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Foreign aid and sustainable forestry

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Abstract

Foreign aid can contribute to sustainable forestry in many ways. The goal is to secure forest benefits of the future, without compromising the needs of the present generations. This paper elaborates on forestry aid as it has evolved in the past. Future directions are suggested, referring to short and midterm projects, as well as long-term programmes. Tree planting has worked in the past, and is an option for scaling up the activity in the future. Distributing fuel efficient cooking stoves could work in a similar way, sparing trees and at the same time improving the quality of rural life. Planted trees and new stoves can be made available in the near term, that is, within a time horizon of one to five years. In the mid-term, over a time span of 5-15 years, forest inventory and monitoring systems are relevant candidates for successful foreign aid in forestry, although the methods are not yet sufficiently developed to become applied in tropical rain forests. The support of universities and the infrastructure for higher education in forestry, agriculture, and rural development, is important in the long term. Forestry, which generally operates in remote rural areas, is susceptible to logistical problems and resource misuse. It is important in forestry aid to circumvent corruption risks of both in recipient nations and in donor organizations. Forestry aid must emphasize domestic action by local experts, as well as capacity building in the recipient countries.

Keywords: forestry aid, sustainable forestry, development, forestry paradigms
JEL classification: Q0, Q01

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1 Introduction

Forests cover about one third of the global land area, and are important to rural development in most countries worldwide. Forests provide raw material for construction, industry, and energy, and uphold the majority of terrestrial biodiversity. Forests grant also many other benefits. The relative importance of the various ecosystem services depend on local conditions, because there are large differences in climate, deforestation history, population density, etc. For example, the role of forests in the protection of devastating floods is very important in the densely-populated lowlands of China (Niu et al. 2012). Flood protection is less important in other environments, such as arid highlands.

Forestry is a large economic sector, which mainly evolves unrelated to efforts of foreign aid. Forest ecosystem services provide win-win benefits within the forestry sector and between other sectors, but there are also trade-offs. It is important to appreciate the long time horizon of forest related action. Time lags until the materialization of benefits are characteristic to forestry policies. This calls for careful preparation of aid programmes, commitment, and persistence. Forestry aid must be tailored to the specific ecological, economic, and cultural characteristics of the recipient region.

The richer countries are urged to donate 0.7 per cent of their gross national product (GNP) to official development assistance (ODA). The United Nations General Assembly Resolution first pledged to this target in 1970. Since then, several international agreements over the years have referred to this goal. For example, the International Conference on Financing for Development in 2002, in Monterrey, Mexico, and the World Summit on Sustainable Development held in Johannesburg later that same year, reaffirmed this demanding and altruistic target.

The combined gross domestic product (GDP) of the Organisation for Economic Cooperation and Development (OECD) countries was US$43,000 billion in 2011. A share of 0.7 per cent would imply a global aid target of approximately US$300 billion. The OECD nations actually provided US$133.5 billion of net official development assistance, which did not reach the defined target, but nevertheless equates to a considerable international funding. Most of the aid support will be reserved to other areas, such as education, health care, agriculture, sanitation, electricity infrastructure, etc. If one per cent of foreign aid is allocated to promoting sustainable forestry, approximately US$1.3 billion can be made available for forestry projects. This is adopted here as an order of magnitude estimate of forestry aid. Hence the question is what can be achieved in forestry with the best possible allocation of foreign aid in the order of US$1.3 billion annually?

This paper seeks to identify guidelines for foreign aid in forestry in the short, mid, and long term. It first describes the evolution and paradigm shifts of forestry aid in the past. From these experiences, it then elaborates on questions posed by the UNU-WIDER institute, which are as follows:

Regarding foreign aid and sustainable forestry:

- What works?
- What could work?

- What is scalable?
- What is transferable?

These questions are addressed, noting that foreign aid operates in the real world where several forces interact, and aid project alone cannot solve development problems. Foreign aid is a piece of a large puzzle, with which good governance is maintained in rural regions of the world.

The forestry sector has special characteristics, which call for attention. First, forests tend to be located apart from the main population centers in remote rural areas. The population density is often low in forested areas, the infrastructure is weak, and human skills and capacities are not always easy to find. Secondly, forests rarely produce goods with high and immediate market value. Forest goods and services are diverse, and many important services cannot directly be measured in monetary terms. For example, forests regulate the hydrological cycle, with mountain forests protecting lowland areas from devastating floods. Such services are enormously valuable, but direct funding mechanisms are lacking, which would encourage the management of upstream forests to provide this ecosystem service. Thirdly, forests in many cases are considered secondary to agriculture and animal husbandry in rural areas of the developing world. Forests grow on residual land. This is often the case in both subsistence farming and cash crop systems. Solving farmland problems is sometimes the best way of promoting sustainable forestry.

