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MARKET BASED INSTRUMENTS APPLICATIONS TO NON-WOOD FOREST PRODUCTS AND SERVICES

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List of abbreviations and acronyms

APT Association for the Promotion of Tourism
A/R Afforestation/Reforestation
B Billions
BioCF BioCarbon Fund
CAC Command and Control
CAP Common Agricultural Policy
CDM Clean Development Mechanism
CER Certified Emission Reduction
CICES Common International Classification of Ecosystem Services
CITES Convention on International Trade in Endangered Species of Wild Fauna and Flora
CO_2eq Carbon dioxide equivalent
CoC Chain Of Custody
EU European Union
ES Ecosystem Services
ETS Emission Trading System
FSC Forest Stewardship Council
GAPC Good Agriculture and Collection Practices
GHG Greenhouse gases
Gg Gigagrams
GMO Genetic Modified Organism
ha hectare
HoReCa Hotels, Restaurants and Catering
HS Harmonised System
ISO International Standards Organization
JI Joint Implementation
KP Kyoto Protocol
lCER Long term Certified Emission Redution
LULUCF Land use, land use change and forestry
M Millions
m a.s.l. meters above sea level
MEA Millennium Ecosystem Assessment
MBI Market Based Instruments
MCF Magnifica Comunità di Fiemme
MR Monitoring Report
Mt Million metric tonnes
MtCO_2eq Million metric tonnes of carbon dioxide equivalent
NGO Non-Governmental Organisation
NTFP Non Timber Forest Products
Non-GMO Non Genetically Modified Organism
NWFP Non Wood Forest Products
PGI Protected Geographical Indication
PDD Project Design Document
PDO Protected Designation of Origin
PEFC Programme for the Endorsement of Forest Certification
PES Payment for Ecosystem Services
REDD Reducing Emissions from Deforestation and Forest Degradation
RDP Rural Development Programme
SFM Sustainable Forest Management
SFVC Short Food Value Chain
SME Small and medium enterprise
t ton
tCER temporary Certified Emission Reductions
TSG Traditional Speciality Guaranteed
TST Trentino-South Tyrol

UAA Utilised Agriculture Area
UNFCCC United Nation Convention of Climate Change
VAT Value Added Tax
VER Verified Emission Reduction
WB World Bank

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Abstract

Forests are fundamentally important in relation to the multitude of ecosystem services they provide.
Many ecosystem services supplied by forests are positive externalities and public goods and they are considered “market failures”: people can benefit from them without contributing to their sustainment. The failure in assigning a proper value may lead to degradation of forest ecosystems, or to abandonment of forest management, resulting in a consequent under provision of the service, with substantial economic and social losses to society.
To preserve and sustain ecosystem services, including those provided by forests, there is an increasing agreement in favour of Market Based Instruments (MBI). MBI encourage behaviour through market signals rather than through explicit directives. Their main common characteristic is the use of monetary values in one way or another through a commodification process.
MBI are heterogeneous and many authors have listed and classified them, in different ways. The present research adopts the classification of Pirard (2012), who described six types of MBI: direct deals, tradable permits, regulatory price signals, voluntary price signals, reverse auctions and Coasean type agreements.
Among the several ecosystem services provided by forests, some, more than others, have experienced a process of commodification, testified by several examples worldwide. This is the case of Non-Wood Forest Products (NWFP) and of the climate regulation that derives from the carbon sequestration function of forests.
The research aimed at i) assessing which are the most important MBI types applied to NWFP and forests carbon, according to the scientific literature; ii) analysing the application of MBI to NWFP and to climate regulation that derives from the carbon sequestration function of forests, at different scales; iii) assessing whether the application of the MBI to NWFP and to climate regulation that derives from the carbon sequestration function of forests, in the selected examples, is likely to deliver co-benefits or sustainability aspects.

