Project co-funded by the European Union and national funds of the participating countries

Deliverable 3.4.2	Guidelines for sustainable capitalization of bioprospect for agriculture and industry

Project title	Conservation and sustainable capitalization of biodiversity in forested areas (BIOPROSPECT)
Call identifier	Interreg V-B "Balkan-Mediterranean 2014-2020" Transnational Cooperation Programme
Project acronym	BIOPROSPECT
Starting date	October 20th, 2017
End date	October 19th, 2019
Funding scheme	European Regional Development Fund (ERDF),Pre-Accession Assistance (IPA) Fund / National Funds
Contract no.	BMP1/2.1/2336/2017
Deliverable no.	1
Partner	PP4
Deliverable name	Guidelines for sustainable capitalization of bioprospect for agriculture and industry
Work Package	WP3
Date	10/05/2019

BIOPROSPECT+ CONSORTIUM

CO
Democritus University of Thrace - Department of Forestry and Management of the Environment and Natural Resources- Special Account for Research Funds (DUTH/DFMENR/SARF)-Greece

Aristotle University of Thessaloniki-Special Account for Research Funds - Department of Economics (AUTH)-Greece

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Deliverable Title

Guidelines for sustainable capitalization of bioprospect for agriculture and industry

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VERSION HISTORY

Version	Completion date	Modifications

ABBREVIATIONS

Term	Explanation

Contents

LIST OF FIGURES

FOREWORD

This document provides all related information and description of the methods, means, tools and practical guidelines regarding the Guidelines for sustainable capitalization of bioprospect for agriculture and industry.

1. Executive Summary

This document aims to present methodologies towards Guidelines for sustainable capitalization of bioprospect for agriculture and industry. Agriculture is the dominant land use in Europe; almost 50% of the land surface is given over to agricultural production of some form. A significant part of Europe's natural heritage (including its biodiversity) is therefore to be found within rural landscapes. There are mutual and complex interactions between agriculture and biodiversity: agriculture needs biodiversity and it influences biodiversity. The agricultural sector is one of the major natural resource-based industries that can provide biodiversity benefits through the application of sustainable management systems and the adoption of alternative and innovative technologies and practices. Understanding interactions between biodiversity and agricultural production and translating this knowledge into management practices is essential to ensure the delivery of safe and sufficient food, fibre and fuel, as well as public environmental services that all Europeans and the world benefit from. The notion that agriculture must become more sustainable is incorporated in local, regional, national, European and global policies and instruments. Knowledge is being increasingly accumulated on how biodiversity can be mobilized to make agriculture sustainable. Economic activity is one of the major drivers of biodiversity loss, and Europe is still losing biodiversity at an alarming rate. Key direct drivers of biodiversity decline are habitat change, climate change, invasive species, over-exploitation and pollution. Business can help reduce these pressures by managing and mitigating their impacts on biodiversity and ecosystem services. Practically all businesses have an impact on biodiversity, either through their supply chain or through investments they make. This document will also provide companies with tools and methods, guidance and best practices already implemented to help them introduce biodiversity conservation into their strategies and operations.

Figure 1. Biodiversity

Figure 2. Sustainable Development

2. Guidelines for sustainable capitalization of bioprospect for agriculture and industry

2.1 Introduction

Bioprospecting is the exploration of biodiversity for new resources of social and commercial value. It is carried out by a wide range of established industries such as pharmaceuticals, manufacturing and agriculture as well as a wide range of comparatively new ones such as aquaculture, bioremediation, biomining, biomimetic engineering and nanotechnology. The benefits of bioprospecting have emerged from such a wide range of organisms and environments worldwide that it is not possible to predict what species or habitats will be critical to society, or industry, in the future. The benefits include an unexpected variety of products that include chemicals, genes, metabolic pathways, structures, materials and behaviours. These may provide physical blueprints or inspiration for new designs. Criticism aimed at bioprospecting has been addressed, in part, by international treaties and legal agreements aimed at stopping biopiracy and many activities are now funded by agencies that require capacity-building and economic benefits in host countries. Thus, much contemporary bioprospecting has multiple goals, including the conservation of biodiversity, the sustainable management of natural resources and economic development. Ecologists are involved in three vital ways: first, applying ecological principles to the discovery of new resources. In this context, natural history becomes a vast economic database. Second, carrying out field studies, most of them demographic, to help regulate the harvest of wild species. Third,

emphasizing the profound importance of millions of mostly microscopic species to the global economy. Agriculture and industry are both depended in bioprospecting and capitalisation of biodiversity. However, due to human influences, species are becoming extinct at up to 1,000 times the rate that natural condition would cause. Without effective measures, biodiversity loss will continue to accelerate leading to unforeseen effects on the economy and society. From a global perspective, the following factors are the primary drivers of biodiversity loss:

- Degradation and destruction of habitats and ecosystems
- Overexploitation of natural resources
- Climate change
- Emissions/Pollution
- Invasive alien species

Whereas the reduction of emissions is a „traditional goal“ of environmental management systems and climate change increasingly taken into consideration via the reduction of energy consumption and greenhouse gases, other aspects are rarely considered.

Figure 3. Emissions of gases that are harmful to the environment

The agricultural sector has a strong role to play in achieving the goal of ‘Sustainable growth and sustainable capitalisation of bioprospect: promoting a more resource efficient, greener and more competitive economy’ listed in the Europe 2020 strategy. From a policy perspective, the Common Agricultural Policy (CAP) is likely to be a driver of sustainability as it has

progressive introduced more environmental and social concerns within the various CAP reforms. Furthermore, industrial sector plays a vital role in sustainable capitalisation of bioprospect and biodiversity preservation both indirect by the energy consumption and gas emission as well as direct via the use of plant based material for the development of new products such as cosmetics, drugs or even bioethanol. While risk management is still a primary reason for addressing biodiversity issues in business, there is also an evolving set of opportunities for the private sector to capitalize on biodiversity values. International and national legislative drivers and changing consumer demands and expectations are contributing to the rapid rise of new market opportunities for businesses to capture value from biodiversity-related goods and services, while at the same time providing important public goods through biodiversity conservation and social benefits.

3. Background and conceptual framework of the sustainable capitalization of bioprospect for agriculture and industry in this deliverable

Bioprospecting is now worldwide in most ecosystems but impacts on the environment are mostly trivial, at least compared with other human activities. The industries involved cumulatively seek a wide variety of organisms and derive a wide variety of products from them. The diversity in genetics, form and function present in most target groups of organisms provides a variety of choices or, to put this another way, a wide variety of alternative highly evolved prototypes. Ecologists increasingly lead or participate in the discovery and resource management aspects of bioprospecting and are instrumental in demonstrating the different economic benefits of biodiversity. The many international treaties and laws that have been established to prevent biopiracy have been successful in some sectors but not in others. However, bioprospecting programs are increasingly involved with issues of equity and the ownership of intellectual property.

Sustainable management of natural capital underlies green growth in key sectors -such as agriculture, manufacturing, and energy- and is vital for resilience and welfare gains. Different resources require different types of policies. For extractable but renewable resources, policy should center on defining property rights and helping firms move up the value chain. For

cultivated renewable resources, policy should focus on innovation, efficiency gains, sustainable intensification, and “integrated landscape” approaches.

The elements of natural capital cannot be regarded in isolation. Integrated landscape approaches can increase production of both “regulating” and “provisioning” services of natural capital.

In some cases, growth and green outcomes -such as cleaner air, cleaner water, less solid waste, and more biodiversity- will involve tradeoffs. But not all of these tradeoffs are inevitable: innovation, which can be sup-ported through smart subsidies, can help minimize or eliminate some of them.