The international scientific community has gradually learned to understand and appreciate the important role of forests in the global carbon budget. Science has made progress documented as follows:

- Prospects have been presented that the era of deforestation may come to an end in the process called ‘forest transition’ (Mather and Needle 1998).
- Historically, losses of biomass in deforestation have released carbon dioxide into the atmosphere (Houghton 2003). In contrast, greening of the planet would help remove higher amounts of carbon dioxide from the atmosphere.
- The removal process already dominates in large areas of the world, where forest biomass is expanding (Goodale et al. 2002).
- Woody debris and forest soils accumulate carbon, and amplify the impact of biomass expansion (Pan et al. 2011).
- Cropland area of the world is near a steady-state, even though widespread cultivation of bioenergy crops triggers land conversion from forest to non-forest. The consumption patterns of food, energy, and fibre have improved, thus avoiding wasteful use of the land resources (Ausubel et al. 2013).

The importance of forests in the global carbon cycle, has received public and political attention, especially in donor countries. This has been an important argument in support of aid projects in forestry, adding a novel dimension to aid policies of the twenty-first century. Forestry projects have moved up in aid project ranking, when assessed from the donor perspective.

2 What has worked in the past?

Tree planting in general has worked in many places, both as a component of aid programmes and unrelated to foreign aid. Wangari Maathai, who was awarded the Nobel Peace Prize in 2004, appreciated the feasibility and multiple benefits from treeplanting (Michaelson 1994). A famous quote from her is: 'I think that when you look at a tree you planted and see it grow, it is like looking at a child grow. You develop a relationship that is very pleasant. You get to love the tree.'

Planting 100 million trees by 2017 was introduced in the Rio 20+ conference in 2012, as a means to promote sustainable forestry. This specific Rio 20+ programme involves primary schools all over the world, connected to one another via the internet and the social media; for more details, see Vanhanen (2012). This programme has an educational element extending way beyond 2017, and perhaps preparing children to work as future professionals within the forestry sector. However, the programme cannot reach remote rural areas, where the internet and electricity are not available, and even school systems may be missing. The programme is well buffered against corruption risks.

Preconditions of success have been analyzed using the history of Swedish forestry as an example (Persson 2003). Wood raw material in Sweden became valuable, when the demand for timber improved, in response to the evolution of wood-working and forestry industries. At the same time farming methods improved in Sweden, and food production from the existing cropland became sufficient to meet the demand of the rural population. Therefore, land clearance for agriculture came to an end. Growth of Swedish cities and large-scale emigration to North America helped to lower the population pressure of the rural regions. The land use patterns became stable and predictable. Sustainable management and protection of forests became a shared value of a large majority of citizens. The economic profit from Swedish forests and forestry was sufficiently high to provide the basis of re-investments to the forestry sector. Forestry became sustainable, not as a response of implementing measures within the forestry sector, but responding to many changes in the society and to the general development. The requirements for sustainable forestry were met. Persson (2003) also describes the evolution of global aid paradigms in the field of forestry as follows:

2.1 Phase 1: Industrial forestry (1960s)

Forestry was viewed as an engine of modernization and economic progress in the developing countries. Aid projects contributed to establishing planted forests and constructing sawmills, and even pulp and paper factories in some cases. Nordic countries were important donors.

2.2 Phase 2: Social forestry (1970s)

The rise of the environmental movement in the 1970s, and droughts in the Sahel region prompted the birth of the next paradigm, forestry for local community development. Persson (2003) uses terms such as farm forestry, social forestry, community forestry, and village forestry, in describing this era of foreign forestry aid.

2.3 Phase 3: Environmental forestry (1980s)

Foreign aid in the 1980s was largely motivated by the notions of saving the rainforests and halting deforestation. The concept of biological diversity, or biodiversity in short, became widely known in science in the 1980s (Soulé and Wilcox 1980; Wilson and Peter 1988). The biodiversity issue was swiftly placed on the aid agenda.

2.4 Phase 4: Sustainable management of renewable natural resources (1990s)

Poor rural people in particular were the primary focus of aid programmes during the 1990s, rather than nature per se. This was a response to the notion that biodiversity cannot be protected successfully unless local communities co-operate.