In order to determine how is the MBI type reflected in the scientific literature the Elsevier Scopus database was used, using a set of keywords.
According to the analysis of the scientific literature, the most quoted MBI for NWFP is “direct deals”. Two levels of analysis were selected: the first focused on the international NWFP trade of Italy (performed using the Harmonised System and UNComtrade) and the second on the regional market of NWFP (with the supply chain analysis of wild mushrooms and chestnuts in South Tyrol conducted through face-to-face questionnaires; plus two in depth case-studies, one in Fiemme valley (TN), targeting the organization of the mushroom picking service, and one in Castione (TN), targeting the organization of a chestnut producers association). The other MBI of main importance for NWFP is “voluntary price signals”, namely certification, which was investigated through literature analysis.
The study for the climate regulation that derives from the carbon sequestration function of forests was conducted at two levels: i) the Italian compliance forest carbon market, in the Kyoto Protocol’s Clean Development Mechanism (CDM) example (utilising official databases) and ii) the voluntary forest carbon market, by submitting an online questionnaire to the actors of the sector.

The analysis of “direct deals” applied to NWFP confirms that commodification of NWFP is so extended that nowadays many NWFP are traded at international scale. In these, Italy has a leading position within the five main global importers and/or exporters of vegetable tannins, cork stoppers, chestnuts and wild mushrooms. The International trade of wild forest products is increasing. This could be an opportunity for Italy and for European Union in general, to promote a sustainable forest management based on multifunctionality, which includes use and commercialization of NWFP.
The survey conducted in Trentino-South Tyrol for wild mushrooms and chestnuts shows the presence of different types of markets and food supply chains, based on local and non-local NWFP, the second

largely exceeding the first. This is driven by the same logics that rule the trade of other commodities, such as the cheaper raw material and labour cost obtainable in some foreign countries.
However, there are also supply chains based on local NWFP. The trade of local products is based on much lower quantities, and almost the totality remains within regional boundaries. The trade occurrs for the vast majority through Short Food Supply Chains, whose application is considered one of the most important tools to strengthen rural development, by providing several socio-economic and environmental benefits.
Chestnuts production in the region takes also advantage of form of integrations among producers and of geographic specific horizontal alliances for the sale of complementary products and services.
Other MBI are applied to NWFP in the region. Of particular importance are the public incentives for the restoration of the chestnuts sector and the permits for the collection of wild mushrooms.

The analysis of tradable permits application to the climate regulation (carbon sequestration function of forest), in the Italian CDM example, shows that Italian Government participates in a relatively high number of forest projects in developing countries, producing a relevant amount of climatic benefits. However, the connection “carbon forest project- conservation of native forests and of biodiversity” is not automatic, since 55% of the new forests was planted with non-native species.
The analysis of the statements of the forest carbon project design documents shows that all the projects claim that they stimulate the local economy, including short and long term employment in the project area, and that they engage the local population. However, the system of indicators developed by United Nation Convention of Climate Change (UNFCCC) does not provide a method for assessing *how much* a project contributes to sustainable development. Integration of the available information from the Italian Government would be particularly valuable, also considering the relevant financial involvement of Italy in these activities and the positive lessons to be learned from the ongoing experience in the light of the future development of the UNFCCC negotiations.
The analysis of the tradable permits in the example of the Italian voluntary forest carbon market shows that the Italian market is a small market, which has showing a decline in the latest years. The prices are instead in positive countertrend. The Italian sector is characterized by a balanced presence of profit and non-profit organizations, which develop more and more small and micro projects in Italy. Differently form the international situation, most of the projects operate in the absence of certification and standards that assure carbon accounting quality and delivery of co-benefits. However, many projects use guidelines and internal quality standards, a strategy aimed at containing costs for the micro or small scale projects. This choice might, however, raise criticisms. A good sign in terms of environmental benefits is given by the fact that most of the projects, contrarily from what happen in the CDM projects, used exclusively native species.
Since problems of double counting with Kyoto based initiatives could undermine the development of the sector, the voluntary carbon market is looking for official signals from the Italian Government. Currently there is a legislative gap about this. With clear and precise directives, a more stable strategy for the sector could be implemented, also looking at the successful examples of domestic markets that exist in many EU countries.

NWFP certification is promoted as a solution to address the many ecological, economic, and social challenges associated with NWFP commercialization. The research shows that several certification schemes are applied to NWFP and they have different scopes, which follow in different degree under the spheres of socio-economic and environmental sustainability and of assurance of quality and health benefits. However, only two standards (sustainable forest management and wild certification), include detailed ecological specifications for sustainable harvesting. Being the entire NWFP supply chain connected to the renewability of the NWFP itself, these recommendations are of particular importance.