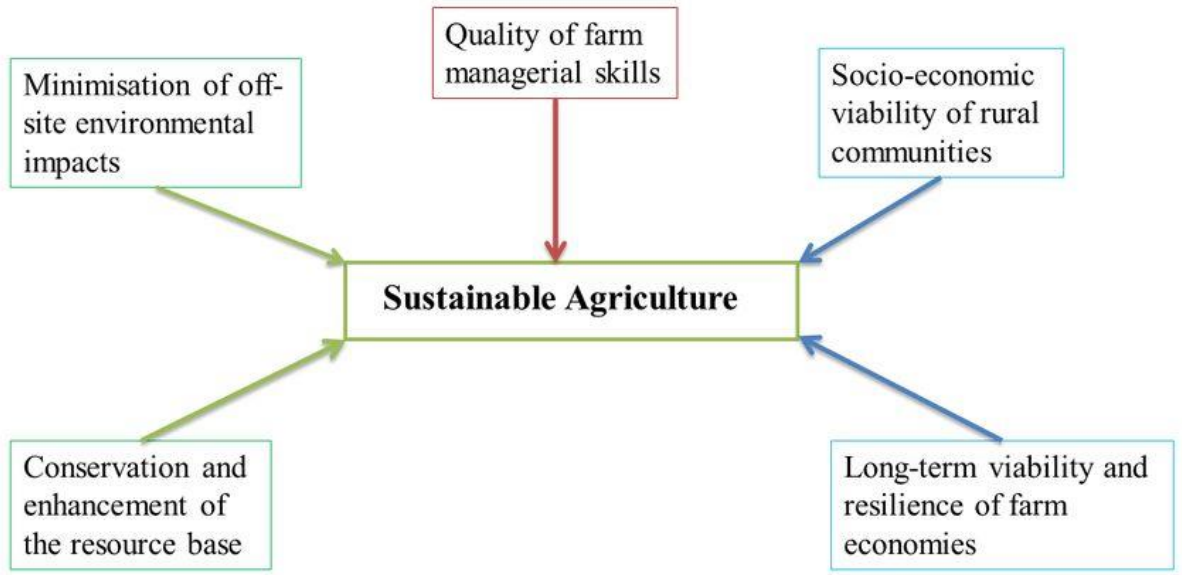

Figure 4. The factors for sustainable agriculture

Biodiversity-based markets are likely to expand fastest and have the greatest impacts in emerging markets, which are home to a significant percentage of the world's unique and threatened biodiversity. Businesses may also find important opportunities to partner with development agencies in these markets, to capitalize on alternative mechanisms for funding conservation. In all cases, it is important to remember that good businesses based on biodiversity values need to be, first and foremost, good businesses. Strong business

fundamentals and capabilities should underpin any business activities aimed at sustainable use and conservation of biodiversity, or partnerships with local communities. Businesses can access three types of markets to capitalize on opportunities that arise from business activities which promote biodiversity protection and maintenance:

1. Markets for biodiversity products that are produced in a manner that is demonstrably beneficial to biodiversity have grown rapidly in the past decade, most notably for sustainably harvested forestry products and some foods. These markets are also driven by an increasing focus by consumers on the quality and safety of products they consume, particularly food. While, many of these markets still command relatively small market shares, most are growing rapidly, driven by increasing demand from consumers and rising interest by business in improving biodiversity performance and reducing reputational risks.
2. In many developed countries, the organic food market has been growing at double-digit annual rates and is expected to continue this rise for the near future. In the United States alone, for example, certified organic products accounted for more than $15 billion in sales in 2004, with the market expected to reach $32 billion by 2009.In response to these business opportunities, some industry sectors have developed tools and guidelines to help businesses effectively manage biodiversity in their operations. Certification systems – such as the Marine Stewardship Council's guidelines for fish, the Rainforest Alliance's Sustainable Agriculture Network standards for agricultural products including bananas, coffee and citrus, and the Sustainable Forestry Initiative and Forest Stewardship Council certification guidelines for wood and paper products – have become an increasingly popular way for companies to credibly demonstrate the sustainability of their products and for consumers to make educated purchasing decisions.

3. One of the largest markets that places an intrinsic value on biodiversity resources themselves is the tourism and recreation sector. Tourism, the world's largest industry, depends significantly on healthy ecosystems. Nature-based tourism, the fastest

growing segment of the global tourism industry, now accounts for a significant percentage of tourists worldwide and represents a major source of foreign revenues for many emerging markets. In the Caribbean, for example, dive tourism, which relies on healthy coral reefs, provides more than US$2 billion to local economies. Because the nature-based tourism sector relies on the existence of healthy, intact ecosystems, such as coral reefs, rain forests and savannas, to attract customers, the future viability of the industry depends directly on ensuring biodiversity conservation and sustainable use of the ecosystems. The increasing recognition of the financial value of ecosystem services is a growing business opportunity for some sectors. The Katoomba Group, which includes representatives from industry, finance, research institutions and conservation organizations, is dedicated to promoting markets for ecosystem services provided by forests, including watershed protection, biodiversity habitat and carbon storage.

While there are a number of examples of market transactions for carbon sequestration or maintenance of water quality and supply, other markets for ecosystem services are just beginning to emerge or are still ideas for the future, including those for natural disaster mitigation, pollination, biomass production and absorption, and maintenance of genetic diversity.

Agricultural sector has also a major role in sustainable capitalization of bioprospect. There is growing recognition that safeguarding biodiversity and managing natural resources sustainably must be a priority in national plans if we are to deliver nutritious food for present and future generations and achieve the 2030 Agenda for Sustainable Development. Today, some 821 million people still suffer from chronic hunger, nearly a quarter of children under the age of five are stunted, and malnutrition affects a third of the global population. The rise in obesity, now afflicting one in eight people on the planet, is a worrying new trend, driven ever higher by rapid urbanization and the relatively easy access poor people have to cheap, energy-dense, processed food high in fats, salts and sugars. A major response to malnutrition, climate change, emerging diseases, pressures on feed and water supplies, and shifting market

demands is to conserve and sustainably use a wide range of plant and animal diversity. Sustainable agriculture is the answer to reversing trends that lead to biodiversity loss, damaged ecosystems, and the deterioration and degradation of our natural resources. Techniques that successfully integrate all three dimensions of sustainability (social, economic and environmental) have the potential to better conserve natural resources while growing more and healthier food with fewer resources, responding to increasing urban demand for greater nutrition and responsible consumption. Mainstreaming biodiversity, integrating landscape and seascape approaches into actions, policies and investments, and supporting farmers' rights to genetic resources, are key to building resilient livelihoods. Tapping into ecosystem services reduces the need for external inputs and improves efficiency.

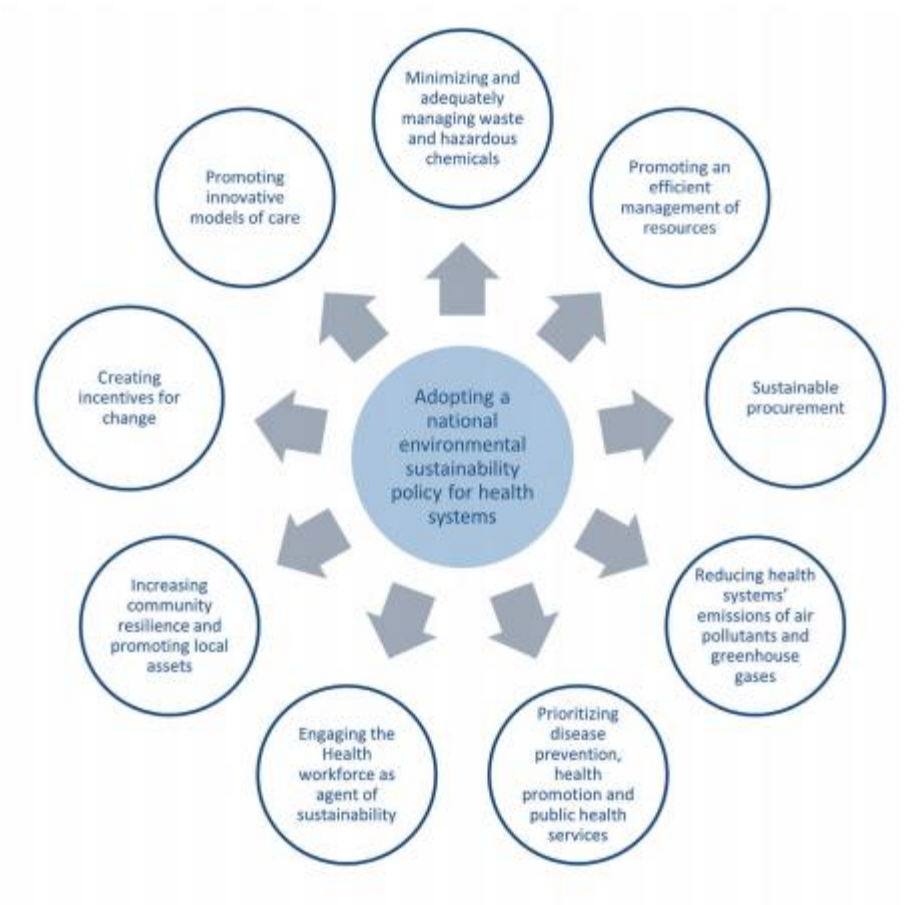

Figure 5. Possible elements of a national environmental sustainability policy for health systems

Figure 6. Food and Agriculture Organization

FAO is a leading organism strives to harmonize the need for food with that of protecting natural resources through the development of an integrated approach to sustainability across agriculture, forestry, fisheries and aquaculture. Recognizing that biodiversity is an integral part of agriculture, FAO is committed to supporting governments and working with other key actors to mainstream biodiversity as a vital element of sustainable food and agriculture.