2.5 Phase 5: Reducing Emissions from Deforestation and Forest Degradation (REDD+, since 2005)

A new phase of forestry aid began following the publication of Persson (2003). Climate assessments emphasized the importance of tropical forests as a global climate system component. Carbon sequestration and the production of renewable biomass became a priority.

Economic productivity was the main focus of early aid, but ecological, social, and cultural issues have gradually moved to the forefront of the programmes. Nevertheless, the economic dimension was never abandoned. All aid after all contains a funding element.

This is a broad account of the emphasis of development in forestry aid, although elements of the five phases have co-existed over the past decades. Foreign aid has not always worked very well (Persson 2003). The remote location of forests and lack of infrastructure have implied logistical problems. Land tenure has been unclear on forested land. Forestry is a slow economic sector, where investors need patience. Sustainable development refers to seeking a balance between ecological, economic, social, and cultural dimensions of human action. It has not proven easy in general let alone with forest projects per se to implement the Swedish path of improving the preconditions of human life, and development more broadly.

While paradigms and the emphasis of foreign aid have shifted over time, forests and forestry of the world have evolved at the same time, mainly unrelated to aid contributions. Fighting poverty remains as a main ultimate goal of all foreign aid, including forestry aid. Learning from the history of the nineteenth and twentieth centuries, it is possible to see positive trends and success stories, regarding what has works in the past. They have often been driven by the private sector, responding to improving demand of forest products. Forestry investments have been triggered and maintained by high and improving value of the wood raw material. However, ecological and social concerns remain.

Kauppi et al. (2006) showed that forest area has sustained in nations, where GNP exceeds a minimum level of about 5,000 US$ per capita. This indicates that development and the evolution of sosioeconomic structures improves forestry as a process, which in most countries has not been driven by the aid contributions. Forest transition that is a shift from forest contraction to forest expansion has occurred (Mather and Needle 1998; Mather 2007).

Tree planting has worked in the past as an element of forestry aid, as it has been integrated into the broad patterns of rural development. Plantation forestry has expanded mainly unrelated to aid programmes. A tree-planting programme based on aid funding has been a small contribution to a large and powerful global trend. The area covered by planted forests grew from 17.8 million hectares in 1980 to 264 million hectares in 2010 (UN-FAO 2000, 2010). In China, forests expanded from 139.3 to 155.6 million hectares from 1990 to 2007, respectively, largely in response to tree planting (Pan et al. 2011). The contribution of aid to tree-planting programmes was insignificant in China, and in general relatively small.

The expansion of tree planting was mainly driven by private companies, which were interested in growing industrial raw material, and government policies for the promotion of services from forest ecosystems (Sedjo 1999). A combination of the private sector action with government initiatives has promoted the rapid expansion of tree plantations in Chile, for example. Hence several forces interacted: private sector interests, the action of local and regional government, and the development of rural infrastructure, largely unrelated to forestry. Forestry aid worked, when successfully integrated into the general transition of the society.

Specifically regarding forests the concept 'forest transition' refers to a shift from shrinking to expanding forests (Mather and Needle 1998). The development of forestry and the rural landscape responds to universal changes of life styles and technologies (Rudel et al. 2005; Ausubel et al. 2013).

Wikipedia in 2012 explains the process of forest transition as follows:

> Forest transition refers to a geographic theory describing a reversal or turnaround in land-use trends for a given territory from a period of net forest area loss (i.e., deforestation) to a period of net forest area gain.
>
> Forest recovery resulting in net increases in forest extent can occur by means of spontaneous regeneration, active planting, or both.
>
> Forest transitions are associated with socioeconomic transformations towards increased industrialization and urbanization. Other conditions leading to the abandonment of agricultural land (e.g., war and environmental legislation) have been found to play important roles in some cases. The different processes through which forest transitions occur are contingent upon the local socioeconomic and ecological contexts. Although some generic processes can be identified, countries do not necessarily experience a regular pattern of forest cover changes with time or development, and the causes and outcomes of forest transitions vary.
>
> Studies of forest transitions have been conducted for several nations, as well as sub-national regions. Territories reported to have experienced forest transitions after the onset of industrialization include: Bangladesh, China, Costa Rica, Cuba, Denmark, Dominican Republic, El Salvador, France, Gambia, Hungary, Ireland, Morocco, New Zealand, Portugal, Puerto Rico, Rwanda, Scotland, South Korea, Switzerland, the United States, and Vietnam. Furthermore, forest-transition dynamics have been documented for regions within Brazil, Ecuador, and Mexico.