Market Based Instruments are mechanisms that can provide economic values to forest ecosystems,

also providing greater flexibility of the management of the resources and to changing conditions. The research shows that application of MBI to forest ecosystem services can perform at different scales, form the local to the global. However, they have not to be idealistically seen as the solution; they rather can, if carefully designed and implemented, complement regulations or provide alternatives. The definition of the best option should be designed case-by-case, especially aiming at including the delivering of sustainable aspects, with particular reference to the place where the forest resources are. At the same way, due to heterogeneity of MBI and of the contexts where they are implemented, MBI effectiveness in managing and conserving ecosystems cannot be *a priori* assessed and other indicators, applied at specific scale, should be used.

Riassunto

Le foreste hanno fondamentale importanza per i servizi ecosistemici che forniscono alla società. Molti servizi ecosistemici derivanti dalle foreste ricadono nelle cosiddette esternalità positive e nella classe dei beni pubblici. Ciò implica che molti possano beneficiare da tali servizi ecosistemici, senza però contribuire al loro sostentamento. Tale fallimento nell'attribuzione del giusto valore può comportare una degradazione degli ecosistemi forestali, o l'abbandono della gestione forestale, con un conseguente sotto approvvigionamento del servizio ecosistemico stesso. Ne derivano conseguentemente perdite anche dal punto di vista socio-economico.
Al fine di preservare, conservare e sostenere i servizi ecosistemici, compresi quelli generati dalle foreste, c'è un crescente accordo circa l'effettività dell'uso degli strumenti basati sul mercato (*Market Based Instruments- MBI*). I MBI sono strumenti che incoraggiano le azioni tramite segnali di mercato, invece che tramite norme. Essi costituiscono un gruppo eterogeneo di strumenti, il cui maggiore comune denominatore è l'uso di valori monetari, in svariati modi, attraverso un processo di commodificazione. Diversi autori hanno classificato i MBI, in modi differenti. La presente ricerca adotta la classificazione di Pirard (2012), il quale ha definito sei tipi di MBI: scambi diretti (*direct deals*), permessi commercializzabili (*tradable permits*), segnali di prezzo su base normativa (r*egulatory price signals*), segnali di prezzo su base volontaria (*voluntary price signals*), accordi basati sul modello di Coase (*Coasean types agreements*), aste al contrario (*reverse auctions*).
Tra i tanti servizi ecosistemici forniti dalle foreste, alcuni, più di altri, hanno esperito un processo di commodificazione, testimoniato da molti esempi nel mondo. E' il caos dei Prodotti Forestali Non Legnosi (PFNL) e del servizio di regolazione che deriva dalla funzione di sequestro del carbonio operato dalle foreste.
La presente ricerca ha avuto i seguenti obiettivi: i) determinare quali siano i più importanti MBI applicati ai PFNL e al servizio di regolazione che deriva dalla funzione di sequestro del carbonio operato dalle foreste, secondo la letteratura scientifica; ii) analizzare l'applicazione di tali MBI ai PFNL e al servizio di regolazione che deriva dalla funzione di sequestro del carbonio operato dalle foreste, a diverse scale; iii) valutare se sia probabile che l'applicazione dei MBI ai PFNL e al servizio di regolazione che deriva dalla funzione di sequestro del carbonio operato dalle foreste, negli esempi selezionati, porti co-benefici o aspetti di sostenibilità.

