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Pushing the Potential of a Human Right to Science: Precarious Labourers and Basic Rights in Conservation Science and Bioprospecting

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Abstract

Does everyone have the right to benefit from science? If so, what shape should benefits take? This paper exposes the social inequalities coalescing bioprospecting in Madagascar through a relatively neglected and underexplored Human Right, the right to benefit from Science (HRS). Although underexplored in the literature, it is acknowledged that conservation practices often rely on cheap 'casual' labour. In contrast to the critical discourses exposing the exploitation and misappropriation of indigenous peoples' cultural and self-determination rights in relation to bioprospecting (i.e., biopiracy), the dependency of scientific advancements on the exploitation of a low-skilled labour force has only been scarcely examined and exposed from a human rights perspective. The reliance on cheap labour is not just limited to local biodiversity inventories (e.g. parataxonomists) but a whole set of other workers (ranging from cooks, to porters and logistical support staff) who are contributing (in) directly to the advancements of science, and moreover, whose contribution is barely acknowledged let alone financially remunerated. As precarious workers it is difficult for labourers to use existing national and international labour laws to fight for the recognition of their basic rights, neither can they easily rely on biodiversity and environmental laws such as the Nagoya protocol to negotiate the recognition of their contribution to science. In this paper we draw the attention to the role of the HRS as a legally binding mechanism to protect the basic rights of low skilled workers in biodiversity projects. Drawing upon the call made by the UN Special Rapporteur, Farida Shaheed that the human right to science encompasses (i) the opportunity for all to contribute to scientific research and (ii) the obligation to protect all persons against negative consequences of scientific research, we explore to what extent the HRS can be used to force national governments, research institutions and commercial companies to provide basic labour and social rights.

1 Introduction: On the Bioprospecting Trail

In November 2005, I was fortunate to observe a bioprospecting (drug discovery from nature) expedition with what was at the time one of the largest and longest running US federally funded projects – the International Cooperative Biodiversity Groups (ICBG).[1] I was the lone foreigner, in a group of Malagasy scientists, researchers, guides and porters, traveling through a relatively unknown forest in Madagascar's northernmost province of Antsiranana.

During our expedition, I was listening attentively to the lead botanist of the group, Jean, as he explained the purpose of a Geographic Positioning System device to a group of porters he hired from a nearby village.[2] Jean remarked, 'the device was given to me by a U.S. botanical repository. It is used to locate my exact position when I collect a plant, and when the plant is analyzed in a laboratory in the U.S. and found to have interesting medicinal qualities, I then can return to the spot and collect more.'[3] After hearing Jean's description, I was interested in what exactly the porters knew about bioprospecting, so I chimed in to ask what they thought of people from the U.S. being so interested in plants growing in their backyard. One porter responded, '…what does a foreigner want with plants? Sapphire, gold, yes, but plants?'[4] The fact that this was the first time the porters had seen a GPS device was not very surprising since this remote area hosts relatively few outsiders, but I was interested to learn that the these porters had not heard of the team's reason for being there. Surely, they would at least be informed of the purpose of the trip. Were these hired labourers not *part* of the bioprospecting mission?

The bioprospecting team (including myself) was perceived by one of the porters who spoke French as "…*vazáha qui suivent le chemin des anciens prospecteurs*" or "whites who follow the path of previous prospectors."[5] Those hunting for minerals and other riches have a long and storied history in Madagascar, and especially in Antsiranana which is home to a wealth of precious gems and the island's largest gold deposit (Campbell, 1988; Walsh, 2004). This porter was now part of a new type of prospecting mission, one in which the correct biology and chemical 'tinkering' might produce a new drug with value vastly more significant than gold or sapphires. Knowing that this was going to be a short-term job, the porter was going to try to personally benefit as much as he could; however, in this case, he was only able to negotiate a one-day wage of 5000 Malagasy Ariary (MGA).[6] In the opinion of one leading conservation practitioner, whose organization is part of the bioprospecting mission, "…They [the porters] are happy to cash in their bioprospecting chips. It's like someone who gets paid to shovel in a gold rush."[7] This statement only adds to the multiple and complex layers of inequality that exist within bioprospecting and is reminiscent of Charles Zerner's notion, "the poor sell [their labour] cheap" (2000:8-9).

The porter, however, might have been also unaware of the highly polarized debate amongst academics and environmental activists surrounding the commodification and misappropriation of nature and rural and indigenous peoples' knowledge systems for bioprospecting (known as biopiracy) (Shiva 1997; Hayden 2003; Parry 2004; Neimark 2012). This long-standing debate has only intensified since the launching of a host of new market-conservation "bioeconomy" initiatives by the EU, OCED, and other large multilateral development organizations such as the UNEP (Corson et al 2013). The bioeconomy

[1] The ICBG (2003-2013) was a private/public consortium of research organizations (Missouri Botanical Gardens - MBG, Malagasy National Institute for Applied Pharmacological Research - CNARP), conservation groups (Conservation International- CI) and commercial partners (Dow AgroSciences, EISAI Pharmaceuticals).

[2] The field research in the following paper was conducted by the fist author and draws on qualitative methods including over 78 semi structured interviews with rural inhabitants, research scientists and policy administrators involved in bioprospecting. Participant observation was also done on two bioprospecting expeditions in 2006/7 in the Antsiranana region of Madagascar. This work was updated with recent published material by Robinson 2014 and follow up conversations with bioprospectors in Madagascar in 2014. All names of research participants are pseudonyms. Malagasy village names have also been changed.

[3] Anonymous interview June 20, 2005.

[4] Anonymous interview June 20, 2005.

[5] Anonymous interview (June 20, 2005).

[6] In 2006, 5000 MGA was equal to approx. U.S. $2.50

[7] Anonymous interview (January 17, 2006).

is generally defined the "production of renewable biological resources and the conversion of these resources and waste streams into value added products, such as food, feed, bio-based natural products and bioenergy" (EC 2009; Bosch 2015). In theory, the discovery of value-added bio-based products and services will help address global environmental challenges such as food security, biodiversity loss, and climate change, whilst delivering inclusive socio-economic development. Yet for some time now, studies have shown that the acceleration of market-conservation has not only increased the commercial value of biodiversity but also potentially risks the social integrity of indigenous and local communities, and sometimes leading to a loss of cultural diversity and overexploitation (Vermeylen et al. 2008; Neimark 2010; Shiva 1997).

One area that remains underexplored in the literature on market-conservation in general and bioprospecting specifically, is the exploitation of the manual or 'casual' or 'precarious' labour force in conservation projects (Sodikoff 2009). This silence is positioned within an increased awareness that the monitoring of biodiversity by professional scientists is a costly affair.[8] Hence, the scientific conservation community actively recommends that biodiversity conservation projects make more use of a locally based, low-skilled workforce (Danielsen et al. 2005; Janzen 2004). Alarmingly, most of the studies recommending the use of a local workforce ignore the issue of labour exploitation. At best, they pay lip service that rangers, amateur naturalists and local resource users trained as plant collectors (parataxonomist) can form the backbone of biodiversity projects and should be remunerated for their efforts. When 'county bumpkin [are] formed into a parataxonomist […] they are employees producing and paying their bills now' (Janzen (2004: 184). Yet, there remain many unanswered questions about the role of labour and the recognition of workers in international bioeconomy programs in the global south, particularly since success is based on sharing of conservation benefits and *inclusion* in the scientific process (Sodikoff 2012; Neimark and Wilson 2015; Garvey et al 2015).