The environmental effects of these forest transitions are very variable, depending on whether deforestation of old-growth forests continue, the proportions and types of tree plantations versus natural regeneration of forests, and the location and spatial configuration of the different types of forests.

The findings of returning forests in these widespread studies raise questions about the prospects of a worldwide forest transition. In other words, can the global extent of forests be expected to reach a turning point in the future, reversing the current trend of overall forest decline towards overall forest expansion? Studies showed that given an increased competition for productive land between different land uses, a global forest transition would require major policy and technological innovations, as well as shifts in demands for fiber, fuel, and food, and that these changes cannot be taken for granted.

The United Nations (UN) and Food and Agriculture Organization of the United Nations (FAO) statistics (UN-FAO 2010) show that, despite forest planting and forest transition in many parts of the world, forested area of the world keeps shrinking albeit at a decelerating rate, see Pan et al. (2011). A general development goal is to reach a balance and a steady-state of the global land cover that is, to bring to an end the expansion of croplands and pastures. Later, the global forest cover may start expanding returning to areas where forests have been lost. It is important to assess aid projects in this broad perspective. Drivers of forest transition have been analyzed in literature (Mather et al. 1998, Lambin et al. 2001, Meyfroidt and Lambin 2008, DeFries et al. 2010, Saikku et al. 2012, Ausubel et al. 2013). An integration of an aid project into the general pattern of forest transition has been critical to the past success. Tree planting serves as an example of such a good integration and an example of an approach, which has worked in the past.

3 How to encourage successful forestry aid?

3.1 Selecting goals

Both the goals and means of forestry matter, when addressing what kind of aid *could work*, are those which UNU-WIDER posed as the second question for this study. Regarding goals, the concept of ecosystem services refers to the benefits people obtain from ecosystems. For example, halting deforestation and reducing forest degradation, sustain ecosystem services such as fuelwood production, landslide prevention, and biodiversity preservation. Maintaining and improving ecosystem services is the goal of sustainable forestry. An agreement of clear goals is the first step to forestry aid, which could work and bring results.

The concept of ecosystem service and its classification into regulatory, supportive, provisioning, and cultural services was promoted in 2005 by the UN´s Millennium Ecosystem Assessment (MEA), a four-year study involving more than 1,300 authors worldwide. Forest ecosystems generally provide numerous and diverse benefits. Many different services are available from a given forest at the same time. Therefore, so-called win-win opportunities exist, and a variety of ancillary benefits are available, when foreign aid is directed to the forestry sector. For example, protecting forest biodiversity automatically preserves carbon stocks, and vice versa. However, notable harmful side effects also exist, and the trade-offs must be assessed.

A yardstick is needed in analyzing the pros and cons of forestry aid projects, with reference to ecosystem services' sensitive side effects and adverse impacts, and sensitive to co-benefits. A cost-benefit analysis is useful. However, not all the impacts can be easily quantified in monetary terms, especially in poor rural regions, where subsistence economy prevails. An intensive effort is presently under way internationally for assessing forest ecosystem services. Poor rural regions of China, for example, assist the social and economic development of the low lands, particularly by protecting Chinese lowland plains from flood damage (Niu et al. 2012).

There are risks that the international interest in the protection of the global climate does not fully acknowledge the multiple benefits from forests at local and regional level. Carbon dioxide (CO_2) emissions from forests have been the main focus in REDD+ programmes, rightly so. This is relevant, because forests greatly affect the CO_2 concentration of the atmosphere (Pan et al. 2011). Co-benefits and positive side-effects of the REDD+ project, however, can sometimes exceed its climate benefits. Noting the complexity and diversity of forests, a comphrehensive assessment of forest ecosystem services is important, in order to gain the full benefit from the project.

Aid by definition must promote poverty abatement one way or the other. A foreign aid REDD+ project aims at managing the carbon sequestration of a specified forest, by directing financial recourses for that specific purpose. For example, as carbon sequestration is the intended aid goal, fuel wood service is recognized as a co-benefit. Poverty abatement is achieved summing up all the co-benefits.

In selecting aid goals, it is important to set geographical priorities. Forests cover about one third of all the land area, affecting the planet´s regulating services, such as the global hydrological and carbon cycles. These services benefit all people. Forest provisioning services, e.g. food, bioenergy, and wood-based industrial products, interest smaller groups of people, namely those directly involved. Forests provide cultural, esthetic, and spiritual services, which are essential to the well-being of people. Biodiversity has economic value by supporting eco-tourism and providing pharmaceutical potential. Biodiversity is also a good yardstick of ecosystem naturalness.