Per determinare quali siano i più importanti MBI, è stato utilizzato il database Scopus, tramite una ricerca con parole chiave.
Secondo la letteratura, i più citati MBI per i PFNL sono i "*direct deals*". Sono stati determinati due livelli di analisi per la ricerca di tale applicazione del meccanismo: la prima internazionale, con focus sul commercio internazionale dei PFNL in cui l'Italia è coinvolta (utilizzando il database UNComtrade); la seconda regionale, con l'analisi delle filiere di funghi selvatici e castagne in Trentino-Alto Adige, condotta tramite interviste dirette; l'indagine si è anche avvalsa di ulteriori ricerche, la prima concernente il servizio di raccolta dei permessi dei funghi in val di Fiemme (TN), la seconda

un'associazione di produttori di castagne a Castione (TN).
L'altro MBI di maggiore importanza per i PFNL, come riportato in letteratura, è "*regulatory price signals*", e specificatamente la certificazione e l'uso di standards. L'analisi dell'applicazione di questo meccanismo si è svolta tramite ricerca bibliografica.
Lo studio sul servizio di regolazione che deriva dalla funzione di sequestro del carbonio operato dalle foreste è stato condotto a due livelli: i) il mercato regolamentare del carbonio forestale, nell'esempio dei progetti forestali sviluppati nell'ambito del *Clean Development Mechanism* del Protocollo di Kyoto (studio avvenuto tramite ricerca nei database ufficiali); ii) il mercato volontario del carbonio forestale, avvenuto tramite questionari inviati agli attori del settore.

L'analisi dei "*direct deals*" applicati ai PFNL conferma che la commodificazione dei PFNL è tale che oggi molti di questi prodotti sono commercializzati in mercati con scala globale. In questo contesto, l'Italia riveste una posizione di leader globale tra i maggiori importatori o esportatori di alcuni prodotti: tannini di origine vegetale, tappi di sughero, castagne e funghi selvatici. Il commercio internazionale di PFNL è in crescita. Ciò può rappresentare un'opportunità per l'Italia, e per l'Unione Europea in generale, per promuovere una gestione forestale sostenibile e multifunzionale, basata anche sui PFNL.
L'indagine condotta in Trentino-Alto Adige per i funghi selvatici e le castagne mostra la presenza di diversi tipi di mercati e filiere, basate sia su prodotti locali che non locali, i secondi largamente eccedenti i primi. Le dinamiche che muovono tali mercati sono basate su logiche similari a quelle di tanti altri prodotti, quali i minori costi di produzione che susistono in alcuni paesi esteri. Tuttavia, nella regione ci sono anche filiere basate su PFNL locali. Il commercio imperniato sulla produzione locale è basato su quantità molto minori e la quasi totalità rimane all'interno dei confini regionali. La commercializzazione avviene tramite filiere corte (*Short Food Supply Chains*), la cui applicazione è considerata ono dei più importanti strumenti per rafforzare lo sviluppo rurale, fornendo diversi benefici sociali, economici e ambientali.
Nella regione esistono anche altri MBI applicati ai PFNL. Di particolare importanza sono gli incentivi pubblici per la revitalizzazione del settore castanicolo e i permessi per la raccolta dei funghi.

L'analisi circa l'applicazione dei *tradable permits* al servizio di regolazione che deriva dalla funzione di sequestro del carbonio operato dalle foreste, nell'esempio CDM italiano, mostra che il Governo Italiano partecipa ad un numero relativamente alto di progetti forestali nei paesi in via di sviluppo. Ciò produce un ammontare rilevante di benefici climatici. Tuttavia, la connessione "progetto di carbonio forestale- conservazione delle foreste native" nonè automatica, visto che circa il 55% di queste foreste è stat piantata con specie non native.
L'analisi condotta sulle dichiarazioni contenute nei documenti di progetto CDM mostra che tutti i progetti sostengono di aver stimolato l'economia locale, inclusa la generazione di impiego a lungo e breve termine, e di aver coinvolto la popolazione locale. Tuttavia, il sistema di indicatori fornito dall' *United Nation Convention of Climate Change* (UNFCCC) non procura un metodo per valutare *quanto* un progeto contribuisca allo sviluppo sostenibile. Sarebbero a questo proposito utili integrazioni informative da parte del Governo Italiano, anche considerando il coinvolgimento finanziario rilevante che l'Italia ha in queste attività. Ciò in vista dello sviluppo delle future negoziazioni in ambito UNFCCC.
L'analisi dei tradable permits nell'esempio del mercato volontario italiano mostra come il mercato italiano sia un piccolo mercato, che ha mostrato un declino negli anni recenti. I prezzi dei crediti di carbonio, invece, risultano essere in controtendenza. Il mercato italiano è caratterizzato da una presenza bilanciata di associazioni profit e non profit, le quali sviluppano sempre più progetti a piccola e micro scala. Al contrario di quanto accade internazionalmente, si riscontra che la maggior parte dei progetti opera in assenza di certificazione e di standard che assicurino la bontà dei calcoli sulla quantità di carbonio immagazzinato e la generazione di co-benefici. Tuttavia molti progetti utilizzano linee guida e standard interni, strategia messa in atto per contenere i costi dei piccoli progetti, i quali