Does everyone have the right to benefit from science? If so, what shape should benefits take and how are they to be shared? Are the burdens of science, including adoption of technologies and policies from discoveries, also shared? Answers to such questions have been at the heart of renewed conversations concerning the often neglected human right to benefit from science. In an interview, Farida Shaheed, UN Special Rapporteur for the Committee on Economic, Social and Cultural Rights (CESCR), noted that the Human Right to benefit from Science (HRS) is in essence about the "the right to self-determination and participation." She went on to say:

Access to science must include participation in the whole scientific process — it's not just the end product. You have the scientific process, then the knowledge that's created, then the applications. All of those things make up the right to science.[9]

Science is rarely considered as a substantive human right, but a HRS is explicitly mentioned in Article 27 (1) of the Universal Declaration of Human Rights (UDHR): "Everyone has the right freely to participate in the cultural life of the community, to enjoy the arts and to share in the scientific advancements and its benefits" and Article 15 (1) (b) in the International Covenant on Economic, Social and Cultural Rights (ICESCR): "recognise[s] the right of everyone to enjoy the benefits of scientific progress and its applications"[10]

Our original contribution to this debate is twofold; first, we seek a wider interpretation of the right to science which defines "sharing as participation," and interpret Art 27 and 15 of UNDHR and ICESCR, respectively, in the broad sense as "actively participating in scientific progress." Doing so, we link these two articles (27 and 15) to the "right to work" and "sustainable access to decent work that meets the needs and welfare of its livelihoods" which is explicitly shown in Article 6 of the ICESCR. In a similar vein to what Olivier De Schutter (2011) has done for linking the right of everyone to enjoy the benefits of scientific progress with the right to food, we argue that the Article 15 must be linked to

[8] The time and monetary resources to continually monitor biodiversity far exceeds the scientific budgets of many research institutions and conservation organizations.
[9] Rabesandratana, T, 2013.
[10] Originally found in the 1948 Universal Declaration of Human Rights, as well as in the International Covenant on Economic, Social and Cultural Rights, adopted by the UN General Assembly in 1966, see www.ohchr.org/EN/ProfessionalInterest/Pages/CESCR.aspx

Article 6 of the ICESCR to reach its full potential to protect local communities from the harm of scientific progress. This strategic linking opens up new dimensions for understanding decent conditions for precarious workers which up to this point has been less recognized in leading labour conventions and debates, such as the International Labour Organization (ILO).[11]

Our second contribution is to draw out these vital linkages through a detailed empirical case study of the ICBG bioprospecting project in Madagascar. Madagascar is an ideal prism to look at the integration of HRS, dignified work and the bioeconomy. Rich in endemic biodiversity, it has been for years been labeled a bioprospecting "hotspot," and a gateway for new market-conservation programs based on drug discovery (Neimark and Schroeder 2009). Moreover, projects such as the ICBG seek an enhanced role of the private sector and civil society in the (re)regulation of nature through forms of commodification of bio-based products and services. In theory, monetary benefits from the discovery and commercialization of new natural products would provide the impetus, and more importantly, the critical funding for the conservation of the island's unique biodiversity and the delivery of sustainable development by conservation groups working in the country.[12] The study highlights the role of non-state or 'third party' groups (e.g., companies, Universities and private research institutions and environmental NGOs) who are now being called upon to ensure that human rights to science and other livelihood and sustainable development needs (e.g., access to food and water) are recognized and addressed (Morgera 2014; Bebbington et al. 2008; Hickey and Mitlin 2009). This also draws vital relevance for the ethical questions and tensions surrounding scientific benefits and labour recruitment found in new 'carbon' (REDD+) and 'green' economies (Payment in Ecosystem services and Biodiversity Offsetting programs). The first aim of this paper is to critically assess how HRS can help to ensure that third party groups can deliver equitable sharing of scientific benefits and burdens in bioprospecting and lay out future research directions in which the framework can be applied. The second aim is to recognize the role of low-wage laborers in the bioeconomy and other market-conservation schemes and find ways to address the rights of these participants if the bioeconomy is to have any chance of success.

2 Human Rights to Benefit from Science and the Precarious Conservation Worker

It is highly unusual to think about science as a substantial human right; hence, it has become one of the most obscure and neglected rights. While some applications of science, such as chemical weapon development, are outright infringements of a human rights approach. Others, such as using science as a way of improving development, (as stipulated by the Task Force on Science, Technology, and Innovation within the context of the United Nations Millennium Project) may be more difficult to link directly to substantive human rights. Despite the obvious connection between science and improvements in healthcare, food security and a clean and safe environment, there is a reluctance to attribute the improvement in human welfare due to scientific developments as a human right in and of itself (Chapman, 2009). This despite the fact that Article 27 of the UDHR has two provisions related to science:

- Everyone has the right to freely to participate in the cultural life of the community, to enjoy the arts, and to share in scientific advancement and its benefits.
- Everyone has the right to the protection of their moral and material interests resulting from any scientific, literary, or artistic production of which he is the author.

[11] To prevent further exploitation (such as non-payment or underpayment) we argue that these two respective articles should be interpreted as an active participation in scientific progress which opens up the possibility to link a HRS to Article 6 of the ICRSCR to the fundamental right to work so everyone has sustainable access to decent work that meets the needs and welfare of its livelihoods.

[12] This is focused within 8j of the Convention on Biological Diversity (CBD) which provided communities the right to benefit from their cultural and biological resources. These benefits are determined by an Access and Benefit Sharing agreement (ABS) which were codified in the long-awaited 2010 Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits which up to this point has not addressed labour rights of precarious conservation workers.

And Article 15 (1) (b) of the ICESCR stipulates to 'recognise the right of everyone to enjoy the benefits of scientific progress and its applications'. As the ICESRC is legally binding to those nations who have become state parties, it also mentions the following mandates:

- The steps to be taken by the State Parties to the present Covenant to achieve the full realization of his rights shall include those necessary for the conservation, the development and the diffusion of science and culture.
- The States Parties to the present Covenant undertake to respect the freedom indispensable for scientific research and creative activity.
- The State Parties to the present Covenant recognize the benefits to be derived from the encouragement and development of international contacts and cooperation in the scientific and cultural fields.

