

## **Inga Foundation – Written evidence (NSD0008)**

*Submitted by Mike Hands on behalf of the Inga Foundation.*

### **1. What is the potential scale of the contribution that nature-based solutions can make to decarbonisation in the UK?**

This nature-based solution was developed for the world's humid tropics and for international-aid policy. The UK can play a major role in alleviating one of the world's great unaddressed environmental and social problems, whilst offsetting immense tonnages of CO<sub>2</sub> emissions.

**A sustainable alternative to slash-and-burn agriculture in rain forests** was the subject of basic field ecological and laboratory research in a series of Cambridge University projects beginning with a pilot study in 1986-7; through research and trials in the Cambridge Alley-cropping Projects (1988-2002); the findings of which are being implemented by Inga Foundation (IF) today in Central America as a proof-of-concept at landscape-scale. IF is a UK-registered Charity (No. 1124688).

Land-use change has been estimated (ECCM) to be contributing between 1.7 and 2.1 billion tonnes of Carbon to the atmosphere annually; some 20-25 % of all human inputs. The great majority of this is comprised of the slash-and-burn of tropical vegetation and subsequent loss of soil organic carbon by enhanced oxidation.

Some 250-300 million families are estimated to be engaged in the practice in the world's tropical regions as a whole, of whom perhaps 100 million are located in the humid tropics. The scale of the problem is immense and has evaded serious attention and resolution for decades. The past 35 years' work has sought to remedy this (<https://royalsocietypublishing.org/doi/10.1098/rsos.201204>).

The **Inga Tree (Guama) Model** is a sustainable, low-input and integrated solution to a long-standing and complex set of problems. It addresses completely the root causes of the original deforestation; it regenerates soil fertility and organic matter content and is currently proving its capacity to restore entire landscapes. There is symmetry in the fact that this is being achieved by the descendants of the original slash-and-burn pioneers who arrived into the virgin forest with axes and machetes a century or more ago. It fulfills 11 of the 17 UN SDGs with no negative impact whatsoever on the remaining 6.

### ***Which ecosystems are most relevant to the UK for nature-based solutions, and which have the largest potential to sequester carbon or reduce emissions?***

The Inga Tree Model is appropriate for UK-aid and for offsetting immense quantities of CO<sub>2</sub> emissions; not, however, for local implementation. The present program (Land for Life Program) began in 2012 with the recruitment of 40 smallholder families per year to a proven system substituting a model of four proven

agroforestry systems for the current practice of slash-and-burn. Recruiting at that rate, the program is estimated to have avoided/sequestered **393,000 tonnes of CO<sub>2</sub> by the end of 2020**; this merely in a pilot project to demonstrate potential.

This is the scale of possible Carbon offset whilst enabling some of the world's poorest subsistence farming families to lift themselves out of food-insecurity and poverty and to re-green their own environments with productive agroforest.

- ***How much of the UK's 'hard-to-mitigate' emissions can be offset by nature-based solutions? How much of the UK's land and exclusive economic zone (EEZ) coastal areas would need to be managed to achieve this, and what level of investment would be required?*** (N/A)
- ***How do the costs and benefits (including co-benefits), of implementing nature-based solutions compare to other techniques for offsetting 'hard-to-decarbonise' sectors?***

For the humid tropics, the Inga Tree Model is unmatched as it is low-cost, low-tech and low-input. Costs are currently running at around \$5,000 per family on an average 8 ha. holding; all of which is restored and re-greened as a result. These costs reflect in-field operations and do not reflect IF core costs in UK. These recurrent costs will come down as the program scales and replicates. Here is a list of benefits:

- **Food Security:** Within two years, 100% of the families with established Inga alleys achieve total food security.
- **Carbon Sequestration:** From 2012-2020, over 390,000 tons of CO<sub>2</sub> have been sequestered/avoided by end of year.
- **Land Regeneration:** From 2012-2019, more than 2,600 acres of degraded land have been regenerated.
- **Nutrition Improvement:** The combination of nitrogen-fixing Inga trees in alley configuration, together with soil supplementary minerals, is today restoring soils highly degraded by decades of repeated slash-and-burn. Families are able to grow basic grain food crops on soil previously considered "sterile". This is not just "yield improvement"; this commonly means an acceptable crop *versus* no crop. The Inga model includes Inga alley-cropping for cash crops (e.g. black pepper, turmeric, vanilla) and Inga/fruit-tree associations (eg. Cacao, Citrus, Avocado, etc.). All are proven and all are organically grown without the need for herbicides, pesticides, chemical fertilizers, GMO seeds or heavy equipment.
- **Erosion Prevention:** Inga alley-cropping is a mulching system providing permanent physical protection to the uppermost (and most vulnerable) soil layers. The technique stabilizes and anchors the soil, effectively preventing all erosion and mudslides. Most notably, Inga alleys survived eight inches of rain falling in eighteen hours and the Nov. 2020 back-to back hurricanes (Eta and Iota).
- **Watershed Protection:** By stopping erosion and toxic runoff, Inga alley-cropping protects watersheds such as rivers, oceans, and coral reefs.

- **Firewood:** Inga alley-cropping provides families a renewable source of firewood for cooking or selling from the yearly pruning without harvesting forest trees.
- **Migration Reduction:** Inga alley-cropping provides families with “land for life,” anchoring them to their land and not forcing them to migrate to cities or other countries in order to find work. IF has testimony from many such individuals.
- **Improved Livelihoods:** Food security allows rural subsistence farming families to grow and sell cash crops, which, in turn, improves their livelihoods, all with no debt or loans.
- **Climate Shock Resilience:** Inga alley-cropping allows families to grow basic food crops even in the harshest climatic conditions. Inga alleys have survived seven months of drought and still produced basic food crops of corn or beans without irrigation or a drop of rain because the thick mulch from the pruning process keeps the ground cool and retains water. The recovering Inga trees also shade the ground from extreme heat.
- **Family Empowerment:** Inga alley-cropping has empowered over four hundred local families enabling them to all work together for a common goal, stay close to home, and keep their land, all without the use of complex technology, high inputs, or machinery.
- **Biodiversity Protection:** By completely eliminating families’ need for slash-and-burn, Inga alley-cropping protects rainforest plant and animal biodiversity; this agroforestry Model as a whole restores habitat.

## Outcomes

- Not one single family in the program has reverted to slash-and-burn.
  - All are reporting the achievement of food-security with Inga alley-cropping.
  - Most are reporting the emergence of fresh-water springs on land restored by the system.
  - IF's Land-for-Life Program is currently in its 10<sup>th</sup> year. Since 2012, between 4 and 5 million trees have been planted in alley-cropping or other configurations.
  - Approximately 500,000 grafted or hybrid, top-quality fruit trees have been distributed to the families as component 3 of the Model.
  - Over 400 families have the Inga Model in various stages of development and/or use.
  - Hundreds more families are now wanting to adopt the system.
  - The picture since 2012 has been transformed in this respect.
2. ***What major scientific uncertainties persist in understanding the effects of nature-based solutions and affect their inclusion in carbon accounting, and how can these uncertainties be addressed?***
- ***How reliable are the estimates of the quantity of greenhouse gas emissions reduction or sequestration by nature-based solutions, as well as the duration and reliability of storage?***

IF's Inga Carbon Model is based on rigorous data published by the Cam Projects (1988-2002); upon data on biomass increments within other published data and on

IPCC estimates. The technical details are available upon request. The Model has been scrutinised by Climate scientists at the Priestley Int'l Centre for Climate at Leeds University and others.

- ***Which bodies should be involved in establishing an agreed evidence base to inform best-practice techniques for restoring peatlands?*** (N/A)
- ***To what extent do we understand the capacity of the oceans and coastal ecosystems to sequester greenhouse gases through nature-based solutions?*** Not applicable in this instance.

### ***3. What frameworks already exist for the regulation and financing of nature-based solutions?***

- ***What can be learned from the implementation of the Woodland and Peatland Codes for the regulation and financing of nature-based solutions?*** (N/A)
- ***Are there good examples of nature-based solutions already being undertaken in the UK or elsewhere, and what can we learn from them?*** Not applicable in this instance.