Domestication and agricultural selection have targeted and improved a small share of the thousands of plant and animal species that our ancestors used to hunt, fish and gather. While this led to better performance and adaptation to specific conditions, allowing us to feed a growing population, it also resulted in a loss of diversity. Today, only three staple crops (rice, maize and wheat) and three animal species (cattle, pigs and chickens) together provide the majority of the world's food-energy intake. Production intensification and wider use of external inputs have resulted in a reduction in the range of varieties used in crop production. Globalization and changing patterns of food production and consumption are also contributing to a crucial shift towards dietary simplification. Diets low in variety but high in energy contribute to the escalating problems of obesity and chronic disease, which are increasingly found alongside micronutrient deficiencies. Biodiversity plays a key role in ensuring dietary adequacy. Micronutrient needs for human health cannot be satisfied without animal, fish and plant genetic diversity, species diversity and ecosystem diversity. Pollination leads to higher nutrient content in many crops and fruits. The alarming pace of biodiversity loss and ecosystem degradation makes a compelling case for re-examining agricultural systems and diets. Sustainable diets promote the use of diverse foods, including traditional and local foods, that make use of nutritionally rich species, varieties of plants and breeds of animals, as well as wild, neglected and underutilized species.

Sustainable agriculture is key to reversing trends that lead to biodiversity loss, damaged ecosystems, deforestation and the overall deterioration of our natural resources. If

terrestrial, freshwater and marine ecosystems are managed sustainably, agricultural sectors can contribute to the provisioning of ecosystem services. These include maintenance of water quality, nutrient cycling, soil formation and rehabilitation, erosion control, carbon sequestration, resilience, habitat provision for wild species, biological pest control and pollination.

Figure 7. Circle of Sustainability

Bioprospecting is the exploration of biodiversity for new biological resources of social and economic value. It is carried out by a wide variety of individuals and industries that include pharmaceuticals, botanical medicines, crop protection, cosmetics, horticulture, agricultural seeds, environmental monitoring, manufacturing, and construction. There are between 5 million and 30 million species on Earth, each one containing many thousands of genes. However, fewer than 2million species have been described, and knowledge of the global distribution of species is limited. History reveals that less than 1% of species have provided the basic resources for the development of all civilizations thus far, so it is reasonable to expect that the application of new technologies to the exploration of the currently unidentified and overwhelming majority of species will yield many more benefits for humanity.

Biodiversity is the fundamental resource for bioprospecting, but it is rarely possible to predict which genes, species, or ecosystems will become valuable for bioprospecting in the future. A

wide variety of species -microbial, plant, and animal and their genes-have provided services, products, blueprints, or inspiration for products or the basis of industries. While species-rich environments such as tropical forests may be expected to supply many products in the long term, bioprospecting thus far has yielded valuable products from many diverse ecosystems, including temperate forests and grasslands, arid and semiarid lands, freshwater ecosystems, and montane and polar regions, as well as cold and warm oceans. In this context, the conservation of all biodiversity in all ecosystems would provide the most opportunities for bioprospecting in the future.

Well-regulated bioprospecting contributes to the joint goals of ecosystem conservation and social and economic development through partnerships and benefit-sharing. Bioprospecting can achieve multiple goals: generating revenues for protected areas, conservation projects, and local communities; building scientific and technological capacity to study and manage biodiversity; enhancing biodiversity science; raising awareness of the commercial and noncommercial importance of biodiversity; creating businesses dependent upon the sustainable management of resources; and, in rare instances, generating large profits for corporations and shareholders. These benefits may occur at local, regional, or national scales.

Market trends vary widely according to the industry and country involved, but many bioprospecting activities and revenues are expected to increase over the next decades. Several major new industries, such as bioremediation and biomimetics are well established and appear set to increase, while others have a less certain future. The current economic climate suggests that pharmaceutical bioprospecting is likely to increase, especially as new methods that use evolutionary and ecological knowledge enhance productivity.

Bioprospecting is one part of a package of economic activities that, when carefully implemented, use biodiversity in a way that contributes to the multiple objectives of the sustainable management of natural resources, poverty reduction, and economic development. Established biodiversity-based industries such as farming, forestry, grazing, and fisheries, along with local uses of biodiversity for foods, medicines, and fibers and for cultural

activities and the development of new industries such as bioremediation, ecological restoration, and biomimetics, generate knowledge of and respect for the multiple benefits of biodiversity. While recent research clearly demonstrates the future resource potential of biodiversity, opportunities for bioprospecting industries in any given country will depend on many factors, ranging from the conservation status of its biodiversity to the trends in a variety of markets.

Global threats to biodiversity, and especially species losses, may affect the development of valuable new products for humanity, including medicines, industrial processes, and new crop varieties. The current global decline of biodiversity may affect bioprospecting in many ways. Serious undervaluation of such losses for bioprospecting result from a lack of recognition that a high proportion of commercially important species are either small or microscopic, and so losses go undetected. Other threats include loss of traditional knowledge, the impacts of some kinds of modern agricultural technologies, and depletion of natural resources.

Bioprospecting partnerships are increasingly supported by international and national laws and self-regulation measures, including codes of ethics, high-quality contracts, and transparent institutional policies that result in benefit-sharing. Recent international agreements include the 1992 Convention on Biological Diversity and the 2001 International Treaty on Plant Genetic Resources for Food and Agriculture and the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization (ABS) to the Convention on Biological Diversity adopted on 2010. More than 100 countries have introduced or are developing laws and other policy measures that complement these international initiatives, regulating access to biological resources and benefit-sharing. Further, a range of documents developed by indigenous communities, researchers, professional associations, and bioprospecting companies has generated a significant shift in the ethical and legal framework within which bioprospecting operates. Nevertheless, serious issues remain, including achieving an appropriate balance between benefit-sharing and the creation of incentives for investment. These often-conflicting

interests among potential partners may operate across local, national, and international scales.

The number of species of use to humanity runs into many thousands, and those that form the basis of contemporary agriculture are well known—not least the major crops and domesticated animals that provide food (Baker 1978; Clutton-Brock 1999). Indigenous people use a very wide range of lesser-known species and often possess deep ecological knowledge that helps maintain the ecosystems in which they live (Myers 1983). In this context, it is widely assumed that the biological resources of the world have been thoroughly explored. Recent research showed that our knowledge of biodiversity is still very limited, however, and that the exploration of all types of organisms is likely to yield many more useful species for an unexpectedly wide variety of human needs and pursuits. To place this in perspective, flowering plants (angiosperms) have provided a wide variety of foods, drugs, cosmetics, fibers, and building materials. But it is now clear that this group of organisms, in its entirety, constitutes only a minor part of the total number of species on Earth and that vast resources remain in other species-rich groups such as the microbes and invertebrates. Some environments are also little explored. This is especially true of the oceans, where current exploration is revealing many new species every week and scientists expect to discover at least 2 million marine species over the next two or three decades. This may be an underestimate, however, as the number of species of marine nematode worms alone has been estimated at 1 million. Even apparently well-known groups such as the mammals and reptiles are revealing new species (Beattie and Ehrlich 2004), and recently a new family of frogs has been discovered in southern India—a major surprise, as amphibians have been studied intensively for decades (Hedges 2003). The importance of the exploration of biodiversity for new products was recognized at the 1990 meeting of the International Society of Chemical Ecology in Goteborg, Sweden, in the Goteborg Resolution: ‘‘Natural products constitute a treasury of immense value to humankind. The current alarming rate of species extinction is rapidly depleting this treasury, with potentially disastrous consequences. The International Society of Chemical Ecology urges that conservation measures be mounted worldwide to stem the tide of species extinction, and that vastly increased biorational studies

be undertaken aimed at discovering new chemicals of use to medicine, agriculture and industry. These exploratory efforts should be pursued by a partnership of developing and developed nations, in such fashion that the financial benefits flow in fair measure to all participants.