hanno difficoltà a sostenere i costi di certificazione. Tuttavia, tale scelta può essere da molti criticata. Un buon indicatore è invece dato dall'uso quasi esclusivo di specie native nei progetti.
Dato che problemi di doppia rendicontazione con il Protocollo di Kyoto possono minare lo sviluppo del settore, esssendoci ora una vacanza legislativa, gli attori del mercato volontario sono in attesa da segnali chiari dal Governo. Con precise direttive potrebbe essere designata una strategia più stabile, anche considerando gli esempi positivi di alcuni mercati domestici in altri paesi europei.

La ricerca sui "*voluntary price signals*" mostra come esistano molti schemi di certificazione che sono applicabili ai PFNL. Hanno obiettivi differenti, ascrivibili con diversa intensità alle sfere di sostenibilità socio-economica, ambientale, e di assicurazione di qualità. Tuttavia, solo due standard (gestione forestale sostenibile e certificazione "*wild*") includono specificazioni dettagliate circa la raccolta sostenibile dei PFNL. Essendo l'intera filiera basata sulla presenza della risorsa PFNL, queste specificazioni sono di fondamentale importanza.

I MBI sono meccanismi che possono fornire valore economico agli ecosistemi forestali, dando anche maggiore flessibilità di gestione delle risorse e maggior resilienza a situazioni dinamiche.
La ricerca mostra che l'applicazione di MBI ai servizi ecosistemici derivanti dalle foreste può essere applicata a scale diverse, dalla locale alla globale. Tuttavia, l'applicazione di MBI non deve essere idealisticamente vista come "la soluzione"; è piuttosto, se attentamente sviluppata e messa in atto, di complemento alle norme esistenti. La definizione dell'opzione migliore dovresse essere designata caso per caso, specialmente mirando ad includere la generazione di aspetti di sostenibilità, con riferimento particolare al luogo dove sono site le risorse forestali. Allo stesso modo, data l'eterogeneità dei MBI e dei contesti a cui sono applicati, l'effettività dei MBI nella gestione e conservazione degli ecosistemi non può essere valutata *a priori* e dovrebbero essere utilizzati altri indicatori, applicati a scala specifica.