#### **Program history/background/summary:**

This technology was not developed for use in temperate regions of the world. It is focussed on the perilous plight of the world's remaining rain forests and of the people who are (or were) dependent upon them. The Inga Model, as an integrated and nature-based solution to a widespread and complex set of problems, could transform the nature and impact of UK aid to countries in the humid tropics. It is already transforming, not only the lives and livelihoods of hundreds of families in its present target area, but also the landscape in which they subsist. IF receives visitors to its demonstration/teaching facilities. As a result, the Model is being replicated in 15 other humid tropical countries.

For generations, slash-and-burn agriculture has been a way of life for subsistence farming families in the tropics around the world. Families clear cut and burn patches of rainforest to create plots of fertile soil on which to grow their basic food crops; the soil fertility, however, does not last. Crop failure and subsequent erosion forces families who depend on slash-and-burn to keep clearing new patches of rainforest every few years just to survive. More than 200,000 acres of rainforest are destroyed every day, with around two billion tons of carbon released from the tropics annually.

But there is a solution. **Inga Alley Cropping (Inga a-c)** is a simple, proven, and sustainable solution to stopping the devastation of the world's tropical rainforests while providing food security.

This revolutionary agroforestry system uses nitrogen-fixing tree species from the genus *Inga* to regenerate land depleted by slash-and-burn, sequester thousands of tons of carbon, and transform the lives of subsistence farming families. *Inga a-c* is a fully integrated agro-ecosystem that naturally recreates conditions of the forest

floor. This not only stabilizes and replenishes the soil but also prevents erosion and protects watersheds, wildlife and marine habitats. Inga a-c also effectively anchors a family to a single plot of land, allowing the entire family to work together close to home and eliminating their dependence on slash-and-burn-- allowing them to achieve "land for life." Inga seedlings are planted in rows on steep, degraded slopes and require no herbicides, fungicides, pesticides, technology or heavy equipment. After 18-24 months, the trees are pruned, with the branches supplying a year's worth of firewood and the leaves a soil-protecting mulch. Crops are planted between the rows. Following harvest (2-3m), the trees are left to recover their canopy. The process can be repeated annually *ad infinitum*.

Since 2012, the Inga Foundation's Land for Life Program in Honduras has planted over 4 million trees and dramatically transformed the lives of over 400 subsistence farming families. After 20 years of scientific proof-of-concept, there is proof in the landscape in two valleys in Honduras (assisting over 2000 people, sequestering and avoiding carbon, and regenerating over 2600 acres of highly degraded land). The ability of the system to anchor, enrich, and regenerate depleted soil provides food security for the families who are also seeing transformed incomes from their long-term cash and tree crops such as pepper, turmeric, vanilla, cacao, and rambutan.

These fast-growing trees block the growth of weeds in their shade and in-between the alleys organic cash crops are planted. The organic cash crops and nourishment crops are grown without chemical fertilizers (just a side dressing of inexpensive rock phosphate dolomite and K-mag).

Inga a-c is implemented by the families and for the families, led by the all-Honduran team of foresters, agronomists and nursery/field operations staff. Without debt, the entire family is enabled to transform their own livelihood from the precarious and food-insecure present condition in dependence upon slash-and-burn practices to a sustainable and productive low-input permaculture, raising the crops they choose on regenerated land. Change occurs by the family itself which achieves as near self-reliance and autonomy as is possible. This low-input, debt-free, and bottom-up program is available now and gives families the means to farm their plots with truly sustainable agricultural practices. Proven over 30 years, Inga a-c is the only solution known in the region to achieve this.

***How should a hybrid public-private financing model be regulated? How should any carbon offsetting markets be regulated to be sure that they prioritise and support well-designed and effective nature-based solutions?***

Inga Foundation has developed and refined, over some years, a Carbon version of the Guama Model. This C-model is based on rigorous scientific data acquired during the Cambridge Alley-cropping Projects (1988-2002), other published data or IPCC published assumptions. Bodies such as The Priestley International Centre for Climate (University of Leeds), Plan Vivo, among others, already exist to scrutinise the model, its implementation and its monitoring, etc.