Several principles are important in considering the economic value of bioprospecting. First, economic values are determined on the margin. This means that values must be placed in the context of particular magnitudes of change. If the great majority of Earth's biodiversity were to be lost, the value of the lost opportunities for inventing and improving products would be astronomical. Less value would be foregone if fewer components of biodiversity were at risk. Second, research and development is an inherently random process, and the outcomes are uncertain. The value to be assigned to a change in the biodiversity available for conducting research is related to the increase in the expectation of the outcome it affords. Third, value is determined by scarcity. If there is a lot of something, a little more or less of it does not make much difference. Conversely, unique resources command large values because there are no substitutes for them. These are illustrated by a thought experiment (modeled after Simpson et al., 1996). Suppose there are many species that might provide the source of particular new product. Many analyses of the value of bioprospecting have focused on the expected reward to success: the probability of making a ''hit'' times the payoff from developing a successful product. However, the value of biodiversity on the margin—what we might label the value of the ''marginal species''—is the incremental increase in the expected reward to success. It is the probability of making a ''hit'' times the payoff times the probability that none of the other species available for testing would have yielded the same success. While commentators often emphasize the rewards accruing to success, other considerations may be more salient. As the number of species researched increases, the value of having more necessarily declines and, in the limit, vanishes. This can be explained as follows. If the probability that any one species chosen at random will yield a success is relatively high, it is unlikely that it will be necessary to test a large number of species in order to achieve a success. Conversely, if the probability of success in testing any one species is low, it is unlikely that two or more will prove redundant, but also unlikely that any will prove successful. Regardless of the likelihood of

success in any given test, the value of the ‘‘marginal species’’ will be small when the number of species is large. The same species may, of course, be tested for any of a number of different applications. Thus, in order to calculate the overall value of the ‘‘marginal species,’’ one would have to sum the values in all potential applications, both current and anticipated. If there are relatively large numbers of species available for testing, comparably large numbers of potential applications would need to be identified for the value of the ‘‘marginal species’’ to be appreciable (although if new products complement one another, values may be greater; Craft and Simpson 2001). Moreover, not all species are equally attractive as potential research leads. Other things being equal, organisms that are ‘‘most different’’ from others will be more valuable. This is not because they are necessarily more likely to yield new products, but rather because they are more likely to yield new products in the event that other, more distantly related, organisms do not (Weitzman 1992). Knowledge is also valuable. Researchers will test first those organisms most likely to yield a success and will be willing to pay more to do so (Rausser and Small 2000). The fact that some organisms are known to promise more leads means, necessarily, that others are considered less - promising and less valuable. If promising prior information is available on the properties of species from better-known regions, the bioprospecting value assigned to the as-yet undescribed species of the world’s remaining pristine ecosystems will be commensurately lower.

4. Guidelines for sustainable capitalization of bioprospect for agriculture and industry

TheEU Business @ Biodiversity Platform promotes the practical integration of biodiversity issues in the agriculture sector and addresses the market-based approach to conservation and viable use of biodiversity and its ecosystem services. Pro-biodiversity business opportunities are supported by an increasingly robust collection of market-based tools which enable companies to adopt biodiversity-responsible practices and to develop and market biodiversity-based goods and services. Tools for building biodiversity business are in place or under development. Companies face several risks related to biodiversity and ecosystem services, but at the same time they present new business opportunities. A number of companies have already started to manage these risks through appropriate enabling

frameworks and partnerships as shown by a number of best practices included in this document. The effective application of best practices at the farm and landscape levels requires the translation of knowledge into policies and practices that create synergies between different components of biodiversity and the provision of ecosystem services. The study of how to change behaviour of farmers to pursue biodiversity-friendly practices is therefore a priority research area for the future. At the same time, possibilities for exchange of experience and networking between the relevant stakeholders are essential to the practical application at farm and landscape levels and across geographical boundaries.

Bioprospecting is the exploration of biodiversity for new resources of social and commercial value. It is carried out by a wide range of established industries such as pharmaceuticals, manufacturing and agriculture as well as a wide range of comparatively new ones such as aquaculture, bioremediation, biomining, biomimetic engineering and nanotechnology. The benefits of bioprospecting have emerged from such a wide range of organisms and environments worldwide that it is not possible to predict what species or habitats will be critical to society, or industry, in the future. The benefits include an unexpected variety of products that include chemicals, genes, metabolic pathways, structures, materials and behaviours. These may provide physical blueprints or inspiration for new designs. Criticism aimed at bioprospecting has been addressed, in part, by international treaties and legal agreements aimed at stopping biopiracy and many activities are now funded by agencies that require capacity-building and economic benefits in host countries. Thus, much contemporary bioprospecting has multiple goals, including the conservation of biodiversity, the sustainable management of natural resources and economic development. Ecologists are involved in three vital ways: first, applying ecological principles to the discovery of new resources. In this context, natural history becomes a vast economic database. Second, carrying out field studies, most of them demographic, to help regulate the harvest of wild species. Third, emphasizing the profound importance of millions of mostly microscopic species to the global economy.

5. Case studies for capitalization of ecosystem services targeted and interventions for sustainability

Many companies have developed sustainable agriculture standards, which provide guidelines for farmers. These have been developed for the crops that Unilever sources in the greatest volume, in consultation with an external advisory panel. Unilever outlines sustainable best management practice for each crop, against sustainability indicators, which include: soil fertility/health; soil loss; nutrients; pest management; biodiversity; value chain; energy; water; social/human capital; local economy and animal welfare. By 2005, good practice guidelines were published for peas, spinach, palm oil and tomatoes, and requirements were incorporated into contracts with growers. These guidelines have been adopted/adapted by companies in a number of other sectors. In implementing these standards, the company has produced biodiversity action plans for two sites and a farmer-focused tool to assist farmers in addressing sustainability indicators, including biodiversity. The company conducts workshops with suppliers and has developed commodity specific training which includes biodiversity and ecosystem services. In addition to managing risk, Unilever is piloting ways of realizing competitive advantage. Its Brand Imprint tool which takes a 360 degree look at product impact from environmental, social and economic perspectives and actions are developed accordingly. An efficient, supportive tool in sustainable potato farming "Preference" has been demonstrating its efficacy for Nestlé and potato producers for the past six years. This easy to use tool made it possible to formalize and implement good agricultural practices that guarantee quality, traceability and protection of the environment. Each producer is audited every third year, which enables him to know his weak points and to improve his practices. "Preference" is now updated to further sensitize farmers to sustainable agriculture practices. That is why new themes have been integrated in the "Preference" toolkit, such as “conservation of biodiversity” and “reducing greenhouse gases”. The most important points to audit:

•Potato production: From plantation to harvest, the farmer must be able to reconstitute all the operations carried out in the potato growing process in order to guarantee optimum traceability.

•Harvest and storage: Verified harvest equipment and good storage infrastructures limit the damage to potatoes.

•Environment: The farmer has to show his commitment to environmental protection in three main areas: the protection and, if possible, improvement of water, soil and air conditions.

• Operation Pollinator: Investing in natural capital for agriculture.

Figure 8. Sustainable local food system

Syngenta, a leading company in the agriculture sector, is developing a conservation program that may enhance farm productivity by reversing the decline of an ecosystem service critical to agriculture – pollination. From field vegetables in Italy, to melons in France, to blueberries in the United States, the importance of insect pollination is unequivocal. In 2009, Syngenta launched Operation Pollinator, an initiative which currently involves EU countries and the USA that aims to restore native pollinators in agricultural landscapes by creating suitable habitats on or near farmland. Establishing and managing floral plant margins around crops increases plant diversity and native pollinator populations, delivering significant environmental benefits with the potential to increase farm profits.

The potential benefits of Operation Pollinator are clearly apparent in the State of Michigan, home to the USA's largest blueberry industry. The economic value of pollinators in Michigan is substantial: the fruit and vegetable sector is worth approximately US$ 800 million annually and includes crops that are highly dependent on pollination to sustain marketable yields. In Michigan, blueberry production has 90% reliance on bees for pollination, to help ensure high yields in this crop worth an estimated US$ 124 million annually (USDA NASS 2008). With recent declines in honey bee populations, other crop pollination strategies are needed to protect grower productivity. Operation Pollinator advises and trains growers interested in converting marginal agricultural land to native pollinator habitat. In coordination with federal conservation programs, growers are assisted to make simple changes in farm operations that are compatible with current practices and existing goals for soil and water conservation. Enhanced native pollinator populations are part of a diversified strategy for maintaining crop yields and improving fruit quality for insect pollination-dependent crops. When managed bees are in short supply or if bee hive rental costs increase, abundant native bee populations can provide supplementary pollination services to farmers. Syngenta understands that the future of agriculture ultimately depends on protecting the environment and enhancing the livelihoods of growers, through the development of more sustainable agricultural systems. Modern agriculture increasingly recognizes the commercial benefits of farm management that increases the biodiversity of beneficial insect species, while also conserving other natural resources (e.g., soil and water). If this can be done in a way that enhances long-term agricultural productivity, not only Syngenta but also the growers it serves and society as a whole will reap the rewards. Blueberry Production in Michigan:

•In 2006 there were 575 blueberry farms across the state, with 18,500 acres under production.

•The average yield of blueberries in 2009 was 5,350 pounds/acre.

•In 2007-2008 fresh blueberries retailed above $2.00/pound (USD) although prices have since dropped to below $1.30/pound (USD).

•Managed bees cost Michigan blueberry growers about $80/acre/year (based on 2 hives/acre). Agéris Farm Network Syngenta, a leading company in the agriculture sector, has developed in France a programme of sustainable farming that demonstrates how competitive

agriculture could be sustainably managed. In particular, it looks at how adapted practices associated with an active ecosystem management can produce biodiversity and be beneficial to the environment. Created in 2001, the Réseau Agéris forms a direct partnership between Syngenta and a number of motivated farmers in France to support them in their efforts to promote the preservation of landscapes and the environment. Currently 12 farms cover the vast majority of France's agro-climatic regions including West Indies in La Guadeloupe. Agéris works as a toolbox for farmers to share their experiences and exchange ideas on best practices for improving crop and farm management enabling these tools to be used in a way that improves yields while providing ecological benefits. Biodiversity enhancement, water protection, and soil erosion prevention are some of the key issues tackled by the network.

