**¿Es la reforestación masiva una herramienta útil para reducir el impacto del cambio climático?**

**Miembros del grupo:**

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**Elementos clave de la pregunta seleccionada. Estos elementos se usarán para hacer la búsqueda bibliográfica.**

* Massive reforestation, climate change.
* (((ALL=(massive reforestation)) AND TS=(massive reforestation)) AND PY=(2010-2022)) AND ALL=(climate change )
* All fields: reforestation help climate

**Selección de 4 artículos científicos recientes (después de 2010) sobre la pregunta.**

Artículo 1: 10.1016/j.gloplacha.2017.05.001 (Reforestation and land use change as drivers for a decrease of avalanche damage in mid-latitude mountains (NW Spain))

Artículo 2: 10.1016/j.biocon.2021.109187 (Reforestation can compensate negative effects of climate change on amphibians)

## Artículo 3: 10.1108/17568690911002870 (Climate change mitigation through reforestation in Godavari mangroves in India)

Artículo 4: 10.5751/ES-04198-160301 (Rebuilding Resilience in the Sahel: Regreening in the Maradi and Zinder Regions of Niger)

**Selección de al menos 1 artículo o informe no científico sobre la pregunta.**

<https://www.bbvaopenmind.com/ciencia/medioambiente/plantar-arboles-una-estrategia-controvertida-contra-el-cambio-climatico/>

**Extracción de contenido relevante del material anterior.** Podéis pegar trozos de los artículos indicando su procedencia.

-An important factor contributing to reduce avalanche damage, especially in settlements, was the abandonment of the traditional management system and subsequent land-use changes in mountain environments. Since the mid-20th century, there has been a regeneration of natural vegetation due to the decrease of the importance of farming activities; this is a process that can be observed in mountain environments of many developed countries of Europe, America and Asia ([Baudry and Bunce, 1991](https://www.sciencedirect.com/science/article/pii/S0921818117300176?via%3Dihub" \l "bb0035), [Rudel et al., 2000](https://www.sciencedirect.com/science/article/pii/S0921818117300176?via%3Dihub" \l "bb0355), [Piussi, 2000](https://www.sciencedirect.com/science/article/pii/S0921818117300176?via%3Dihub" \l "bb0335), [Müller and Zeller, 2002](https://www.sciencedirect.com/science/article/pii/S0921818117300176?via%3Dihub" \l "bb0275), [Gellrich et al., 2007](https://www.sciencedirect.com/science/article/pii/S0921818117300176?via%3Dihub" \l "bb0145), [Cramer et al., 2008](https://www.sciencedirect.com/science/article/pii/S0921818117300176?via%3Dihub" \l "bb0075)). In the Iberian Peninsula, this process has been mainly examined in the Pyrenees, where there was a progressive land [marginalization](https://www.sciencedirect.com/topics/earth-and-planetary-sciences/marginalization) because of the decrease of stocking rate, and grazing focused on flat environments located closer to the villages ([Lasanta and Ruiz, 1990](https://www.sciencedirect.com/science/article/pii/S0921818117300176?via%3Dihub" \l "bb0210)). This led to a vegetation colonization process which last stage is the passive reforestation of formerly grazed areas ([Lasanta, 1990](https://www.sciencedirect.com/science/article/pii/S0921818117300176?via%3Dihub" \l "bb0205)). In the Asturian Massif, this phenomenon has been equally intense ([Zuazúa et al., 1985](https://www.sciencedirect.com/science/article/pii/S0921818117300176?via%3Dihub" \l "bb0435), [Cascos, 2011](https://www.sciencedirect.com/science/article/pii/S0921818117300176?via%3Dihub" \l "bb0065), [Álvarez-Martínez et al., 2013](https://www.sciencedirect.com/science/article/pii/S0921818117300176?via%3Dihub" \l "bb0010)). Here, there was an abandonment of the most distant farm lands and pastures ([Rodríguez-Pascual, 2006](https://www.sciencedirect.com/science/article/pii/S0921818117300176?via%3Dihub" \l "bb0350)) that resulted in the recovery of the forest. In the first decade of 21st century, the main mountain municipalities of the massif had increased their forested area by 15% (on average) with respect to the 1960s ([Bengoa, 2011](https://www.sciencedirect.com/science/article/pii/S0921818117300176?via%3Dihub" \l "bb0055)). In this period, there has been a significant expansion and [densification](https://www.sciencedirect.com/topics/earth-and-planetary-sciences/densification) of the forest at higher elevations ([García de Celis et al., 2004](https://www.sciencedirect.com/science/article/pii/S0921818117300176?via%3Dihub" \l "bb0120)).

Apart from the lower demographic pressure, another factor to be taken into account is the progressive specialisation in bovine breeding, which intensified after 1940 ([Fernández-García, 2006](https://www.sciencedirect.com/science/article/pii/S0921818117300176?via%3Dihub" \l "bb0100)). Since then, most of the livestock consisted of foreign cattle breeds for milking, unfit for grazing steep areas ([Ortega-Valcárcel, 1989](https://www.sciencedirect.com/science/article/pii/S0921818117300176?via%3Dihub" \l "bb0300)). Shepherds almost disappeared together with goat flocks, which were expelled from many areas because they were considered “enemies of the forest” ([Rodríguez-Pascual, 2006](https://www.sciencedirect.com/science/article/pii/S0921818117300176?via%3Dihub#bb0350)). The decrease of goat grazing in steeper slopes, where they usually grazed exerting an important biomass control ([Osoro et al., 2000](https://www.sciencedirect.com/science/article/pii/S0921818117300176?via%3Dihub" \l "bb0305)), has promoted the extension of protective forest ([Gubler and Rychetnik, 1991](https://www.sciencedirect.com/science/article/pii/S0921818117300176?via%3Dihub" \l "bb0155), [Bebi et al., 2001](https://www.sciencedirect.com/science/article/pii/S0921818117300176?via%3Dihub" \l "bb0045)). These social processes are displayed in a timeline and related with the evolution of the damage index ([Fig. 17](https://www.sciencedirect.com/science/article/pii/S0921818117300176?via%3Dihub" \l "f0085)).