Within the context of this paper, we are particularly interested in unpacking the meaning of the wording of Article 15 (1) (b) that recognizes the right of everyone to enjoy the benefits of science and its application. There remains ambiguity whether the right must be interpreted as meaning to benefit from the dissemination of the fruits of scientific progress or whether it alludes to a more substantial and fundamental benefit to participate in its development as well; as experts in this area argue, it requires both interpretations (Chapman 2009). As Chapman further argues:

Like all human rights, the human right to the benefits of scientific progress and its applications imposes a different set of obligations on states than promoting or using science for other purposes, even noteworthy goals. Specifically, it requires that science be seen as an instrument for human benefit. It also necessitates that the process of doing scientific research and the development of applications from that science be consistent with fundamental human rights principles (Chapman 2009: 11).

Particularly the emphasis that Chapman gives to the *process* of scientific research and how this should not infringe upon other human rights principles is pertinent within the context of examining the labour relationships between scientists and an unskilled workforce in the biodiversity sector. In other words, the human right to science is not only an instrument that can be used to hold states and third parties accountable for the wider dissemination of scientific research beyond those that have directly contributed to the scientific advancements, it can also be used as a mechanism to instill upon the scientific community the requirement to develop better employment regulations when working with or using services from an unskilled labour force in the biodiversity and bioprospecting sector and beyond.

> The human rights agenda is not devoid of its own controversies. Historically it is linked to the moral status of seventeenth century natural rights claims and law's positivistic nature. Both criticised for being disrespectful towards local context and non-Western values. Furthermore human rights have also been linked with the intellectual and political tradition of liberalism which strives for the protection of the individual against the violence of the state and not particularly known for protecting the higher good of society or subordinated underclasses. Embracing a pragmatist approach towards human rights, we follow the idea of Ignatieff (2001) that it may be more important to concentrate on the rights themselves than to focus on the historical and philosophical foundations of the principles. On an abstract level this debate might be fully grounded but having been confronted with the injustice on the ground we are eager to open up the debate of equal rights within the context of bioprospecting.
>
> *"[…T]he pragmatic approach to human rights stresses the role of rights in practical politics, law and interpersonal relations rather than the metaphysical foundations for a belief in rights"*(Hiskes 2005, 1362).

Following Dewey and other pragmatists we believe in this particular context that human rights have a role to play in looking for a "participatory democratic deliberation" (Hiskes, 2005, 1362) and as such think that human rights have a role to play to tackle the emergent reality that low skilled workers are being exploited in bioprospecting contracts. We recognise our own dilemmas when confronted with

unequal labour relations in bioprospecting contracts in Kelly Parker's summary of the pragmatist position:

Pragmatism, then, sees *reality* as process and development, and sees *beings* as relationally defined centers of meaning rather than as singular entities that simply stand alongside one another in the world. It emphasizes not substantial beings, but interrelations, connectedness, transactions and entanglements as constitutive of reality. (Parker 1996, 25 in Hiskes 2005, 1363) (emphasis in the original)

Yet, there is some ambiguity how to interpret Article 27 of the UDHR and Article 15 of the ICESCR; is it about passively enjoying the benefits or is it also about actively taking part in the scientific process? Looking into the *traveaux preparatoires*, it is clear that the word "share" must be interpreted as having the same meaning as "participate" indicating an active participation, action or agency (Mancisidor 2015). If we interpret the right to science in the more narrow sense, there is still a requirement for states and arguably third parties to guarantee that the most vulnerable groups are better organised so that they can benefit from the transmission of knowledge. This could be through participatory science programmes in which local people participate (De Schutter 2011). The lack of consensus as to what the right to science might entail will make it more challenging to see this right as an obligation for states to fulfil (Chapman 2009) especially in an evolving landscape of non-state involvement in market-conservation (Corson et al 2013).

In her study of forest conservation projects in Madagascar, Genese Sodikoff (2009: 445) argues that the silencing of the labour debate of low skilled workers is not "for lack of political sympathy with local labour but, rather, relates to the way that conservation has been imagined as an antithesis to production" (c.f. Sullivan et al 2015; Büscher and Fletcher 2015). Conservation science has a long history of subjugating local practices and has become part of the civilizing mission of European empires (Sodikoff, 2009; Brockington, 2002; Anderson and Grove 1987). However, under the auspices of the Science and Human Rights Coalition[13] there is an increased awareness that scientists have a wider responsibility to society beyond just accountability to fellow researchers. Unfortunately, the content and scope of that responsibility remains vague and highly contestable amongst scientists themselves, for instance, fair payment and providing social security to a low skilled workforce is not even mentioned as part of the scientists' social responsibility (Wyndham et al. 2015).

However, it is no longer just up to the state to fulfil these obligations. As Chapman (2009) has clearly indicated the private, and we argue civil society (NGOs, education sector) has an important role to play in the obligation of a HRS. She gives a full list of particular functions that third parties can fulfil and some are particularly poignant within the context of bioprospecting contracts. These requirements are based on a narrow reading of the obligations under Article 15 of the ICESCR and Article 27 of the UDHR:

- Setting priorities for and channeling sufficient investment in a purposive development of science and technology that brings potential societal benefits, particularly to poor and disadvantaged groups;
- In the absence of a strong scientific base, at least having the capacity to evaluate discoveries and technologies developed elsewhere for purposes of directing the importation for the benefit of their populations;
- Developing laws, institutions, and policies conducive to the monitoring and regulation of science and technology, including an adequate process of review to anticipate the potential harmful effects of science and technology and using that data to inform the public;
- Providing a strong science education program at all levels, particularly in the state sponsored school system, leading to a critical mass of skills necessary to develop and adapt science and technology;
- Undertaking ongoing public outreach and educational efforts that will better enable individuals to understand the significance of developments and participate in decision making about priority setting;

[13] For more information see http://www.aaas.org/program/science-human-rights-coalition (30/12/15).

- Providing opportunities for meaningful public engagement in decision making about science and technology;
- Having or creating distribution systems through which the benefits of science and technology can widely reach groups and communities, particularly those who hitherto have been disadvantaged in access to these benefits;
- Developing a national plan of action with a timetable and goals to rectify existing inadequacies and a monitoring strategy to evaluate the extent to which these milestones are being realized.

