of the numerous rivers. Our farm at Las Flores is a case in point and lies at the confluence of a number of tributary valleys of the Cuero. It is also at the crossroads of many mule tracks. Many people pass the farm daily; and many have visited the demo plots. Families' *Inga* plots along the mule tracks fulfill the same role.

Las Flores can thus be seen as the "nucleus" of a "cell" comprising the whole Cuero catchment.

It follows that the scaling up of the Guama Model is achieved by the replication of such cells across other river catchments of the region. The demo-plots / seed banks in the new nuclei need not be as big as Las Flores which will be the main resource and teaching centre for any such scaling-up.

Each new country will need a strategically located centre like Las Flores; they will need teaching and accommodation facilities as well as *Inga* plots and extensive seed orchards. Their establishment will mark the beginnings of a new Green Revolution, more radical than the last; and taking decades, if not centuries, to complete.

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### **In addition, specify the countries where these actions will be taken.**

Honduras

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### **Country 2**

Madagascar

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### **Country 3**

Nicaragua

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### **Country 4**

Dominican Republic

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**Country 5**

Peru

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**Impact/Benefits:**

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**What impact will these actions have on reducing greenhouse gas emissions and/or adapting to climate change?**

The data below demonstrate the potential of the Model in mitigating climate change through both eliminating deforestation emissions and increasing carbon uptake into soil and timber.

The 240 families working with us in Honduras will still be effecting positive atmospheric change a century from now and, by then, will have sequestered of over 4m t. of atmospheric C.

We intend to broker and channel informal carbon funds to the families. Meanwhile, we need to establish the model as a fact on the ground and then to generate actual carbon data.

The following table shows the annual Carbon (C) budget for one family adopting the Guama Model and reforesting 1 ha. *p.a.* from year 3.

Year?	1	2	3	4	5	6	7	8	9	10
C- budget	-3.0	13.4	48.2	53.4	58.4	63.2	71.4	80.0	79.4	81.2
	11	12								
	85.2	87.0								

Total accumulated Carbon 12 years after adoption of the Model is 711 tonnes; and, recruiting 40 families *p.a.* since 2012, IF had totalled 12,720 t. by the end of 2016.

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**What are the most innovative aspects and main strengths of this approach?**

The Guama Model offers potential for major and positive changes in both environmental and socio-economic spheres. Its potential for socio-economic change is far-reaching. The key factor is that sustainability of the basic crop production system implies that the plots can be established anywhere the family chooses: eg. close to home. This means that the whole family can become involved in its own livelihood and creates the sound foundations of familial and social stability enhanced by the great reduction of risk as a destabilising factor.

We are beginning to see the first signs that a "critical mass" of families have begun to demonstrate the food-security and cash benefits of the system; and further spread of the system will happen spontaneously. The system contains

the seeds of its own replication and will need no further input from us. Its great strength lies in addressing the complex of factors at the very roots of the problem and in enabling an integrated solution to them.

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## **Costs/Challenges:**

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### **What are the proposal's projected costs?**

Present experience indicates that the effective establishment of secure demo-farm/seed-banks; together with the staff and capital outlays, could not be achieved convincingly in, for example, Nicaragua, for less than a budget of about \$250,000 per year; and perhaps \$400,000 in the first 2-3 years. Meanwhile, our own present task in Honduras is to establish credibility at all levels of society there.

An integral component of the long-term strategy will be the formation, in the Honduras projects, of a soundly based marketing co-operative for the expected high production of organic cash-crops such as black pepper, vanilla, etc. Some of Inga Foundation's own running costs at the Las Flores centre will be offset in this way, as we shall be a functioning pepper/vanilla farm in our own right.

In each target country of CA the least requirement to achieve even a starting base would be a 5-year budget, based on the above; and a second 5-year medium-term implementation phase to build credibility at scale. This would replicate IF's Land for Life program for which the budget estimates in 2012 were \$4.4 million. Taking into account the infrastructure (teaching, etc.), vehicles, etc. needed for even a medium-term project, it might be realistic to estimate \$5-6m over 10 years in each country.

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## **About the Authors**

### **Mike Hands.**

Ecologist specialising in the ecology of Tropical Rain Forest; and especially in the ecology of slash-and-burn subsistence agriculture. After some years' experience in development projects in the World's tropics, he began, at Cambridge in the mid-1980's, the studies that have led to this present program. Following a pilot project in Costa Rica, he spent the following 14 years as Senior Research Associate in the University of Cambridge; working almost entirely in Central America. In this role, he directed four research projects in Costa Rica and Honduras. These four Cambridge projects upheld and expanded his initial hypotheses and findings; they led to the development and proving of a set of sustainable agricultural techniques as alternatives to slash-and-burn.

In 2007, he and colleagues established **Inga Foundation** as a registered UK Charitable Trust to continue and expand this pioneering work in the world's rain forests.

He is Director of Inga Foundation's Land for Life Program and has represented IF in many international forums; most recently at the UN Committee for Global Food Security (CFS44) at FAO. Rome.

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10. Mike Hands awarded the 3rd Organic Farming Innovation Award (OFIA) at the World Organic Congress. Nov. 10th 2017. New Delhi.

[https://www.ifoam.bio/sites/default/files/mike\\_hands\\_reduced.pdf](https://www.ifoam.bio/sites/default/files/mike_hands_reduced.pdf)

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**What enabling environment would be required in order to implement this proposal?**

Regional and National policy; together with the international funding and will to establish teaching centres across the region.

IUCN (Mesoamerica) are preparing a funding proposal jointly with FAO/UNDP which (they inform me) will include the Guama Model for the Central American wet zone. The proposal envisages another agroforestry model (Quesungual) for the drier zones.

Having proven the Guama Model at scale (river catchment), we are poised to roll it out over the whole region, given the institutional support and funding.

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