Forests extend to different regions, and there exist large variations between forest systems and the services they provide. It is important to note the large variability in forest ecology, population density, affluence, infrastructure, and social and cultural factors between regions of the world. The largest biome the tropical forests are particularly diverse. One small fraction of this large domain is interesting in this context; the remote rural fraction, where people are short of arable land and short of wood material to be used in construction and as fuel. This region mainly on the African continent must remain in the geographical prime focus of forestry aid—an area, where aid is needed and aid projects could work in the future.

3.2 Selecting means

Forestry is a large enterprise and a slow system, where time horizons are long and patience is required for obtaining returns. All programmes, large and small, need a preparatory phase before launching. Search of partners, preparation of project plans and budget negotiations, as well as reaching and signing agreement always take time. Immediate results are not available. Some initiatives can provide relatively near-term benefits, while others require more

persistent and patient support. Projects and programmes with a long time horizon pose unique challenges, but are important in promoting sustainable development. A horizon of several decades in pace, with the dynamics of forest transition, is sometimes necessary for a full scale realization of forestry impacts. Capacity building in particular takes time—decades rather than years.

A minimum time horizon of a focused tree-planting project is approximately three years, given the time required for preparation and implementation. On the other hand, capacity building takes much longer. The time step 'quarter' is very special in education—it is a quarter of a century, not quarter of a year as in business life. Directing a young person through the primary school to higher education and then on to a PhD degree typically takes 25 years. Establishing a high-quality research university can take even longer, up to 50-100 years. Feasibility assessments must cope with the fact that only a certain kind of aid projects can provide results within a short time span of 3-10 years. Short-term programmes are rarely the ones that remain in the history as the best success stories.

Foreign aid in forestry is potentially successful, if it adopts modern and realistic aid paradigms, seeks to promote co-benefits and ecosystem services in collaboration with the best local experts, integrates into the general development of forests and forestry, adopts a realistic time horizon, and deals with long term time perspective. The means of aid projects must also be chosen in a way that the risks of misuse and corruption are minimized. Successful forestry aid ultimately contributes to poverty reduction. Examples are given below of aid programmes, which show promise at various time horizons.

4 Opportunities for scaling up

4.1 Short term

A potential of scalable measures is in changing wasteful consumption of forest based food, energy and fibre. Inefficient patterns of material flows are common in all countries. Ausubel et al. (2013) elaborate on the significant progress, which has been achieved in the past in terms of efficiency improvements. Such examples encourage scaling up this progress by means of forestry aid. As an example project, fuel-efficient cooking stoves can be introduced to create development in rural areas, which are not yet connected to the electric grid.

A wood-fired stove has an analogy in solar energy systems, consisting of solar panels connected to to a battery. Both systems can operate in rural conditions outside the electricity grid. Solar cells and the battery are industrial products, which are best produced in the donor country, and then transferred to poor regions of the recipient country. The cell captures solar energy, which is stored in the battery for later use. In the same way tree leaves capture solar energy, produce electrons in phosynthesis, and the energy is stored in the wooden 'battery'. Energy is released in the burning process providing the neccessary heat for cooking hot meals (Figure 1).

Figure 1: A simple and robust cooking stove

Note: The stove quickly produces a hot flame using a small amount of wood. The idea is simple: cooking with an efficient stove spares fuelwood and saves forests.

Source: Photo by the author.

A stove, unlike solar electricity, is a single purpose item, which applies to cooking only. But for cooking purposes, the analogy to solar energy holds. A modern stove made of high-quality steel, is an industrial product like solar cell and battery, which needs to be produced in a factory and be transported to rural regions. The stove is simple and robust compared to the solar cell-battery system. No maintenance is needed, if the construction is robust. The life time of a stove is up to ten years and the unit cost is affordable. Therefore, the system is easily scalable.

A forestry objective of the fuel efficient stove is to spare trees. As an efficient stove replaces inefficient wood combustion, the demand of wood is reduced per cooking event. The energy output from a harvested tree improves, as more meals can be cooked per unit of wood. The impact is amplified, as tree planting becomes more profitable and socially attractive.

In the win-win mode an efficient cooking stove supports social development goals. Working time is spared, both in cooking and in the effort of collecting fire wood. Cooking with an efficient stove enables the preparation of five meals with 20 kilos of wood, which has been carried home by a household member. The same amount of wood is only enough for the preparation of two meals using inefficient combustion of wood. Manufacturing and distributing fuel-efficient stoves as a forestry aid project is an interesting and scalable approach, which improves consumption patterns, preserves forest resources, and promotes social development goals.