Those critical to conservation have already identified the role of non-state third party actors in resource policy (Büscher 2010; Corson 2011). Yet less of these studies hold their parties accountable within human rights to science framework. This is surprising since third party actors and obligations are outlined alongside other very key statutes located in the Inter-American Commission on Human Rights, including a focus on the rights of marginalised and vulnerable populations, scientific responsibility and right to benefit from science and intellectual property and the participation in development decision-making. It is noted in the 1993 Vienna World Conference on Human Rights that it is up to the state to allow for the scientific freedoms and cooperation, diffusion and conservation of science and the application of its benefits.[14] Yet, rather than quelling the matter, this has, in fact, provided fertile ground to discuss and debate what the role of states, and the increasing involvement of non-state groups, to implement and carry out and fulfill their legal and moral obligations to the proclaimed right to science (Shaver 2010). For example, according to the UN, governments are not necessarily responsible for infractions that might take place by third party actors such as private companies and institutions, nevertheless, "[s]tates may breach their international human rights law obligations where such abuse can be attributed to them, or where they fail to take appropriate steps to prevent, investigate, punish and redress private actors' abuse" (2011, 4). Given that the role and responsibility to ensure human rights do not sit in the lap of states alone, but with other industry and civil society actors, one might then question the role of civil society and research organizations to ensure the equitable sharing of benefits and burdens of integrated science, conservation and development projects such as bioprospecting in the ICBG. [15]

3 Unskilled Labour Force in Bioprospecting and Market-Conservation

The growing unskilled labour force embedded in conservation and bioprospecting projects are a sign of a growing trend of labour organisation in Sub-Saharan Africa with a shift towards precarious, temporary and informal forms of work. Unskilled labourers in the "conservation sector" are part of a category that is labelled as unprotected work which is defined as "precarious, or marginal type of economic activity, directly or indirectly subject to decisions of powerful actors in which workers have limited input" (Bernards, 2015: 13). Obviously, Africans have been exposed for a very long time to informal work arrangements, temporary labour migration and subsistence production. So on first sight the unskilled labour force "employed" in the biodiversity sector is not an exception in being exploited as precarious workers. However, there is a sense of new urgency as the literature on changing labour relations in Sub-Saharan Africa have identified three core alterations in the labour relations. First, increasingly African subsistence farmers are pushed into wage labour. Second, established workers find their relatively "protected" position eroded as a result of the retrenchment of public sector employment and the geographical displacement of certain sectors. Finally, and this is the most poignant change for the workers in the biodiversity sector, contemporary forms of unprotected work takes place against more entrenched power relationships whereby workers are incorporated into

[14] Accessed at http://www.ohchr.org/EN/Issues/Pages/WhatareHumanRights.aspx (March15, 2014).
[15] We argue alongside De Schutter et al (2013), that the Maastricht Principles on Extraterritorial Obligations of States in the Area of Economic, Social and Cultural Rights (ETO) have been held up in the past to provide a human right protection against potential abuses of TNCs and can hold Intergovernmental Organisations accountable for their impact.

transnational relations of production subject to the power of socially and geographically distant core actors (Bernards, 2015: 13).

For example, Sodikoff (2012) study argues quite cogently that "subaltern labo[u]r" provided by low-wage conservation workers in Madagascar have not only protected and monitored the forest to add value, they have also built paths for tourists, guided tourists, amassed species inventories, monitored tree growth, measured rainfall, carried equipment and provisions, identified species by Latin names. This work built off a long history of colonial forest service, where French "experts," outranked "indigenous" workers; and evolved out of the work of Malagasy carriers who served as porters to natural historians and collectors. However, within the high-stakes landscape of market-conservation, these "low-paid" conservation agents must navigate localized moral economies by evicting fellow villagers and even family member out of protected areas to enforce top-down interventions.[16] In her study of biodiversity conservation scientists in Indonesia, Lowe finds that a "post-colonial condition" overshadows the work of Tongan locals who "struggle for recognition within transnational scientific domains" (2006, 13). While we argue that this co-production of nature and scientific knowledge has for some time been recognized by critical scholars and activists as an assemblage of institutions, identity and social and political relations, rarely is labour recognized as critical factor in analysis. The issue of co-production of science has been widely explored in Science and Technology studies (see Latour and Woolgar 1986; Jasanoff 1990; Coombe 2001; Whatmore 2009; Waterton et al 2014) but increasingly it has also attracted the attention of human rights and environmental law scholars exploring human right to science (Morgera, forthcoming, Chapman 2009).

Up to this point, a HRS does not come into any real consideration when bioprospecting contracts are negotiated at either the institutional and state level or within local level benefit sharing agreements. And moreover, NGOs and the scientific research community such as universities, are not usually been envisaged by labour standards so they fall within the cracks of the provisions in labour law, hence the need to look for an alternative mechanisms. It may be more appropriate, therefore, for some of these requirements to be addressed at the national or international level within ministries and amongst the scientific research institutions involved in negotiating the material and technology transfer agreements and milestone and royalty payments, others seem to be more relevant at the local level in particular is better informing and educating those involved of their rights and responsibilities in delivering rightful benefits (and burdens) and decision making over scientific participation in drug discovery. For the follow two sections, we connect with bioprospecting observations and narratives from the field. First we provide an introduction to the ICBG –its history and development– and we then move to local Malagasy perceptions of the bioprospecting project. We show how little Malagasy understand of the process of drug discovery and the precarious position as labourers in the commodity chain.

4 The ICBG Madagascar

The ICBG is composed of private and public international organizations, research institutions and companies involved in a large-scale collaborative effort to discover novel pharmaceutical and industrial products (Rosenthal and Katz, 2004). [17] Specifically, the ICBG-Madagascar is a bioprospecting project which originated from the Biodiversity Utilization in Suriname Project (1993-1997), led by Dr. David Kingston at the Virginia Polytechnic Institute and State University (VPISU). The project in Suriname was one of five initial projects contracted by the ICBG in 1993. After the first funding cycle, the team led by Kingston submitted a proposal in conjunction with some of the larger organizations involved in Suriname who also had operations in Madagascar for the second round of ICBG.[18] Subsequently, the team was granted a second five-year round of funding, and expanded to

[16] In Madagascar, direct applicability of international conventions by the courts is guaranteed by the Constitution, which, in its preamble, recognises the International Bill of Human Rights, the African Charter on Human and Peoples' Rights and the conventions on the rights of women and the rights of the child.

[17] Drug discovery screening are conducted for cancer, malaria, tested in assays for effects on cancer, immunology, malaria, neurological disease and tuberculosis and agro-products including fertilizers, pesticides (Robinson 2014).

[18] This team also included representatives from the Missouri Botanical Gardens (MBG) and Conservation International (CI). US National Institutes of Health (NIH), the National Science Foundation and the US

Madagascar. This stage of the project which was designated Phase I (1997-2003) in Madagascar was designed around plant collections within the Zahamena National Park, in the eastern forests of the Toamasina (Tamatave). A third round of funding was awarded to Kingston's team, this time to work solely in Madagascar. This round (2003-2008) consisted of plant and marine collections in dry forest in northern Madagascar. The last and final round of funding (2007-2013) included microbial collections within five centrally located conservation sites co-managed by the lead ICBG botanical collection institution Missouri Botanical Gardens (MBG).[19] It was this last round which instituted the systematic collection of soil microbes (Robinson 2014). This shift from plants collected in the north and west of Madagascar in Phases I and II towards microbial collections in Phase III, mirrors growing scientific interest in microorganisms worldwide.