- ***How can we ensure that the carbon accountancy is science-based, robust, and consistent across nature-based solutions?***

See answers to the question above. Existing methodology is sufficiently well-developed to address this question. Methodologies, such as those used for REDD programs, are grossly over-intricate and near-impossible to implement in real, field-based contexts; with real families. Simplicity is required to address these questions and will greatly expedite the roll-out, at family level, of nature-based solutions.

IF's Carbon model is sufficiently rigorous to achieve reliable monitoring of both emissions avoided and CO<sub>2</sub> sequestered.

**4. *Who are the key stakeholders for the implementation of nature-based solutions in the UK? How can stakeholders' expertise and concerns inform the incentives and requirements for implementing nature-based solutions?***

- ***How can farmers (including tenant farmers) and land managers be supported in their deployment of nature-based solutions by policy and legislative frameworks?***

IF's approach is not applicable to UK-based land Managers.

- ***Are there examples of projects which have engaged with stakeholders and local communities to implement nature-based solutions successfully, and what can we learn from them?***

(see full explanation in Question 3) IF's Land for Life Program now has hundreds of families wanting to adopt the Inga model because it is a program built on trust and consistency. They have seen its success for themselves and are eager for change. The Land For Life program may be easily replicated as this revolution in land-use is effected by the families themselves.

**5. *How should implementation of nature-based solutions be integrated with other government policies for landscapes and seascapes, for example, agricultural, forestry, and land-use planning policies?***

- ***How could nature-based solutions implementation contribute to the UK's goals surrounding biodiversity, the preservation of nature, and adaptation to climate change?***
- ***Which ongoing governmental plans, policies, and strategies are relevant to nature-based solutions, and can they be better coordinated? For example, are the Nature for Climate Fund and associated targets for peatland and forestry restoration designed so as to support nature-based solutions?***
- ***Should incentives for nature-based solutions be included in future agri-environment schemes, and if so, how?***

Answers to all the above: **Via UK-aid policy**; which needs to be simplified and freed from the Brussels-fomented bureaucracy of recent decades. The selection,

evaluation and monitoring of projects was previously very well achieved by experienced desk officers in DFID (formerly ODA, Min. of Overseas Dev., etc). The present system of evaluation, etc. by "Logical Frameworks" is designed to be useful to administrators with no knowledge of field operations in the tropics. It is beguiling, but dysfunctional.

**6. How should nature-based solutions be planned and monitored at the national level?**

- **What measuring, reporting, and verification requirements should be put in place to determine the degree of success of nature-based solutions? Which techniques and technologies are best suited to accomplishing robust monitoring?**

As above; and in this humid tropical context: The evaluation, selection and monitoring of nature-based initiatives by **professionals with experience** of rural, tropical environments and projects; not by Logical-framework-wielding administrators, accountants, etc..

**POSTSCRIPT**

- Inga Foundation would welcome the opportunity to have its Carbon Model scrutinised by reputable Climate scientists.
- For the history and scientific context of the Cambridge Alley-cropping Projects and Inga Foundation's implementation of their outcomes in its Land for Life Program, please see my recent publication on the Royal Society's Open Science platform (February 2020): <https://royalsocietypublishing.org/doi/10.1098/rsos.201204>. This is an invited paper which will be part of a forthcoming RS Special Collection on Sustainable Land-use. In the interim, it has been published as a free-standing paper.
- The Program has won a number of international awards and endorsements over the years, including the Organic Farming Innovation Award (2017) and recognition from a number of UN agencies, including FAO, UNFCCC; UN Committee on Global Food Security (CFS); IUCN (Global, Regional and Central America).
- IUCN (Meso and S. America) conducted an economic evaluation of the Guama (Inga) Model which emerged as a top technology for the Humid zone: <https://portals.iucn.org/library/node/48381>
- Other examples include the UN FAO TECA food production systems initiative: <https://teca.apps.fao.org/teca/en/technologies/10056>
- IF were joint winners of the World Economic Forum Trillion Tree Initiative. September 2020 <https://www.weforum.org/agenda/2020/01/one-trillion-trees-world-economic-forum-launches-plan-to-help-nature-and-the-climate/>

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