Results from Agéris farms allow Syngenta to make recommendations on various environmental schemes like hedge management, intercrop choices, field margins, set-aside practices and pollinators. Biodiversity Audits demonstrate that a great diversity of plants, insects and animals has developed thanks to the implemented measures. Up to 420 plant species (8% of French flora) and more than 70 bird species (12% of the total birds species of France) can be found on a single Agérisfarm.

Wine production Listel produces wine on relict sandbanks formed by the Rhône River, on the French Mediterranean coast, also recognized as a UNESCO site and included in the Natura 2000 network. Its vineyards and natural habitats are divided into patches which creates an irregular mosaic which reflects and is synonymous with the landscape management of the Mediterranean coast. Besides the wine production which today achieves approximately 4.5 million bottles a year in the Jarras estate, horse breeding is also an important activity. Being a main factor in successful grape and wine production and a non-renewable resource, soil is a crucial component of the landscape management; the soil is managed in order to meet the standards implied by the thematic strategy of the European Union on soil protection in the Mediterranean Basin (and should meet the levels required by the anticipated legislation on soil protection).

Examples of concrete actions in the field of land use and land management, in pursuit of soil protection as defined by EU criteria (in what might be called a preventive approach) include: the maintenance of traditional activities such as “enjoncage” and sowing cereals in the vineyards; improving the soil’s biological diversity and biological activity; supplying the estate with fresh water in order to counteract the impact of salinization; and maintaining agricultural practices (that have proven to be ecologically and economically sustainable and improve the knowledge on fresh water table dynamics and its impact on vineyards).

Chocolats Halba: Implementing agroforestry to ensure cocoa bean security and partner satisfaction. The chocolate and confectionery company Chocolats Halba, a subsidiary of the Swiss retailer COOP, has integrated sustainable cocoa sourcing into its supply chain. Like the rest of the chocolate industry, the company faces chronic supply shortages. Because of price instability, cocoa production is riskier for small-scale farmers, who produce most of the world’s cocoa; many are searching for alternative employment opportunities. Chocolats Halba discovered that the best way to support farmers was to establish diversified agroforestry systems that include cocoa as one of many crops. In such systems, biodiversity is generally higher because they establish a more diverse landscape. With agroforestry systems, farmers also have a higher and more diverse income, which means that cocoa farming is not only good for biodiversity and ecosystem services – it is also good for making cocoa growing attractive again. According to ChristophInauen, Head of Chocolats Halba Sustainability and Projects: “Farmers that work with us realize that we are not only interested in cocoa but also in their livelihood, their income, biodiversity (we help them reforest deforested areas), and other issues. This makes our relationship very strong: farmers give their best to improve the quality of the cocoa in order to give us something back. So, we have reliable sourcing partners and very strong relationships with our farmers. In case of a supply shortage, this would surely help us. The benefits of biodiversity-based corporate social responsibility lie with the quality of its products, the security of its supply chain, the long-term contentment of its cocoa-growing 29partners, and the positive environmental impacts being generated in tropical countries—which are among the most important regions for conserving biodiversity and ecosystem services.

Conservation Grade nature-friendly farming. The UK-based Conservation Grade certification system of 'nature-friendly farming' provides food brands, producers and consumers with efficient food production while enhancing biodiversity and ecosystem services and preventing wildlife declines on farmland. It does so by requiring Conservation Grade farmers to take 10% of their land out of production for conversion to wildlife habitats. In return, these farmers are able to use the Conservation Grade logo on all of their products and have access to a supply contract for their produce for which there is a guaranteed premium over the market price. The Conservation Grade farming scheme exemplifies innovative new solutions to feeding the growing world population without destroying biodiversity and ecosystem services. Independent scientific trials have demonstrated that the Conservation Grade system leads to significant increases in biodiversity, as compared to conventional agriculture, without foregoing output for the land under conservation.

The Sheep Farm carries out extensive sheep grazing on montane meadows. The micro-enterprise has its own herd but also lease (hire) sheep from a number of other farmers. They produce sheep milk, cheese, wool, mutton, hay and "sheep farming services", to other farmers. According to information provided by authorities of the Popradzki Landscape Park increasing the population of sheep (which almost completely disappeared between 1980 and the late 1990's) and bringing back sheep farming into the region is a critically important measure to maintain the open landscapes of the region.

Figure 9. Popradzki Landscape Park

In this area of Poland, farmers therefore have an important role to play in supporting the management of the Natura 2000 site of Ostoja Popradzka. The Sheep farm plans to expand the scale of production in the near future to enhance its income basis and thus sustainability in general along with selling regional products based on local biodiversity. An old indigenous sheep race is bred and preserved, mountain meadow and pasture biodiversity is preserved, and the environmental objectives of the Popradzki Landscape Park are supported .Weleda: Organic production of lavender from Moldova and roses from Turkey Lavender: About 40 km north of Moldova's capital, Chisinau, Weleda established its sustainable project for the cultivation of organic Lavender. Weleda works with up to 200 seasonal harvesting partners in this area.

Many people in rural areas of Moldova live below the poverty level. Through this partnership, Weleda has supported organic cultivation and provided farmers with the ability to export their goods with a long-term guarantee. This secure demand supports the economic and social make up of the region. In addition, the organic cultivation of Lavender in Moldova further supports the fertile earth and environmental wellbeing of the region. Roses: In order to answer the annual demand for roses in a sustainable way, Weleda developed a fair trade project with the local farmers and residents of the village of Senir in Isparta, Turkey. Several years ago, Weleda began by helping these communities convert their land into organic cultivation. Since then, 290 farmers in 7 villages with 120 hectares under cultivation have enhanced their farms according to organic standards. Weleda continues to provide educational, ecological and social support, offering this local community a secure living, while protecting their land and water for a sustainable future.

The objective of the project is to preserve a specific area of land which historically belonged to the Maděra family, in the same condition that it was in prior to the period of socialist collectivization. In the period of collective farming of "united farmers' cooperatives" this land was not included in consolidated areas consisting of many hectares of land. The land was spared inappropriate interference with the water regime, with erosion-control ridges, as well

as moors and preserved damp meadows. After the fall of communism, Mrs. Maderova was able to regain possession of the land. In 1991, taking into consideration the value of the land concerned and its importance for the landscape, she decided to manage it in an environmentally sound manner, without the application of chemical preparations, the aim being to preserve theexisting biodiversity. The land also serves as a refuge for species that were once common in the surrounding landscapes, previously affected by large-scale collective farming.

The above goals were attained by active participation in administrative proceedings and plans under preparation relating to the land concerned or any land immediately adjoining it. This concerns any ill-considered digging and spreading of ridges, which serve for erosion control, the construction of roads on agricultural land, extending the built-up area of villages with the construction of residential buildings on sites which are ecologically valuable, preserving the original appearance of the landscape and creating a healthy and clean environment. The natural transition from the built-up area to the non-built-up area, as well as free access to the landscape, remains preserved.

Other initiatives and good practices. There is increasing interest on the part of major food and agriculture companies to promote more sustainable agricultural practices, partly in response to pressure groups, but more fundamentally in order to secure their supply chains and consumer markets. Some examples include:

•The Sustainable Agriculture Initiative Platform (www.saiplatform.org), which aims to promote agricultural practices and production systems that preserve resources and enhance efficiency.

•The Sustainable Tree Crop Program for Africa (http://edcintl.cr.usgs.gov/treecropsaf.html), focusing on cocoa, coffee and cashews with support from the United States Agency for International Development (USAID), major chocolate and cocoa trading companies, and other businesses.

•The Common Code for the Coffee Community, coordinated and partially-funded by the Deutsche Gesellschaftfür Technische Zusammenarbeit (GTZ) (www.gtz.de), in conjunction with leading coffee traders, roasters and retailers.

•Business for Social Responsibility's Food and Agriculture Group (www.bsr.org), focusing on sustainable water use within its corporate members' supply chains.

•Based, in part, on the perceived growth in demand for more sustainable agricultural products and the potential benefits for biodiversity conservation, a number of agencies are launching new programmes to support this form of rural development.