In order to follow the "spirit" of benefit sharing found in the CBD the ICBG has supported economic development and conservation interventions in rural areas of collection. These conservation and development programs offer economic incentives to the Malagasy government and regional *communes* to conduct rural-level micro-development projects or "microprojects" The ultimate purpose of the microproject (described in detail below) is to provide tangible compensation to local communities for their help in collection.[20]

The term "upfront compensation" is commonly used in Madagascar to describe payments given to rural inhabitants for their participation in microprojects in areas located near sites of collection.[21] The funds for the project are to be provided before or during collection, and are upfront or prior to any other monetary returns such as royalties or milestone payments that may be received after any discoveries are made. For the ICBG, the logic behind the compensation scheme is rather straightforward; drug discovery is a complex process that takes a great deal of time (estimates are to bring a drug to market takes upwards of 10 to15 years). This upfront payment accordingly provides an example of benefits that may be gained from protecting their biodiversity. Moreover, the project holds that by providing rural Malagasy with some economic alternatives through income generating activities, they will begin to reduce charcoal production, pasture burning and other "unsustainable" livelihood practices such as forest burning for upland rice cultivation (known as *tavy*), and begin buying onto long-term conservation stewardship.[22]

However, the way that bioprospecting is conducted with small collection teams hiring short-term porters and guides raises questions regarding who is able to capture the majority of the benefits and just what the burdens of participation are. I posed these important questions to rural residents living in collection areas to provide a better understanding of Malagasy perceptions of project benefits and burdens and rural residents sense of distributive mechanisms within the ICBG.

Participation in the ICBG

Once the bioprospecting team obtains collecting permits from the Malagasy government, there is no other legal obligation for them to respond to demands of any local authorities or inhabitants before entering a forested area.[23] However, it is the ICBG policy to arrange 'courtesy' visits with rural Malagasy before collection. This short meeting (*kabary* in Malagasy) between the project and the

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Agency for International Development (USAID) – it has since been replaced by the US Department of Agriculture (USDA).

[19] Since Madagascar currently does not have a specific law for bioprospecting, the ICBG was set up alongside the guidelines of already established access and benefit sharing MOU's developed between the US NIH and the national pharmacological institute CNARP. Only recently has there been movement to produce national laws based on the standards set by the Nagoya Protocol.

[20] The term 'local communities' is used commonly as an area of intervention by the ICBG microprojects.

[21] Anonymous interview Dec. 14, 2006. The term "upfront compensation" was designed by the architects of the ICBG - Suriname project and imported into Phase I of the ICBG in Zahamena.

[22] Recent studies have shown mixed results in demonstrating that conservation goals are met through bioprospecting (Neimark and Tilghman 2015; Robinson 2014).

[23] To obtain collection permits or conduct research in Madagascar, scientists must apply through the Ad hoc Flora/Fauna Committee/Orientation Committee for Environmental Research or CAFF–CORE. All forested land not under cultivation or under any type of co-management scheme (GELOSE or GCF) is designated as property of the state.

president of the *fokontany* greatly benefits the researchers.[24] The *kabary* is an opportunity to explain the researchers' objectives and needs,[25] and begin the process of selecting workers, including fifteen to twenty men and women who are chosen by the village head to work as guides, cooks and porters. Although more generally, these posts are delegated to family members and those close to either customary or political authority selected to represent the village. There is a specific gender selectivity here, as women were sometimes chosen as cooks, they were generally not picked to take other tasks such as porters or guides. The meeting usually provides the researchers unlimited access to intact forests near the village during collection and guarantees their safety throughout their stay.

The payment was negotiated at the ICBG rate at 5,000 Ar (U.S. $2.50) per day. Due to the somewhat easy access to many of the vegetative areas in Antsiranana, porters usually work for two days (one day drop off and one day return). Cooks and guides stay for the duration of the trip and maybe for multiple trips, depending on the next location. The porters each load 25 to 30 kilos of materials and food, and carry it to and from the requested site. The site is usually found by the hired guide in the area, with water availability and central location as criteria. It seems that sites are chosen where the guide can maintain access and personal communication with the village, and in return, the village can keep an eye on the researchers.

Most workers hired have some relationship with the village head, and their hiring was seen by many in the village as a favor passed down through the village administration. In the end, the process of hiring 'local' is vital for the team's success. Although legally the researchers may enter the forest, their collecting activities have the potential to be disrupted if they do not hire from the area. As Lanto, a porter hired by the team, indicates:

Yes, they are allowed to go into the forest, and we can't do anything to stop them. All we need is money and we won't do anything. We don't know much about what they do, but if they [researchers] give us something for our pockets [money], we won't bother them.[26]

However, not everyone was in line with how benefits were exchanged, as observed by Henri, a rural resident:

If they [ICBG] tell us that they get new drugs from the plants, and not hide it, maybe there will be a benefit for people in the village. Still, we didn't know why they had gone into the forest, and it was only after they came back that we found out. In the end, we didn't know if they had their collecting permits or not.[27]

This confusion of just what the project was about leads to the question: how are rural Malagasy to learn about the benefits of bioprospecting if even those who are involved in the project are still left without any significant knowledge of the project's mission? And beyond a few days of employment, how else are Malagasy participating in the ICBG? For example, what are they learning and what is the interaction, how much do knowledge do they pass on to others? And in terms of employment, what is their pay rate, are there different rates depending on the job they do, and what about gender is there a difference in pay?

Whose water trough is this?

Prior to any work in the areas, ICBG information meetings were held within the two rural communes of Ramena and Mahavanona and a larger meeting was held in Antsiranana.[28] The purpose of these meetings was to explain the application procedure to apply for rural-level microprojects funded by the ICBG and how the vetting process for selection was going to proceed. Applications were to be written by the commune head and sent to a screening committee composed of the Malagasy representatives of the three leading organizations of the ICBG (CNARP, MBG and CI). By the end of the application

[24] Anonymous interview Dec. 7, 2005. A *kabary* is a cultural form of communication and political speech, whereby Malagasy indirectly explain an historical event relevant to a current situation.
[25] Anonymous interview Dec. 7, 2005.
[26] Anonymous interview March 5, 2006.
[27] Anonymous interview March 5, 2006.
[28] Anonymous interview May 31, 2007.

process, fifteen small and medium range projects were selected in the three different communes, those of Nosy Be (marine site), Ramena and Mahavanona (terrestrial sites) (see Table 1).[29]

Table 1. List of microprojects in the Antsiranana region[30]

Commune	*Village*	*Type of project*	*Type of collection (marine or plant)*
Nosy Be	Nosy Lafy	Community building Animal breeding Horticulture	Marine
Nosy Be	Anrodrimna	Animal breeding Horticulture Reforestation/afforestation	Marine
Ramena	Varindirina	Water well/irrigation dam[31] Animal breeding Horticulture projects Reforestation/afforestation	Plant
Mahavanona	Sabatinava Ankadino Ambatofaroa Mandjaranivavo	Feeding troughs Animal breeding Horticulture projects Reforestation/afforestation	Plant

For many scientists involved in the project, the benefits returned to the villages, either in the form of labour payments or the microprojects themselves was viewed favorably. For example, the virtues of the microprojects are mentioned repeatedly by ICBG representative as "…a method of giving something back to the source country and especially the local community."[32] The permanent representative of the MBG, for example, commented on the completion of a Phase I microproject:

There was the construction of a bridge and granary. I was there during the inauguration [of the bridge]. They were happy to see their work accomplished. The real advantage of the bridge allowed the villagers to get to the hospital easier.[33]

But how do the rural inhabitants view the microprojects? For some, such as the President of Varindirina, they seemed like an equivalent exchange for their resources:

I think it is equal. They came here only once. They spent one week and gave us [Varindirina] 14,000,000 Ar (roughly U.S. $6,900). So, I think it is equal. Maybe they got more compared to what they took but whatever we get is already fine for us.[34]

More generally, within the three villages surveyed, residents' accounts of the microprojects were mixed and participation in the microproject and implementation was largely limited to a few individuals in each. And even though all three villages had microprojects that were actively or previously constructed, most residents had little or no knowledge that they were even occurring, much less that they were linked to the ICBG (see Table 2).