1 Introduction

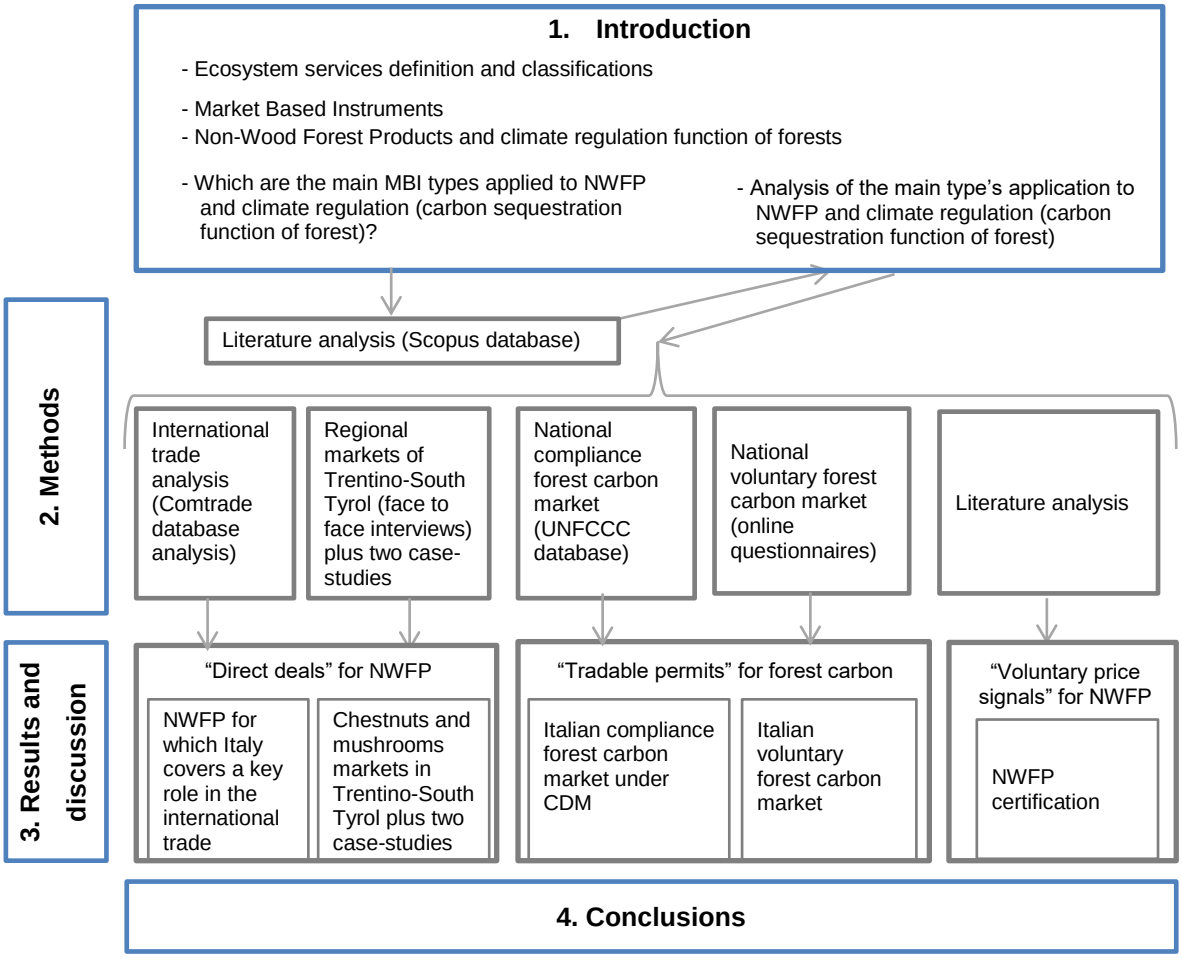
The *Chapter* illustrates the structure of the thesis, the research background and it provides the state of the art of the application of specific Market Based Instruments to Non-Wood Forest Products and to the climate regulation benefit provided by forests (carbon sequestration function). It also illustrates the objectives and the research questions.

Contents

1.1 Structure of the thesis

Chapter 1 illustrates the structure of the thesis, the research background and it provides the state of the art of the application of specific Market Based Instruments to Non-Wood Forest Products and to the climate regulation benefit provided by forests (carbon sequestration function). It also illustrates the objectives and the research questions. *Chapter 2* explains the methods applied for each of the issue covered by the research. *Chapter 3* illustrates the results and the discussion. Results are subdivided in subchapters according to the Market Based Instruments and the forest good or benefit investigated. *Chapter 4* provides the conclusions drawn from the results presented in *Chapter 3*.
The thesis is structured as visualised in Figure 1.1.

Figure 1.1 Thesis structure and contents



1.2 Background

1.2.1 Ecosystem Services: definition and classifications

Ecosystem services are defined as the benefits that people obtain, directly or indirectly, from ecosystems (MEA, 2005). Forests cover 31% of world's land surface and they are fundamentally important in relation to the multitude of ecosystem services they provide.