In addition, some investment banks and other financial institutions are becoming more active in the sustainable agriculture sector. Examples include Rabobank, Citigroup, Triodos Bank and ABN-Amro. There is no standard solution for maintaining biodiversity: example of flower strips. Setting up flower strips on cropland is undoubtedly a key measure for improving the biodiversity of the agricultural environment. In areas where cropland dominates, flower strips not only sustainably improve the image of the agricultural landscape but also provide food and a refuge for insects and other wild animals. Moreover, they also constitute a source of food for honeybees. Thus in 2009, for example, farmers from the French Nouricia cooperative began creating flower strips in collaboration with beekeepers. By 2010, 15 farmers had grown flowering plants over 32ha of land, thereby providing sources of nectar and pollen. In the first year alone, these areas accounted for half of the pollen collected by bees, which is proof indeed of how important they are as a source of food. The industry-financed initiative "Operation Pollinator" was given the objective of increasing the population of native pollinating insects in the agricultural environment. Many cash crops depend on insect pollination, e.g. fruit trees and bushes, rapeseed, sunflower, strawberries. With improved pollination, yields and quality can also be increased. Farmers are a part of this initiative in 13 countries across Europe (Portugal, Spain, France, Belgium, Netherlands, Ireland, UK, Sweden, Germany, Switzerland, Italy, Hungary and Greece). They receive special seed mixtures and advice about setting up flowered areas and are compensated for any resulting income losses. As plant protection products cannot be used on flower strips, they do not simply provide a valuable dwelling for native insects but they also reduce the risk of pests such as aphids

developing resistance. Flowering plants grown on fallow land also play a positive role. The French cooperative Terrena-Poitou created meadows for bees on 300 ha, planting Phacelia and alfalfa, amongst others. Seeds were in part provided to farmers free of charge. In particularly dry years an exemption can be granted, allowing these fields to be harvested, whereby the alfalfa fields can provide an additional source of livestock fodder.

In England, a voluntary initiative – Campaign for the Farmed Environment (CFE) – was launched in 2009 with the objective of retaining and exceeding the environmental benefits provided by land formerly required being set-aside under the Single Payment Scheme (SPS). The benefits of the land management encouraged by the initiative will improve water quality and soil protection and increase populations of farmland wildlife. One of the campaign's objectives is for around 60,000 ha of uncropped land to be dedicated to nature conservation, including the establishment of flower strips. Developing flower strips and areas and in particular the choice of seeds depends on whether the purpose is for providing food and a habitat for beneficial organisms, a refuge for small game or a meadow for bees. Local factors such as the soil properties and the operation of the farm (farming system, crop rotation, annual or multi-annual establishment) also have an influence on the size of the area and the flowering plants chosen. Perhaps the most important is the presence of adequate policy frameworks, but many other factors also matter for increased private investment in biodiversity business.

6. Guidelines-Recommendations for sustainable capitalization of protected areas

Multi-stakeholder participation and 'ownership' of biodiversity business initiatives, involving the full gamut of private stakeholders (e.g. investors, entrepreneurs, brokers, auditors, customers), but also public agencies and NGOs. A prerequisite for moving forward in this area is to clarify the respective roles and commitments of different stakeholders in developing pro-biodiversity business.

Demand-led developments: opportunities should be generated based on market needs and on consumer demand.

The importance of public policy for stimulating biodiversity business. Voluntary action is clearly a valuable tool for raising awareness and testing alternative business approaches to biodiversity conservation. Voluntary initiatives such as eco-labelling and certification can also drive major market changes, where consumer preferences for 'sustainable' goods and services are strong. In that respect implementation of effective marketing activities is a key issue.

Distribution chains should be designed and implemented efficiently. Biodiversity business plans and performance indicators: integrated biodiversity business plans and project-level biodiversity management plans need to include both commercial and biodiversity performance indicators. Both process and output indicators can be used to assess the extent to which biodiversity is reflected in business management decisions, products and services. The EU Business and Biodiversity Platform – Agriculture Workshop (14 September 2010, European Commission, DG Environment) provided the opportunity to discuss the key needs in relation to business and biodiversity and the EU B@B Platform itself. The key needs and recommendations for sustainable capitalization of forested areas according to the platform are:

•How to convince farmers to continue biodiversity-friendly practices when financial support stops? How to change behavior?

•The role of pictures and success stories (cases and practical examples) is crucial when convincing people to change behavior.

•Regional biodiversity targets need to be set and communicated through core species that are visible and emblematic for certain agriculture practices (e.g. bees, farmland birds and butterflies).

•The local adaptation of rules, regulations and agriculture practices is crucial for success.

•Adopt a bottom-up approach and listen to stakeholders/local actors.

•The biodiversity importance education of the local people and farmers is of paramount importance.

7. Conclusions and recommendations

The effective application of best practices at the farm and landscape levels requires the translation of knowledge into policies and practices that create synergies between different components of biodiversity and the provision of ecosystem services. The study of how to change behaviour of farmers to pursue biodiversity-friendly practices is therefore a priority research area for the future. Targeted advice can significantly assist the integration of biodiversity conservation at farm level. At the same time, possibilities for exchange of experience and networking between the relevant stakeholders are essential to the practical application at farm and landscape levels and across geographical boundaries. Some of the case studies in this document illustrated that besides food, feed and fuel, agriculture can also produce biodiversity. Policy tools exist to foster it, but a joint-up approach is crucial for success.

In addition, education of farmers is missing – both in terms of the young farmers (e.g. inclusion of biodiversity in curricula of agricultural high schools), the new generation and existing farmers (e.g. through training sessions). The economic and social return needs to be clear. The long-term financial perspective is essential – less yield for more biodiversity is not motivating farmers. Peer to peer communication is also a key to success – “the role of neighbours” is essential within the farming community. This is valid to all business operators, not only land managers and farmers, but also SMEs and large companies. Could biodiversity be used as a proxy for sustainability on the farm? The EU B@B Platform is expected to make recommendations and to help harmonizing the policy requirements - bringing together the agriculture and the environment policy (e.g. in relation to buffer strips, cross-compliance). There is a need for down-to-earth guidelines, to be as practical as possible and specific to farming practices.

Developing appropriate indicators applicable at regional level, since within Europe biodiversity is very heterogeneous at farm level. Those indicators should fit to both regional and local conditions and might serve as tools for benchmarking at later stage 5.

Furthermore, the development of appropriate legal rules and processes is critical for implementing sustainable forest management at both the international and national levels. The development of forest law should take place according to 'rule-of-law' criteria. Fuller proposes that the following requirements as essential for rule by law: that the law be sufficiently general, that it be publicly promulgated, prospective, clear and intelligent, free of contradictions, sufficiently constant to enable people to order their relations and not impossible to obey. International and national forestry laws and governance processes must work towards meeting these criteria. The concept of environmental justice supports the arguments advanced in this thesis. Ultimately, it is proposed that those countries with the capacity to implement sustainable forest management, along with those who are high consumers of forest products, are the ones that should bear more responsibility for implementing sustainable forest management. Such an approach is much more practical and ethical and, as such, will lead to improvements in protecting and managing the global forest estate.

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ANNEX A

International code of conduct for plant germplasm collecting and transfer

Before the collection the collector should be aware and follow among others the rules of the International code of conduct for plant germplasm collecting and transfer presented below, and always follow national law and obtain the required permits.

Objectives and Definitions

Article 1: Objectives

This Code has the following objectives:

1.1 to promote the conservation, collection and use of plant genetic resources from their natural habitats or surroundings, in ways that respect the environment and local traditions and cultures;

1.2 to foster the direct participation of farmers, scientists and organizations in countries where germplasm is collected, in programmes and actions aimed at the conservation and use of plant genetic resources;

1.3 to avoid genetic erosion and permanent loss of resources caused by excessive or uncontrolled collection of germplasm;

1.4 to promote the safe exchange of plant genetic resources, as well as the exchange of related information and technologies;

1.5 to help ensure that any collecting of germplasm is undertaken in full respect of national laws, local customs, rules and regulations;

1.6 to provide appropriate standards of conduct and to define obligations of collectors;

1.7 to promote the sharing of benefits derived from plant genetic resources between the donors and users of germplasm, related information and technologies by suggesting ways in which the users may pass on a share of the benefits to the donors, taking into account the costs of conserving and developing germplasm;

1.8 to bring recognition to the rights and needs of local communities and farmers, and those who manage wild and cultivated plant genetic resources and in particular to promote mechanisms:

(a) to facilitate compensation of local communities and farmers for their contribution to the conservation and development of plant genetic resources; and

(b) to avoid situations whereby benefits currently derived from plant genetic resources by these local communities and farmers are undermined by the transfer or use by others of the resources

Article 2: Definitions

2.1 "Collector" means a legal or natural person that collects plant genetic resources and related information.

2.2 "Curator" means a legal or natural person that conserves and manages plant genetic resources and related information.

2.3 "Donor" means a country or legal or natural person that makes available plant genetic resources for collection.

2.4 "Farmers' Rights" means the rights arising from the past, present and future contributions of farmers in conserving, improving, and making available plant genetic resources, particularly those in the centres of origin/diversity. These rights are vested in the International Community, as trustee for present and future generations of farmers, for the purpose of ensuring full benefits to farmers, and supporting the continuation of their contributions, as well as the attainment of the overall purposes of the International Undertaking

2.5 "Ex situ conservation" means the conservation of plant genetic resources outside their natural habitat.

2.6 "Genetic erosion" means loss of genetic diversity.