[29] Anonymous interview June 27, 2006.
[30] Reported by ICBG**,** Feb. 2005.
[31] While the project claimed a 100 percent completion, a site visit to the village in Feb. 2005, I found only partial delivery of the microprojects. The only reports of completed projects were of the dam, the planned irrigation well ran into complications and was never completed.
[32] Anonymous interview Feb.14, 2005.
[33] Anonymous interview June 27, 2006.
[34] Anonymous interview March 6, 2006.

Table 2. Knowledge of ICBG-led microprojects in three sites

Village	*Any knowledge of microprojects*
Sabatinava*	2
Ambatofaroa	8
Varindirina*	6
Totals	16

* indicates villages with microprojects

As shown earlier with knowledge of the ICBG, there seems to be collective ignorance held by rural inhabitants about the microprojects overall. This questions whether the choices for the microprojects have any rural level input at all. For those who did know anything about the project, the survey seemed to show that knowledge of the project was only diffused to those who lived close to the project sites, who were direct relatives of the president, or who worked with him in some capacity (e.g., Vice-President of *Fokontany*, school teacher).[35] An example of villagers' description of benefits was noted by the President's brother:

The president reported to us during a meeting that we had[…]the project about the dam is related to the fact that MBG came here [the benefit we got from them]; however the microproject about keeping chickens or ducks is to make people stop making charcoal which destroys the forest.[36]

In many interviews, villagers said they felt the microprojects did not represent what they wanted. For example, since a very few actually owned *zebus* (the local breed of cattle), a watering trough was not suitable. When I asked the president of the *fokontany* of one of the villages why many of his residents felt disappointed in what the ICBG delivered, he said:

It was a bit difficult, because there was no participation of people in the village. If we want to carry out a successful microproject, people should participate. The money is already there, but people don't want to participate. In Sabatinava, for example, the water place has already been dug, but people don't want to work on it. And I don't know why. What I think happened is that what *commune* gave us is not what people really want. They want to raise chickens or do something that people can get a direct benefit. People don't want a well or a watering hole.[37]

When I asked further why a watering trough was selected, he expressed the project's urgency "…in getting a project done, rather than what people really wanted.2[38] In another interview a village President said:

They [ICBG] said they asked them [the residents], but people didn't really understand the process. So ICBG planned the project, but I think it was only done on table [ICBG didn't go to the village to ask people's opinion]. They just did it. The *commune* didn't protest because they knew it was something urgent to get done.[39]

It is easy to see why the *commune* and other elected officials see the benefits of the project, since they have been the main beneficiary all along. For example, in 2002-03, each commune received roughly U.S. $7,000 for the microprojects. When these payments are compared to the 2002 annual budgets for the communes of Ramena and Mahavanona, which reported roughly U.S. $ 4,200 and $10,600 respectively, they represent a sizable supplement to the annual operating budgets for village projects and programs.

Questions of 'who benefits' from a project might better be rephrased as, who has the *ability* to participate and what does participation mean in terms of trade-offs and costs to the individual or group? In fact, beyond the daily wage to porters, guides and cooks, many felt that overall neither they

[35] Anonymous interview March 5, 2006.
[36] Anonymous interview March 4, 2006.
[37] Anonymous interview March 5, 2006.
[38] Anonymous interview March 5, 2006.
[39] Anonymous interview March 5, 2006.

personally nor the village benefited from the project, and many were eager to highlight how *some* benefited more than *others*. For example, when I asked Bako, a woman farmer in Varindirina, if she had received any direct benefit from the project she said:

Only the President received benefit from these researchers because he went with them. He has also taken some people from the village with him, but they are the only ones who get money. They gave him money and gifts. Moreover, he didn't report to his people what they did there. Even people in the village don't know what they are doing there.[40]

Since the President was cited by many respondents as a major, and sometimes the only, recipient of benefits, the respondents also questioned the role of the 'community' commonly featured in bioprospecting projects. In reality, the rural residents I spoke with represented groups of differentiated individuals whose benefits from bioprospecting varied from a one-time cash payout to nothing at all, and whose participation consisted of a couple of days work for a few workers at most. One local observer summed up the situation by claiming that the bioprospectors were just following a long line of other *vazáha* (foreigners) who came to their forests and extracted 'their' resources. This was reflected in the following reaction by Bako:

They take everything they want, for example [precious] stones…but they analyse everything they get. What is written in their permit is like a title that they are going to collect plants, but in fact they collect something else after[…][t]hey can go everywhere with their permit[…]these foreigners [researchers] come here because there are lots of things in the forest[…]there are gold and sapphire[…]*there are treasures there*.[41]

In Malagasy, the use of the term *misy valeur be ao* 'there are treasures there' in this context is particularly significant, because it reflects knowledge of the researchers' mission to extract resources that may be both 'unique' and 'quite valuable.' It also indicates that rural residents are quite aware that their forests are among the richest biodiversity 'hotspots' in Madagascar and the world and it is important to control access so that they can begin to benefit from anything extracted.[42] As Mamy, a rural resident in the village reflects:

The microproject is not compensation given by the researchers for collecting plants; *it is to get the people out of the forest*. We haven't seen the compensation yet [from the researchers]…and it will probably never come. The important people will keep it. That's why I said that it is better that *we* take over the management of the forest.[43]

Similar to other peasant economies, rural Malagasy depend on the forest for a number of livelihood resources. Unlike the southern and eastern regions of Madagascar where forests are used for *tavy* or upland shifting cultivation agriculture, forests in the north are providing multiple economic and social benefits including timber for construction, fodder for livestock, fuelwood, charcoal, medicinal plants, and fibres.[44] Furthermore, for many rural Malagasy, forests are particularly important social meeting spaces and many places hold sacred cultural significance (Fritz-Vietta et al. 2011). Despite these facts, the many ways Malagasy use the forest are not factored into the design of the microprojects. Rather the microprojects are meant to be 'alternative' activities to get Malagasy 'out of the forest' altogether. And in the end, keeping rural Malagasy out of their forest for conservation objectives may simply add to the considerable burdens borne by a vulnerable group.