As with tree planting, a campaign can be launched with a goal of distributing 100 million fuel-efficient wood-fired cooking stoves to rural regions of the world, which are not yet connected to the electricity grid. A robust cooking stove is an example of a transferable device, which can be distributed to poor rural areas, including the most remote areas, where

an electric grid is unavailable. Manufacturing and distributing stoves is possible at reasonable expenditure, using foreign aid. The devices are affordable. Thus a distribution programme of 100 million stoves can be launched within the current budget constraints of foreign aid allocated to forestry.

As less wood is needed, the harvest pressure is decreased and harvest levels become more sustainable. The benefit is distributed among different groups of people and among the different ecosystem services. Well-being of the household is improved as a co-benefit, as fuelwood collection becomes less laborious. Planting trees near the village and thus shortening the walk to collect wood can further enhance the benefit obtained from the stove. If one cooking stove spares 1,000 trees over its life time of ten years, a programme of distributing 100 million stoves has a potential of sparing of 100 billion trees. This would make a significant contribution to halting deforestation and encouraging forest transition at continental, and even the global level.

If an average family using one stove consists of five people, and 100 million stoves are distributed successfully, lives of 0.5 billion people would improve in the least developed rural areas of the world. This would be feasible within a relatively short time by 2018, and at costs which are within the budget constraints of forestry aid at present. A 100 million stove programme is relatively robust against corruption. However, large-scale manufacturing, transportation, distribution, and end-use of the devices imply certain risks of misconduct.

4.2 Midterm

Improving forestry databases is feasible and very important. Information on forest attributes is crucial for policy makers in defining base lines and setting development goals to policies on rural development. Forest inventory skills can be transferred to recipient countries, with high potential of building critical capacity and creating innovation centers of future.

A system has recently been tested and applied in Tanzania in National Forest Resources Monitoring and Assessment programme (NAFORMA). Most of Tanzania´s forests are dry tropical forests, where trees grow in a relatively sparse spacing, making it easy for a measurement team to penetrate the forests. Moreover, remote sensing methods are effective, when the forest canopy is relatively open.

Tanzania´s trees have been counted to determine their age, size, and species. The work was carried out in collaboration with national and international experts.[1] The publication is not available at present, and project evaluation is not currently possible, but the fieldwork has been completed successfully. The programme is expected to replace outdated statistics, help the East African country assess the services provided by forest ecosystems and allow the raising of REDD+ funding.

The NAFORMA project is not as easily scalable and transferable as the short-term project proposed above. Conditions of Tanzania´s dry tropical forests are favourable for making systematic observations. Tree canopies are relatively sparse, thus easily observable by remote sensing methods. Similar methods do not currently exist for the monitoring of tropical rain forests. The costs of NAFORMA are modest, in the order of US$10-20 million, but

[1] Personal correspondence with Erkki Tomppo.

implementing such programmes is science-intensive, and the technical and scientific skills required are not easily available. Patience will be needed, as the measurements must be repeated after a few years to detect any possible trends of biomass, biodiversity, and carbon. Despite scaling obstacles, a measurement programme such as NAFORMA is useful and cost-effective for promoting sustainable forestry and for serving policy design and implementation in the midterm of 10 to 20 years. The approach is prone to corruption and misuse, because national and international organizations are required with staff, equipment and vehicles. Tanzania´s example nonetheless shows that corruption risks can be circumvented.

Forest monitoring programmes can be scalable; however, they require a midterm time horizon of 5-15 years, and can be applied only to certain areas of the tropical biome. Methods of forest monitoring exist and are available, but the application requires highly qualified staff. What may succeed in Tanzania may not be scalable to tropical rainforests, with dense vegetation and multi-layer canopies.

Scalable measures are available also in changing wasteful consumption of agricultural products. If food consumption is wasteful, and farming practices inefficient, farms expand excessively, and forests suffer as a consequence. Increasing yields has been a dominant and very valuable trend of global land use since the 1960s (Ausubel et al. 2013).

Forestry benefits scale up, if the pressure of land conversion forest-to-non-forest can come to an end. Investing in forests, which soon will disappear, logically cannot support forest ecosystem services. In other words, it is unlikely that scaling up is successful by working against the great wave of forest transition. During the phase, when forest cover is diminishing, it is important to improve farming practices and consumption patterns, with the objective of reaching steady-state land cover as soon as possible. After forest transition, when forests can expand, investing in forest improvement and management becomes more rewarding. It is crucial at all times that farming practices improve, food material is not wasted, and bioenergy development is reconciled with other ecosystem services form farmland, pastures, and forests. The population growth is bound to continue and the demands are high for improving the nutrition of especially the poor.