2.7 "In situ conservation" means the conservation of plant genetic resources in the areas where they have naturally evolved, and, in the case of cultivated species or varieties, in the surroundings where they have developed their distinctive properties.

2.8 "Plant genetic resources" means germplasm or genetic material of actual or potential value.

2.9 "Plant germplasm" or "genetic material" means the reproductive or vegetative propagating material of plants.

2.10 "Sponsor" means a legal or natural person that sponsors, financially or otherwise a plant collecting mission.

2.11 "User" means a legal or natural person that utilizes and benefits from plant genetic resources and related information.

Chapter II

Nature and Scope of the Code

Article 3: Nature of the Code

3.1 The Code is voluntary.

3.2 The code recognizes that nations have sovereign rights over their plant genetic resources in their territories and it is based on the principle according to which the conservation and continued availability of plant genetic resources is a common concern of humankind. In executing these rights, access to plant genetic resources should not be unduly restricted.

3.3 The Code is addressed primarily to governments. All relevant legal and natural persons are also invited to observe its provisions, in particular those dealing with plant exploration and plant collection, agricultural and botanical activities and research on endangered species or habitat conservation, research institutes, botanical gardens, harvesting of wild plant resources, agro-industry including pharmaceutical plants and the seed trade.

3.4 The provisions of the Code should be implemented through collaborative action by governments, appropriate organizations and professional societies, field collectors and their sponsors, and curators and users of plant germplasm.

3.5 FAO and other competent organizations, are invited to promote observance of the Code.

3.6 The Code provides a set of general principles which governments may wish to use in developing their national regulations, or formulating bilateral agreements on the collection of germplasm.

Article 4: Scope

4.1 The Code describes the shared responsibilities of collectors, donors, sponsors, curators and users of germplasm so as to ensure that the collection, transfer and use of plant germplasm is carried out with the maximum benefit to the international community, and with minimal adverse effects on the evolution of crop plant diversity and the environment. While initial responsibility rests with field collectors and their sponsors, obligations should extend to parties who fund or authorize collecting activities, or donate, conserve or use germplasm. The Code emphasizes the need for cooperation and a sense of reciprocity among donors, curators and users of plant genetic resources. Governments should consider taking appropriate action to facilitate and promote observance of this Code by sponsors, collectors, curators and users of germplasm operating under their jurisdiction.

4.2 The Code should enable national authorities to permit collecting activities within its territories expeditiously. It recognizes that national authorities are entitled to set specific

requirements and conditions for collectors and sponsors and that sponsors and collectors are obliged to respect all relevant national laws as well as adhering to the principles of this Code.

4.3 The Code is to be implemented within the context of the FAO Global System on Plant Genetic Resources, including the International Undertaking and its annexes. In order to promote the continued availability of germplasm for plant improvement programmes on an equitable basis governments and users of germplasm should endeavour to give practical expression to the principles of Farmers' Rights.

Article 5: Relationship with the other legal instruments

5.1 The Code is to be implemented in harmony with:

(a) the Convention on Biological Diversity and other legal instruments protecting biological diversity or parts of it;
(b) the International Plant Protection Convention (IPPC) and other agreements restricting the spread of pests and diseases;
(c) the national laws of the host country; and
(d) any agreements between the collector, host country, sponsors, and the gene bank storing the germplasm.

Chapter III

Collectors' permits

Article 6: Authority for issuing permits

6.1 States have the sovereign right, and accept the responsibility, to establish and implement national policies for the conservation and use of their plant genetic resources, and within this framework, should set up a system for the issuance of permits to collectors.

6.2 Governments should designate the authority competent for issuing permits. This authority should inform proposed collectors, sponsors, and the other agencies of the

government's rules and regulations in this matter, and of the approval process to be followed, and of follow-up action to be taken.

Article 7: Requesting of permits

To enable the permit issuing authority to arrive at a decision to grant or to refuse a permit, prospective collectors and sponsors should address an application to the issuing authority to which they:

(a) undertake to respect the relevant national laws;

(b) demonstrate knowledge of, and familiarity with, the species to be collected, their distribution and methods of collection;

(c) provide indicative plans for the field mission - including provisional route, estimated timing of expedition, the types of material to be collected, species and quantities - and their plans for evaluation, storage and use of the material collected; where possible, the sort of benefits the host country may expect to derive from the collection of the germplasm should be indicated;

(d) notify the host country of the kind of assistance, that may be required to facilitate the success of the mission;

(e) indicate, if the host country so desires, plans for cooperation with national scholars, scientists, students, non-governmental organizations and others who may assist or benefit from participation in the field mission or its follow-up activities;

(f) list, so far as it is known, the national and foreign curators to whom the germplasm and information is intended to be distributed on the completion of the mission; and

(g) supply such personal information as the host country may require.

Article 8: Granting of permits

The permit issuing authority of the country in which a field mission proposes collecting plant genetic resources should expeditiously:

(a) acknowledge the application, indicating the estimated time needed to examine it;

(b) communicate to the collectors and sponsors of the proposed collecting mission its decision. In case of a positive decision, conditions of collaboration be established as soon as possible before the mission arrives in the country, or begins field work. If the decision is to prohibit or restrict the mission, whenever possible, the reasons should be given, and where appropriate, an opportunity should be given to modify the application.

(c) indicate, when applicable, what categories and quantities of germplasm may or may not be collected or exported, and those which are required for deposit within the country; indicate areas and species which are governed by special regulation;

(d) inform the applicant of any restrictions on travel or any modification of plans desired by the host country;

(e) state any special arrangement or restriction placed on the distribution or use of the germplasm, or improved materials derived from it;

(f) if it so desired, designate a national counterpart for the field mission, and/or for subsequent collaboration;

(g) define any financial obligation to be met by the applicant including possible national participation in the collecting team, and other services to be provided; and

(h) provide the applicant with the relevant information regarding the country, its genetic resources policy, germplasm management system, quarantine procedures, and all relevant laws and regulations. Particular attention should be drawn to the culture and the society of the areas through which the collectors will be travelling.

CHAPTER IV

Responsibilities of Collectors

Article 9: Pre-collection

9.1 Upon arrival in the host country, collectors should acquaint themselves with all research results, or work in progress in the country, that might have a bearing on the mission

9.2 Before field work begins, collectors and their national collaborators should discuss, and to the extent possible, decide on practical arrangements including:

(i) collecting priorities, methodologies and strategies,
(ii) information to be gathered during collection,
(iii) processing and conservation arrangements for germplasm samples, associated soil/symbiont samples, and voucher specimens, and
(iv) financial arrangements for the mission.

Article 10: During collection

10.1 Collectors should respect local customs, traditions, and values, and property rights and should demonstrate a sense of gratitude towards local communities, especially if use is made of local knowledge on the characteristics and value of germplasm. Collectors should respond to their requests for information, germplasm or assistance, to the extent feasible.

10.2 In order not to increase the risk of genetic erosion, the acquisition of germplasm should not deplete the populations of the farmers' planting stocks or wild species, or remove significant genetic variation from the local gene pool.

10.3 When collecting cultivated or wild genetic resources, it is desirable that the local communities and farmers concerned be informed about the purpose of the mission, and about how and where they could request and obtain samples of the collected germplasm. If requested, duplicate samples should be also left with them.

10.4 Whenever germplasm is collected, the collector should systematically record the passport data, and describe in detail the plant population, its diversity, habitat and ecology, so as to provide curators and users of germplasm with an understanding of its original context. For this purpose, as much as local knowledge about the resources (including observations on environmental adaptation and local methods and technologies of preparing and using the plant) should be also documented; photographs may be of special value

Article 11: Post-collection

11.1 Upon the completion of the field mission, collectors and their sponsors should:

(a) process, in a timely fashion, the plant samples, and any associated microbial symbionts, pests and pathogens that may have been collected for conservation; the relevant passport data should be prepared at the same time;

(b) deposit duplicate sets of all collections and associated materials, and records of any pertinent information, with the host country and other agreed curators;

(c) make arrangements with quarantine officials, seed storage managers and curators to ensure that the samples are transferred as quickly as possible to conditions which optimize their viability;

(d) obtain, in accordance with the importing countries' requirements, the phytosanitary certificate(s) and other documentation needed for transferring the material collected;

(e) alert the host country and the FAO Commission on Plant Genetic Resources about any impending threat to plant populations, or evidence of accelerated genetic erosion, and make recommendations for remedial action; and

(f) prepare a consolidated report on the collecting mission, including the localities visited, the confirmed identifications and passport data of plant samples collected, and the intended site(s) of conservation. Copies of the report should be submitted to the host country's permit issuing authority, to national counterparts and curators, and to FAO for the information of its

Commission on Plant Genetic Resources and for inclusion in its World Information and Early Warning System on PGR.

11.2 Collectors should take steps to promote observance of the Code by the curators and users to whom they have passed the germplasm which they have collected.

