Understanding and measuring development impact in interventions involving agroforestry and bioenergy

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Introduction

The aim of the talk is to introduce the concept of global impact assessment by using a case study of bioenergy from agroforestry where energy could be derived from both the woody and non woody parts

Reflection

- It has been 28 years since the first set of agroforestry bioenergy trails were planted in the UK using funding from the EC Non nuclear energy R+D budget line. It is timely to reflect on what impact they have had and also to suggest to other agroforestry researchers on how they may think about and monitor global impact

Poplar Agrenforestry in Old Wolverton: Bioenergy from woody and non woody sources combined

Poplar Silvoarable in India

A tri-partite environmental contract

Private sector, government and farmers. Partnership is key to the widespread application of agroforestry due to management , market and institutional complexity. This work and the work of FRR Ltd in the Aravalli hills project led to a successful Environmental forestry CDM project in Haryana

Environmental Agroforestry

This land had no organic matter and was subject to strong winds . Soil erosion was a major problem.

Water availability could be another environmental indicator

Environmental indicators in tripartite environmental stewardship contracts should be simple and measurable by a child

Aims of the Old Wolverton Trial

- The specific aims of the trial were
- To assess if a full yield of arable crop would be available if the trees were harvested for bioenergy on a 3-5 year rotation
- To assess if biomass from the trees and arable crop straw could be produced at a very low net cost given the net income of the arable crop

Results

- Dramatic decreases in cereal yields were observed at the age of 5 years, but no significant decreases at the age of 3 years when the trees were already 9 m tail (Newman, 1994).
- In summary biomass from trees that occupy no land ?

Impact in research and impact in the real world

- The normal way in which researchers would think of impact is through an assessment of publications. A citation score would indicate how many times a person quoted any paper but would not indicate how the contribution of the knowledge affected the world

- In rural development the objective of endeavours is often to bring about changes in human behaviour to reduce problems such as poverty or environmental degradation

A theory of change

- A development actor carries out activities in order to obtain physical outputs which in turn lead to behavioural outcomes. It is hoped that these outcomes lead to a new state of affairs at the end of the project after many years have elapsed. The state of affairs is called the project purpose. Many projects and other actions contribute to the overall objective set by a government or donor agency.
- The theory that links this chain of events is called a theory of change

My current work with agroforestry : Establishment of 143,000 ha in Tamil Nadu

- Farmers are involved in a tree planting **activity** assisted by the state forestry department
- The envisaged physical **output** is an area of agroforestry of 143,000 ha

Outputs to results

- These outputs may lead to the outcomes (**results**)
- Farmers adopt tree planting management harvesting and selling methods that reduce unsustainable and damaging extraction processes in biodiverse natural or semi natural forests
- Resource poor farmers adopt profitable agroforestry systems and linked sidelines that lead to increase in the number of meals that they family can eat in a day

The results lead to the attainment of a purpose

- These results led to the attainment of the **project purpose** which could be characterised as
- Soil erosion reduced by X% and food security increased by Y% by the end of 2019

The project purpose if achieved contributes to a goal or overall objective

- This in turn along with other projects and initiatives could contribute to a goal or **overall objective of**
- Soil erosion reduced by X% and food security increased by Y% in India by 2025
- Of course there are many **assumptions** behind each step of activity to output to outcome to purpose making a significant contribution to the overall objective.

Local Impact

- Is is the effect of the intervention on the target beneficiaries ie the project farmers. This is very much within the management system boundary of the implementing agency and this can be stated as the projects attainment of targeted outcomes (**results**).

Global Impact

- Is more easily understood as “spread” or “multiplier effect”. It is a somewhat mysterious (during implementation) process outside the management system boundary.
- The existence of the project causes or contributes to changes in other parts of India and could do this by sectoral links outside the agriculture or forestry sector.
- Is defined as the nature and extent to which the **project purpose** contributes to the **overall objective**

Some common Impact Pathways

1. Movement of champions
2. Assets
3. Technologies
4. Policy or procedural reform

Ex post construction of a theory of change at Old Wolverton

The activity of action research involving an agroforestry trial would lead to the physical outputs of one trial and at least two publications. This would lead the outcomes of

1. Other scientists in the region adopting the research protocols
2. farmers in the region adopting bioenergy using short rotation trees on agricultural land
3. the owners of the land (Milton Keynes Development Corporation) adopting agroforestry practice and bioenergy short rotation trees on urban and peri urban land
4. This in turn would lead to the project purpose of tree based bioenergy in England increased by 10% by 2000

Research Results 1

- The research showed that if the trees had been harvested at age 3, the maximum annual loss of wheat yield would he that due to the mulch strips alone, i.e. 12%. By this time, the mean volume of an individual tree was 0.0887 m^3, and. the average annual biomass increment was 7.9 oven dry tonnes. The trees, however, did not affect the wheat crop so assuming that they only occupied 1.6 m^2 each, the productivity produced in the vertical dimension on the polyethylene strip represents nearly 70 tonnes of timber biomass ha^{-1} $year^{-1}$.

Research Results 2

- In summary, in a very short rotation poplar coppice (3 years), for only a 12% loss in crop yield, 8 tonnes ha"^{1} year^{-1} of woody biomass can be produced. This appears to be more economical than devoting entire fields to the production of a single energy crop (Newman *et al.*, 1991c).
- But what of coppice regrowth?

The project purpose was achieved linked to the following outcomes

- Work by Beaton, 1992; and Beaton *et al.*, 1992 adopted the protocol
- Farmers in Bucks have adopted poplar growing for timber and or biomass in several locations and
- Agroforestry adopted by the MKDC was the most successful of all urban landscapes in terms of benefits per net cost.

Global Impact

- The global impact is even more interesting if one posits an overall objective of global bioenergy produced increased by 10% by 2015.

- Trees are now of main sources and this is achieved on agricultural land.

Impact pathways

- Movement of champions: Key members of the research agencies involved have influenced agroforestry policy and practice in Countries as diverse as Kenya, Cameroon, India and China
- Movement of assets and or technology: Mulching is now an integral part of tree planting on farmland
- Policy and procedural reform: Germany has adopted sensible farmer incentives for tree based bioenergy in the form of index linkage of biomass prices to wheat prices. The EU has included agroforestry as part of the CAP

Final thoughts and recommendations

- It is important to build on the bioenergy and agroforestry approaches in Germany and France. Theory of change approaches linked to global impact assessment could increase the rate of global policy reform.
- It is recommended that future research includes the following provocative proposition formulated in the form of two questions:

1. Is England's policy response to proposed CAP reforms based on evidence or pressure from specific lobby groups?
2. How could agroforestry action research locate and harness any energy for change in important lobby groups?

Thank you

Any questions please?