5 Transferring lessons: role of universities

A functioning educational system is crucial to the sustainable development in the long term. It has been acknowledged across the industrial world that universities serve as embryos of economic prosperity and social progress, also regarding the development of sustainable forestry. Harvard University, founded in 1638, and the numerous other excellent universities in the eastern United States are the key foundation of the country's wealth. California´s blooming economy is also based on universities as centers of innovation and higher education. China is following the US path with excellent universities moving up international ranking lists, based on adequate national funding and support of the best talents.

The Swedish example, which Persson (2003) refers to, is indicative. Sweden has developed and maintained scientific and multi-disciplinary approach to forests and forestry based on university research. Primary and secondary schools are also important, but the role of universities is exceptional. An educational system needs good teachers to work and collaborate with young people. University staff, including the professors, refer in their teaching to the latest results of international scientific research. University students, after

their graduation, accept jobs as teachers and distribute their knowledge to pupils at all levels of the school system.

Africa is an exceptional continent, where the university network is sparse and weak. This is an obstacle to all development, and in particular, improving farming and providing forestry practices with basic needs. Hayward (2012) writes:

> Higher education in Africa in the 1960s and 1970s pictured excitement, creativity, and pride—given that faculty members dedicated to teaching were involved in innovative research, and many helped lay the foundations for governance and development. Quality was high, and universities held in great esteem. Most students were eager scholars, exhilarated by their good fortune, and certain they were destined for leadership roles. And a start was made on graduate programmes. By the early 1980s, the picture was different for most universities—including budget shortfalls in declining national economic circumstances, repression, curtailed academic freedom, civil unrest, and loss of status. Donor interest shifted to primary education, and external funding declined from US$103 million annually as late as 1994, dropping to an average of US$30.8 million from 1995 to1999.

The United Nations Educational, Scientific and Cultural Organization (UNESCO) is active in finding support for African universities and trying to increase of funding for higher education. The organization refers to the difficulties Africa must face overcoming the challenges of higher education. They include the rapid increase in the number of young people reaching the college age, uncontrolled brain drain, financial shortcomings and the hence the low quality of teaching and research, as well as general difficulties in governance structures. There are prestigious universities in South Africa, Egypt and elsewhere, but the lack of universities is striking in many African countries, given that the population of the continent is twice as large as that of Europe. There is far too little research in Africa focusing on domestic issues such as forests and forestry of Africa.

Universities typically work internationally, but additionally respond to local and national interests, select national issues, and local themes as research topics. The ultimate goal of higher education is to detect talented individuals and pave their way to professions where they can work to improve the well-being of themselves and their fellow citizens. African universities need loyal and persistent support and a clear focus on forestry, agriculture, and rural development. The continent is very diverse ecologically and culturally. Therefore, it is important that each country and region can support research and university education, which responds to local needs using the best local talents and expertise.

The shortage of higher education is a fundamental root cause of the development crisis in Africa. UNESCO´s Association for African Universities has 173 university members in 34 African countries. None of the African universities is listed among the 100 best universities in the world in any of the international ranking lists. Half a dozen African universities rank among the 500 best universities in the world, but the high-quality universities are mostly located in just one country, South Africa.

While the education system is weak, the number of young people is expanding. In 2012, nine out of ten countries in the world with the highest fertility rate were located in Africa. Talented children, which were born in 2012, will need college education in 2030-35. Any aid

programme must seriously address the growing imbalance in Africa between the number of young people and the lack of higher education.

The lack of universities in Africa is a general problem, only partly related to the shortage of research and teaching of forestry. However, agriculture and forestry are key components of future development in Africa. Patient international support to the faculties of sustainability science and forestry in African universities appears as scalable and transferable action available to foreign aid. Certain risks of misconduct and corruption exist, but most of them can be avoided if support is directed to the academic staff, and their immediate needs for infrastructure are satisfied. The recruitment procedure of academic staff must follow best international practices, with priority in assessing the scientific publication record of professor candidates.

6 Discussion and conclusions

The broad development of forests and forestry is affected by social and economic drivers. World population keeps growing, fortunately at a decreasing pace, but with a momentum, which generates billions of new adults in the next few decades. Improving lifestyles and diets, combined with the growing population, create pressure on land ecosystems. This is the big picture, in which forestry aid must merge.