Where appropriate, this might be by means of agreements with curators and users consistent with Articles 13 and 14.

Chapter V

Responsibilities of Sponsors, Curators and Users

Article 12: Responsibilities of Sponsors

12.1 Sponsors should take steps to ensure, as far as is possible and appropriate, that collectors of collecting missions which they sponsor abide by the Code, particularly Articles 9, 10 and 11.

12.2 Sponsors should, as far as is possible and appropriate, establish agreements with curators of the germplasm collected under missions that they sponsor to ensure that curators abide by the Code, particularly Article 13. Such agreements should, as far as is possible and appropriate, ensure that subsequent curators and users of the collected germplasm also abide by the Code.

Article 13: Responsibilities of Curators

13.1 In order to be able to identify in the future the origin of the samples, curators should ensure that the collectors' original identification numbers, or codes, continue to be associated with the samples to which they refer.

13.2 Curators of the collected germplasm, should take practical steps to ensure, as far as is possible and appropriate, that future enquiries from the local communities and farmers who

have provided the original material, and the host country, are responded to, and the samples of the plant germplasm collected are supplied upon request.

13.3 Curators should take practical steps, inter alia by the use of material transfer agreements, to promote the objectives of this Code including the sharing of benefits derived from collected germplasm by the users with the local communities, farmers and host countries as indicated in Article 14.

Article 14: Responsibilities of Users

Without prejudice to the concept of Farmers' Rights, and taking into account Articles 1.7 & 1.8, users of the germplasm, should, to benefit the local communities, farmers and the host countries, consider providing some form of compensation for the benefits derived from the use of germplasm such as:

(a) facilitating access to new, improved varieties and other products, on mutually agreed terms;

(b) support for research of relevance to conservation and utilization of plant genetic resources, including community-based, conventional and new technologies, as well as conservation strategies, for both ex situ and in situ conservation;

(c) training, at both the institutional and farmer levels, to enhance local skills in genetic resources conservation, evaluation, development, propagation and use;

(d) facilitate the transfer of appropriate technology for the conservation and use of plant genetic resources;

(e) support for programmes to evaluate and enhance local land races and other indigenous germplasm, so as to encourage the optimal use of plant genetic resources at national, sub-national, and farmers and community level and to encourage conservation;

(f) any other appropriate support for farmers and communities for conservation of indigenous germplasm of the type collected by the mission; and

(g) scientific and technical information obtained from the germplasm.

Chapter VI

Reporting, Monitoring and Evaluating the Observance of the Code

Article 15: Reporting by Governments

15.1 Governments should periodically inform the FAO Commission on Plant Genetic Resources of actions taken with regard to the application of this Code. When appropriate, this may be effected in the context of the yearly reports provided under Article 11 of the International Undertaking on Plant Genetic Resources.

15.2 Governments should inform the FAO Commission on Plant Genetic Resources of any decision to prohibit or restrict proposed collecting missions.

15.3 In cases of non-observance by a collector or sponsor of the rules and regulations of a host country regarding the collecting and transfer of plant genetic resources, or the principles of this Code, the government may wish to inform the FAO Commission on Plant Genetic Resources. The collector and sponsor should receive copies of this communication, and have the right to reply to the host country with copy to the FAO Commission. At the request of collectors or their sponsors, FAO may provide a certificate stating that no unresolved complaints are outstanding about them under this Code.

Article 16: Monitoring and Evaluating

16.1 Appropriate national authorities and the FAO Commission on Plant Genetic Resources should periodically review the relevance and effectiveness of the Code. The Code should be considered a dynamic text that may be brought up to date as required, to take into account technical, economic, social, ethical and legal developments and constraints.

16.2 Relevant professional associations and other similar bodies accepting the principles embodied in this Code may wish to establish peer review ethics committees to consider their members' compliance with the Code.

16.3 At a suitable time, it may be desirable to develop procedures for monitoring and evaluating the observance of the principles embodied in this Code, under the auspices of the FAO Commission on Plant Genetic Resources which, where invited to do so by the parties concerned, may settle differences that may arise.

The collecting report should include:

•a statement of the objectives of the collecting;

•a description of the environment of the target region;

•an account of the logistical and scientific planning;

•details of the execution of the mission (timing, itinerary, sampling strategy and collecting techniques);

•a summary of the results (germplasm collected and areas surveyed);

•details of the onward distribution of the germplasm and data;

•recommendations for follow-up;

•acknowledgements.

General Guidelines

1. Always carry the collection kit.

2. Wherever required, collector(s) should take prior written permission from the authorized agency for collection.

3. Collections must be done in two sets:

a. First for Voucher preparation in triplicates (find details in the respective guidelines).

b. Second for DNA barcoding (NO FIXATIVE BE ADDED).

4. A review of the collection site including its habitat, area and diversity will help giving an insight into its usefulness to the collector.

5. Collection should not harm the environment.

6. When submitting the specimen to BioGene it is mandatory to submit the proforma attached in this guideline as Annexure I and Annexure II.

7. Any submission without these proforma will not be considered.

8. Avoid duplication of the samples. Check BioGene specimen list.

9. While collecting the samples, avoid cross-contamination.

10. Surface sterilize the specimen, if required and avoid diseased/ pathogenic specimens.

11. Collected specimens should be transported immediately to the lab avoiding direct sunlight. Refer to details mentioned in the respective guidelines for plants, animals and microbes.

12. Take high resolution photographs (preferably 300 dpi) with appropriate ISO and background settings.

ANNEX B

The EU Common Agricultural Policy

The EU Common Agricultural Policy (CAP) is a key tool for halting the loss of agricultural biodiversity in Europe by 2010 – and beyond. In conjunction with market developments, technological and structural change has been an important driver in the relationship between agriculture and biodiversity. The CAP was introduced in the 1950's and was the basis for today's European Budget and EU wealth. The importance of agriculture for Europe's economy and policy should therefore not be underestimated. Today the CAP represents about 40% of the total European budget, with agricultural and regional policy together accounting for over 80%. The CAP has two pillars which differ in terms of financing, functioning and structure.

The first pillar provides support for farmers, currently through the Single Payment Scheme (SPS), mainly used in the EU, and the Single Area Payment Scheme, mainly used in the EU. These two schemes accounted for about 70 percent of CAP resources in 2008. The payments are linked to "cross-compliance" requirements: farmers that receive the subsidies must meet both EU rules (several directives are indicated in EU legislation) as well as national rules on

good agricultural and environmental conditions. This pillar also supports export subsidies and other market interventions.

The second pillar provides support for rural development across several thematic areas; the second pillar is notable in that it supports actions closely linked to environmental and biodiversity goals, including for farming and other activities in Natura 2000 sites as well as more generally for extensive or HNV farming. Biodiversity issues are addressed specifically via instruments such as the agri-environmental measures. Support from Pillar 2 is partially co-financed by Member States and regional administrations. However, when re-calculated to account for expected modulation and Member State co-financing, this amount increases to almost 37 percent of the total CAP budget for the 2007 – 2013 period.16 Rural development policy, known as Pillar 2 of the CAP, has considerable potential to tackle the biodiversity challenge. The EU rural development policy 2007-2013 provides aid for farmers who sign up to environmental commitments, and the Reform of the CAP aims to strengthen landscape protection and reward farmers who go beyond traditional methods to plant hedgerows, create ponds or leave fields uncultivated.

The CAP underwent a mid-term review and reform in 2003, which resulted in compulsory modulation (requiring countries to shift funds from Pillar 1 support to measures available under Pillar 2) and cross-compliance, under which direct payments became contingent upon respect of EU and national rules on good agricultural and environmental conditions. The 2003 reform also further strengthened rural development policy, both in scope and financial resources. In 2008, EU agriculture ministers undertook a “health check” of the CAP, which resulted in a range of measures, including assistance to five challenge areas (climate change, renewable energies, water management, biodiversity and dairy sector restructuring) and an increase in the mandatory modulation rate for transferring funds from Pillar 1 to Pillar 2.

At present, the CAP faces serious and multi-dimensional challenges. As agricultural realities, broader development goals including increased importance of environmental issues, and marked budget constraints define the debate around the EU Budget 2014-2020, there are high expectations for the CAP post 2013. The European Commission has recently concluded a public debate on the future of the CAP after 2013 and issued a formal Communication on

this matter at the end of 2010. Formal legislative proposals for the post-2013 CAP will follow in mid-2011.

As was also noted under the heading “Green Growth” in the Spanish Presidency paper prepared for the Informal Agriculture Council in Merida in June 2010 on “Agriculture and reform of the Common Agricultural Policy (CAP) in the perspective of the EU 2020 strategy”, “the CAP has taken on board the need to incorporate sustainability and preservation of the environment and resources in all its actions. In the period up to 2020, this priority needs to be given greater visibility, highlighting agriculture's contribution to the provision of public goods, the preservation of biodiversity and the fight against climate change”.