-On the other hand, we corroborated our second hypothesis that forest gain would increase habitat suitability for all species. In addition, we showed that the additive and synergistic effects of climate and forest cover change are likely to increase environmental suitability in an optimistic land-use scenario for all ten species, corroborating our third hypothesis. Finally, we also showed that reforestation could compensate the negative impact of climate change on the three species predicted to lose climatic suitability in the future

-The reforestation effort, at a local level, described in the study is an initial step towards adaptation aimed at coping with ongoing rapid sea‐level rise. Implemented successfully, this kind of participatory activities eventually leads to mitigation and disaster preparedness. If reforestation can take place with the added benefit of employment to the local villagers, it is the best option. But restoration activities that use local people as contract labour only and not involving them in the long‐run management of the restored ecosystem may not be successful (Rönnbäck et al., 2007).

Apart from being prepared for facing the consequences of sea‐level rise the long‐term benefits of establishing the original mangrove communities are enormous for the local people and the coming generations. The question whether changing the landscape by reforestation will address the issue of climate change or not will only be answered after a long‐term monitoring.

The increase in mangrove biomass is not only beneficial for mitigating sea‐level rise but also for enhancing carbon sequestration. It was also suggested by Chmura et al. (2003) that mangrove forests sequester carbon faster than terrestrial forests. Moreover, the role of mangroves as carbon sinks may be ecologically important since decomposition in mangrove soils occurs mainly through sulphate reduction, which would contribute less to greenhouse gases. This is an extra advantage of increasing mangrove biomass. Apart from mitigating the ill effects of climate change, there are several other benefits accruing from restoration activity. Environmental advantages of restoration are protection from storms, tsunamis and erosion and increase in green cover.

-Two development trajectories appeared in Niger in the twentieth century, each catalyzed by a different kind of foreign intervention. The colonial intervention uncritically applied a European export model to the entire Sahel region, thus totally reforming the landscape, institutions, and the practices of agriculture and forestry. It succeeded during relatively wet periods to generate wealth at the cost of increased vulnerability to episodes of drought and famine, especially for millions of rural farmers and pastoralists. When wholesale imposition of ideas conceived outside of Niger was abandoned, then a second, more sustainable, trajectory emerged. Interventions began exploring with people at all levels of Nigerien society for what sustains production as well as the ecosystems and society that support it. The regreening of the Maradi/Zinder region provided biophysical evidence (200 million trees), economic evidence (thriving livelihoods), and social evidence (enhanced social capital and reduced conflict) that the second development trajectory is more sustainable across all sectors of society. In wet periods livelihoods in the Maradi/Zinder region could flourish enough to sustain people locally as well as sustain export for profit. During the most recent drought the region suffered far less than any other part of Niger.

Few of these facts are new. But systems analysis helped to integrate these facts into a new synthesis that supports some existing hypotheses and adds novel insights to explain both previous failures and the current success in reforesting the Maradi/Zinder region. It legitimates the drive in sustainability science to develop an interdisciplinary conceptual framework for assessing vulnerability (Turner et al. 2003, but see Patt et al. 2009) by revealing how interactions across the biophysical, economic, and social domains were critical to regreening success. The failure of single-issue policies becomes more understandable when one recognizes that the pattern of interactions was more important to the sustained success of regreening than any single factor or process. Interventions at different scales catalyzed the shift from vicious to virtuous circles, and it is this multilayered pattern of reinforcement that has sustained regreening. These new patterns of interactions improved and sustained livelihoods and ecosystems in the Maradi/Zinder region such that they coped with the latest drought better than any other region of Niger. However, while they seem better at coping with economic or climatic shock or stress, the resilience of society and nature in the Maradi/Zinder region to global sources of uncertainty remains a pressing question in a society with one of the highest population growth rates on Earth.

**Conclusiones.** Texto elaborado por el grupo que responda a la pregunta planteada inicialmente.

Como hemos podido observar en los artículos mencionados anteriormente, creemos que, si es una herramienta útil, ya que podemos contrastar datos de cuando se hacía lo contario (deforestación masiva) y obtenemos unos resultados por ejemplo en el artículo que trata sobre las avalanchas de nieve observamos que empleando una deforestación hacía que hubiera un mayor número de avalanchas llevándose así a personas heridas o fallecidas. En cambio, con la reforestación masiva se redujo en un alto porcentaje este tipo de avalanchas proporcionando así una seguridad más alta a los ciudadanos de la zona y protegiendo mejor la fauna y flora local.

Leyendo todos los artículos podemos concluir que, la reforestación, el aumento de biomasa, la no deforestación o, como sea que lo quieras llamar, ayuda a la mejora del ecosistema. Reduce el número de avalanchas, mejora el hábitat de ciertas especies, ayuda a controlar el nivel del mar, retiene cierta contaminación de carbón y CO2, etc.

Luego a la pregunta, “¿Es la reforestación masiva una herramienta útil para reducir el impacto del cambio climático?**”,** podemos responder que sí. La reforestación masiva hace bien al ecosistema y, por consiguiente, ayuda a reducir y a sobrellevar el impacto del cambio climático