People convert forests to croplands in order to obtain food for the growing population. Farming methods improve, average yields rise, and urbanization, industrialization and the development of the service sector replace subsistence farming in many parts of the world. The fundaments of human livelihood change. This development can rescue forest ecosystems, which otherwise would become converted to arable lands, in order to feed the growing population.

Ausubel et al. (2013) refer to ‘peak farmland’ noting that the area of cultivated agricultural lands has ceased to grow. More precisely, it would have ceased to grow in absence of bioenergy expansion, which covered about 20 million hectares of croplands in 2012. Despite bioenergy threats, the big picture is surprisingly positive in the world on average. Improving yields have been the main single contributor to this positive development.

The gap between rich and poor has increased. Foreign aid is meant to improve the livelihood of the poorest people and the poorest regions. More than a billion people are still not connected to the electricity grid. Many of them live in forests or near forests.

Significant foreign aid has been allocated to sustainable forestry since the 1960s. The paradigm of aid contributions has evolved over time. Too little attention was given in the early decades to scaling delays, balancing the economic, social, and ecological objectives, as well as circumventing corruption and appreciating the diversity of forest ecosystem services. Even at present, too little attention is paid to the general process of forest transition, which frames all projects. Concurrently, the process called ‘forest transition’ made surprising progress, deforestation in many nations ceased and forests started to expand. The forest biomass of the world is no longer a source but a sink of atmospheric carbon (Mather and Needle 1998; Kauppi et al. 2006; Rautiainen at el. 2011; Pan et al. 2011; Ausubel et al. 2013).

Foreign aid made modest contributions to the promotion of sustainable practices in forestry (Persson 2003). The positive development of forest transition has been associated with social and economic development and with an alleviation of poverty (Lambin et al. 2001, 2011). The evolution of forests and forestry has primarily been unrelated to foreign aid. Foreign aid dedicated to forestry rarely, if ever, triggered, or even significantly promoted forest transitions. This is no surprise, as the volume of forestry aid is far smaller economically than that of the forestry sector system as a whole.

Thomas Rudel in his recent book describes the motivation of people to protect the environment as 'defensive' or 'altruistic' (Rudel 2013). By defensive environmentalism, he refers to interests of people to protect the domestic, local environment. Promoting sustainable forestry far away from home is primarily a global 'altruistic' effort. The sense of 'defensiveness' may improve as globalization increases contacts between people.

Success of an aid project is measured in terms of improvements achieved in forests in the recipient country. The perspective of this paper is that of the recipients are poor people in the rural areas of the world. Donors appreciate sustainable forestry, which seeks to balance biodiversity protection, carbon sequestration, creation of income to rural areas, improving social relations with respect, and enhancement of local cultures. Examples are elaborated in this paper with a potential of meeting these goals.

The risks of corruption have especially been emphasized, regarding aid expenditures in the least-developed economies (e.g. Moyo 2006). These risks further call for integrating forestry aid policies with development policies more broadly. Integration of forestry is important with agriculture, energy, transport, mining, rural development, education, governance, and law enforcement. Ultimate success depends on improving the electric grid, road and rail network, improving health care, providing clean drinking water, and improving the food chain from farming practices to cooking instruments. Development liberates rural populations to help themselves in creating small businesses and finding a livelihood, which is benign to the near-by forest vegetation. In other words, sustainable forestry needs a favourable general setting, where forest transition can be reached and passed.

Carbon sequestration as an ecosystem service is becoming valued in monetary terms. Citizens in donor countries are concerned about climate. A 'close-to-home' appeal is attached to climate mitigation. If *they* do not take good care of their lands, *our* climate will become adversely affected (Rudel 2013). If REDD+ projects are integrated into plans for providing ecosystem services at the global scale, this holds promise to sustainable forestry. Monitoring REDD+ is a challenge. Deforestation of dry tropical forests can be accurately measured with modern technologies, but forest degradation is difficult to observe in tropical rain forests with multi-layer canopies.

Forests by definition are rural. Rural cultures tend to be more diverse than the urban ones. Projects and approaches are recommended in this paper for the promotion of sustainable forestry by means of foreign aid. Tree planting can be promoted and cooking methods can be improved. Forest observation system can be improved. Universities can be supported especially in Africa focusing on forestry, agriculture and rural development.

In conclusion, sustainable forestry can be promoted by foreign aid in rural areas, assisted with a broad spectrum of measures. A minimum of three to five years is needed to implement any major project. A long-term commitment is required in most cases. Forestry in due course

must be organized by domestic actors. Therefore, the importance of developing the educational system cannot be overemphasized.

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