Benefits on the cheap: Milestone payments and royalties

Of the different types of benefits that may arise from a bioprospecting project, *royalties* and *milestone payments* are the monetary benefits that have been most analysed, but least realized (ten Kate and Laird, 2000). In a bioprospecting project, 'milestone' payments are usually generated when significant discoveries are made at successive stages of the research process, whereas 'royalties' only come

[40] Anonymous interview March 6, 2006.
[41] Anonymous interview March 6, 2006.
[42] Anonymous interview May 12, 2006.
[43] Anonymous interview March 4, 2006 – quoted in Neimark 2009.
[44] Anonymous interview June 15, 2006.

following the full commercialisation of a natural product. There have been only a few reported cases where cash payments in the form of royalties were shared by rural actors incorporated into a bioprospecting project.

For those involved in the ICBG in Madagascar, if there was a royalty agreement set in place, the rural inhabitants were the last to know. In fact, very few rural Malagasy understood why they might even be entitled to any royalty rights; nor were they knowledgeable about how they would be compensated if these payments were to arise. As expressed by two rural residents in Sabatinava:

Andre: I think it is a good project because of the common benefit. If they will get new drugs from what they have found in the forest, everyone in Madagascar will all benefit from the drugs. And we expect a lot in return.[45]

> *Interviewer: So, as far as you're concerned, have you received any benefits from those researchers? Money or any kind of help?*
>
> *Lano: We haven't received any benefit. They just collected the plants, put them in a big bag and they were gone.*
>
> *Interviewer: So, you haven't received anything?*
>
> *Lano: Nothing! However, they said that one day, they may be able to make something [drugs] from the plants and that can be our benefit. At least, that's what they said.*[46]

Within the three sites investigated, I could not find any rural residents in the surrounding *Montagne des Français* area who have had the ICBG royalty payments explained to them in detail. The only person with any significant knowledge of a monetary benefit scheme was Rokoto, the president of Ambatofaroa:

> *Rakoto: In my opinion, I think it is an exchange because they collected plants that they would turn into medicine, and then would sell it to get money. Part of the money [they would get when the medicine is made], but I don't know how many percent will be for the villages where they collected the plants. That's how they explained it to me.*
>
> *Interviewer: Did they tell you what percent?*
>
> *Rakoto: They didn't tell us the percent of the money that would be for the village. They just said what they gave us is a benefit from the plants they collected, and they [ICBG] would manage the money.* [47]

The gaps in knowledge that rural residents had of these monetary benefits are significant. The benefits that rural residents think potentially can be returned will add to their 'buy-in' to the project's goals. If they see the project as a 'one-time only' employment opportunity with no prospect for future returns, there is little chance of long-term biodiversity conservation. At this point, when collection from a given rural area is over, unless re-collection is ordered, many in the team will never return to the area. With little benefit-sharing in return, the irony is not lost on some Malagasy:

> *They collect medicinal plants. Some of the plants couldn't be found in their area so they come here because we can get drugs from our plants. They have lots of benefits because they make the drugs in their country[…]they'll keep it [the drugs] but we will be the one who buy it later.*[48]

In fact, contrary to the misconception that the bioprospecting mission is complete, in reality as the material heads to the drug discovery laboratories, the search for a usable drug from the material collected has actually only begun. In this light, the longer-term microprojects are understood as payment to the commune for access to its forests. Would their feelings change if they understood the massive profits that might be had from the discovery of a drug? Very few rural residents seemed to

[45] Anonymous interview March 5, 2006.
[46] Anonymous interview March 6, 2006.
[47] Anonymous interview March 4, 2006.
[48] Anonymous interview March 6, 2006.

understand that their plants may be valuable, yet if they understood more, would they be more willing to work with the researchers or possibly more resistant? Much remains to be seen. Yet as it stands now, if the ICBG project is keen on telling only those on a 'need-to-know' basis and little return for their labour in either a fair wage or real participation in the scientific process.

In 2013-4, Daniel Robinson an Australian researcher interested in benefit sharing in a number of global bioprospecting programs did a detailed case study of the ICBG in Phase II and III collection areas. He reported in a number of his interviews (some conducted around the same sites in the Diana area above) some similarities and differences to our results above. For example, he noted some differences in the selection and delivery of compensation benefits and satisfaction of those benefits, most notably in the marine sites and later the southern central regions of soil microbial collection. His respondents seemed more pleased with the benefit packages which he notes is a direct reflection of how the project has matured and learned what projects and how to best deliver them over time. While there seemed to be only some minor disputes on the return of benefit in some of the marine areas, there was a general agreement that the ICBG had begun to work out a compensation agreement that provided tangible results (motor boat for monitoring marine areas; two wells for local school; rebuilt schools; handicraft markets).[49]

However, similar to our findings, many local ICBG participants (those who worked as guides, porters, and labourers) felt that were not involved in the scientific aspects in any meaningful way. They wanted to learn more about the scientific aspects and have the results feedback in way that would improve their livelihoods. As shown by Robinson:

> *The community seemed generally aware that some research had occurred but did not seem concerned− perhaps, because of the predominant focus of soil and marine microbes. Members of most villages noted that they did not know anything about the results of the research […]* (2015, 60).

Another echoed:

> *We have heard the results of marine and terrestrial research [by MBG and CI] but it is not enough. We are hopeful that we could hear more results. We have questions of access to information from researchers. We'd like to know more – for example, we don't know why the marine bioprospecting was important.*

Another group of respondents in the town of Ibity responded,

> *In this group of interviewees, one man had been involved as a guide during bioprospecting activities. The MBG officer at the site, Mamisoa, had been involved in the collection of soil (bioprospecting) and plant identification activities (for herbarium vouchering only) at this site (and in Zahamena and Diana). He noted that there was no training really for local people – some of them just received some basic pay for their work as guides or porters[...]However, the training of Malagasy people who work for MBG was highlighted by a number of interviewees* (2015, 69-70).

5 Discussion and Conclusion

The issues found in this paper are informed by scholars engaging in key concerns of human rights, equity and the ability to participate in science (Chapman 2009; Chapman and Wyndham 2013; De Shutter 2012). In this paper we put forward a new way of thinking about the benefits to science and labour that arise within bioprospecting, market-conservation and beyond (green and carbon economy). Our first concern is the recognition of local participants to fully engage in the scientific practice. According to Whndham, "[s]cience participation helps create informed, empowered citizens" and runs along a so-called "continuum of access," defined on one end as "access for the general public" and on the other as "access for scientists," and includes "'citizens'" involvement in science-based decisions" (Whndham Quoted in Rabesandratana 2013, 1). But how citizens are meant to participate in the bioprospecting and how the really end up participating are two very different things. Rather than full

[49] Many of these benefits are listed in detail within the different sites see Robertson 2015.

participation, results show that Malagasy are continually "bought off" through sometimes meager benefit-sharing. This represents a subtle, but significant form of marginalization where rural Malagasy take on facilitation of bioprospecting activities without acknowledgement of the project's mission to discover drugs or benefits that they could receive, needless to say "real" compensation, of the potential or actual burdens of their participation. This builds of Schroeder et al. (2008, 550) claim that benefits and burdens in sustainable development are universally accepted or understood, but rather their conceptualization is "always relative in both in absolute terms and with respect to any particular group of potential resource users."

Second, at the rural level where resources are collected, Malagasy hold very little knowledge about the projects and what type of benefits, if any; they may receive from the discovery of a drug. This ignorance may develop because of purposeful attempts by bioprospectors to hold back vital information about their goals of drug discovery so that first, rural actors will not restrict access to collection sites if they feel they are not being fairly compensated, and secondly, continue to participate as manual laborers. This collective ignorance also questions just how Malagasy are participating in the decision-making process of drug discovery and related conservation-led development activities. Although there has been some reserved optimism from rural Malagasy about the protection of local resources affiliated with related conservation activities of bioprospecting projects, there still seems to be quite a bit of confusion as to just what "protection" means in this context (Robinson 2014). In some cases, residents question their ability to restrict access to any foreigners (scientists or businessmen) coming to collect mineral or bioprospecting resources. Many of these access dynamics, which are taking shape within areas of bioprospecting collection, need to be addressed particularly by associated third parties in bioprospecting – namely companies and scientific community. This participation must include a full share of decision-making by rural actors who are accountable by both the Malagasy state (the legal owner of the forested sites of collection and now the National Parks Office) and third party actors along the natural products commodity chain. Malagasy state agencies and institutions, which provide companies and NGOs access to collection sites, must be willing to hold back collection permits unless a more democratic and procedural process which helps engage in science and scientific education is adopted. This must also include a process in which rural Malagasy are informed and participate in the process of decision making and are fairly compensated for their participation.

This follows similar market-based interventions from both in bioeconomy and emerging 'Green Economy' interventions (Payments for Ecosystem Services, REDD+, and Biodiversity offsetting schemes) which are measured in short-term monetary benefits, but fail to also account for the costs (social capital, added labour, loss of access to resources) of the interventions (see Fairhead et al., 2012; Corson et al. 2013; Montefrio and **Dressler** 2016). In the case study of the ICBG, there is not yet a commercialized product, and benefits are outlined within a pre-determined bioprospecting contract signed by all organizations and institutions involved. In this context, "upfront" benefits are distributed first on the basis of one's involvement in the particular projects, groups or organizations, and second on the basis of one's professional expertise. It is has been shown elsewhere that some Malagasy research scientists are able to tap into scientific benefits in the form of the technology (equipment and materials) and knowledge (plant databases, trainings) now available to them through their participation in the project (Neimark 2012; Robinson 2014). However, to overcome shortfalls in research funding, Malagasy research institutes are now pressured to contract with larger multi-partner bioprospecting projects that are much better equipped and can provide them with needed resources. In the end, third party scientific research organizations and environmental NGOs must find better ways to inform rural inhabitants about the project's goals and possible benefits of their activities, and devise ways that rural inhabitants can participate not just in the decision making process, but actually take part in science in some meaningful way, such as direct training in drug discovery or access to medicine or health care. Projects must occur in the context of a more democratic and decentralized process, with input from inhabitants who are potentially most affected by the projects themselves and who have been directly involved as wage laborers. Yet, compensation for this particular unrecognized group of participants must also include a fair and decent wage.

The question of labour relationships in biodiversity conservation and bioprospecting projects is increasingly poignant, as one of the main post-2015 development goals is improved job security. The

link between biodiversity and poverty reduction has been widely accepted and within the efforts to reduce biodiversity loss, there is an increased awareness that poverty alleviation and biodiversity conservation agendas should be further integrated with a view towards employment. As it is widely understood that development happens through jobs, it is very timely that the biodiversity sector pays closer attention to requirements set out by international rights organisations to regulate labour relationships between scientists and local community members.[50]

Concerned in this article with the exploitation of unskilled manual labour force in conservation and bioprospecting projects, this article looks for alternative protection mechanisms beyond the ILO for providing meaningful international commitments to guarantee basic rights and social justice to marginalized groups of workers. We acknowledge the liberatory potential of bioprospecting as long as local people can directly share both monetary and non-monetary benefits (Robinson 2014). While in some contexts when communities who resist marketization because they do not want their cultural "products" transformed into commodities and bioprospecting could be experienced as a threat to their livelihoods and abuse of their basic human rights a moratorium on collecting might be the appropriate answer to this outcry (Williams and Zelizer 2005). However, within the context of our experience there is a growing group who do not question bioprospecting contracts per se, but are disgruntled with the procedures that are in place to regulate access to the field (Vermeylen and Walker, 2012).

It is clear that from a HRS perspective, ICBG has not respected the provisions of Article 27 of the UDHR and Article 15 in the ICESCR. From the quotes and the observations in the field we got a real sense that *not* "everyone has the right to share in the scientific advancements and its benefits" (Art. 27 (1)), *neither* are the "rights recognized of everyone to enjoy the benefits of the scientific progress and its application" (Art. 15 (1) (b)) in the narrow sense. Bioprospecting contracts, even those negotiated under the auspices of the CBD, remain elusive and as this case study has so visibly demonstrated, fair and equitable sharing of the benefits remains an ambitious but unclear goal under international law. Therefore, it is important that the precarious workers in conservation and bioprospecting contracts look for alternative strategies to protect their basic human rights under the banner of a HRS. A broader interpretation of the meaning of a HRS closely linked to other human rights obligations such as the right to work might lead to more tangible outcomes for the low skilled Malagasy workers. Particularly if we link the right to work to some of the work that the International Labour Organisation is undertaking to protect the position of precarious workers. For example, ILO Director-General Juan Somavia initiated ILO's platform 'Decent Work' in 1999 was a first step to response to the challenges posed by globalisation and the efforts undertaken by the ILO to rebrand itself after the end of the Cold War. Yet the programme now has to respond to the need to "improve the conditions of all people, waged and unwaged, working in the formal and informal economy, through efforts at re-regulation and the expansion of social and labour protections" (Vosko, 2002: 26; ILO 1999: 3-4).

It is important though that we also highlight that it is not only workers recruited under bioprospecting contracts or biodiversity initiatives can fall back to these provisions under the ILO and the UDHR but that researchers from universities, conservation and other research organizations can be hold accountable for not fulfilling their obligations to respect everyone's human rights. Hopefully arrangements, such as the human rights to science and others including the Maastricht principles on ETO posed by De Shutter (2013), can help deliver a framework which holds host governments, scientists and other third parties (NGOs and companies) accountable in delivering direct scientific rights and benefits including a decent wage for precarious workers than the current measurements which are in place under the auspices of the Nagoya protocol and CBD.

[50] See UNSDNS 201http://unsdsn.org/resources/goals-and-targets/goal-2-promote-economic-growth-and-decent-jobs-within-planetary-boundaries/

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