The concept of ecosystem services (ES) is attracting increasing attention as a way to communicate the dependence of the society on ecological systems (Daily, 1997; De Groot et al., 2002). The modern concept of ecosystem services comes from the late 1970s, with the utilitarian framing of beneficial ecosystem functions as services, aiming at increasing public interest in biodiversity conservation (Gómez-Baggethun et al., 2010).The term "ecosystem services" was introduced in 1981 (Ehrlich and Ehrlich, 1981) and the concept is built on literature highlighting the societal value of nature's functions (Westman, 1977; Ehrlich and Ehrlich, 1981; De Groot, 1987). In the '90s there was a period of "mainstreaming" of the concept in the literature (e.g. Costanza and Daily, 1992; Perrings et al., 1992). In those years, the interest on methods for estimating ES economic value increased (Costanza et al., 1997). The Millennium Ecosystem Assessment (MEA), a four year study involving more than 1,300 scientists worldwide, represents a milestone, for its importance in including ecosystem services in the policy agenda (MEA, 2005). After the publication, the literature on ecosystem services has faster grown (Fisher et al., 2009).

Different schemes have been proposed by scholars for classifying ES. A wide used classification, adopted in several studies (e.g. Fisher et al., 2009, Mavsar et al., 2008, Chiabai et al., 2009) is indeed the one proposed by the Millennium Ecosystem Assessment (MEA, 2005), which grouped ecosystem services in four categories. The categories, with example related to forest ecosystems, are:

i. provisioning services, that is tangible products obtained from ecosystems (e.g. wood and non-wood forest products);
ii. regulating services, that is benefits obtained from the self-regulation of ecosystems (e.g. air quality regulation, climate regulation etc.);
iii. cultural services, that is non-material benefits obtained from ecosystems (e.g. recreational and ecotourism, spiritual and cultural values);
iv. supporting services, that is services that are necessary for the production of other ecosystem services (e.g. nutrient cycling, soil formation, primary production).

MEA stressed human dependency not only on ecosystem services, but also on the underlying ecosystem functioning, contributing to make visible the role of biodiversity and ecological processes in human well-being.

Recently, from the work on environmental accounting of the European Environment Agency, a new Common International Classification of Ecosystem Services (CICES) has been developed and then revised up to the current version 4.3 (Haines-Young and Potschin, 2013). It represents a summary of the previous classifications and it is willing at becoming the reference system for future studies. The consultation over the document, still ongoing, highlights the importance of making a distinction between final ecosystem services, ecosystem goods or products and ecosystem benefits. According to CICES the following definitions are recommended:

- final ecosystem services are the contributions that ecosystems make to human well-being. These services are the outputs of ecosystems and they directly affect human well-being of people. A fundamental characteristic is that they "*retain a connection to the underlying ecosystem functions, processes and structures that generate them";*
- ecosystem goods and benefits are things that people derive from final ecosystem services. They are outputs, both products and experiences, and they are not functionally connected to the systems from which they were derived. Goods and benefits can be referred to collectively as "products";
- human well-being is that which arises from adequate access to the basic materials for a good life needed to sustain freedom of choice and action, health, good social relations and security. The state of well-being is dependent on the total output of ecosystem goods and benefits, the provision of which can modify the status of well-being.

Supporting services are those functions, processes and structures that generate all the other services and products. CICES places the supporting services at an upper level than the others. Therefore, CICES classification divides the ecosystem services in three groups (called sections):

i. provisioning services: all nutritional, material and energetic outputs from living systems;
ii. regulating and maintenance services: comprises all the ways in which living organisms can mediate the environment that affects humans. They include degradation of wastes and substances by exploiting living processes and the mediation of flows in solids, liquids and gases that affect humans;
iii. cultural services: covers all the non-material outputs of ecosystems that affect physical and mental states of persons. The experts involved in the consultation note that all services have a cultural dimension. However, they decided to maintain "cultural" as a separate section. They therefore recommend that cultural services are considered as the physical locations or situations that give rise to modifications in the physical or mental states of people, and whose characteristics are fundamentally dependent on living processes (species, habitats and ecosystems). The settings can also include cultural landscapes, providing they are dependent on living processes of the specific site.

Following this distinction of ES, CICES provides a hierarchical structure (division, group, class, class type). The categories at each level do not overlap and the categories at the lower levels inherit the properties or characteristics of the levels above. Table 1.1 reports the CICES example at three digits level. In the last column examples from forest ecosystem are added.

Table 1.1 CICES version 4.3 at three digit level plus examples from forest ecosystems

Section	Division	Group	Examples from forest ecosystems
This column lists the three main categories of ecosystem services	This column divides section categories into main types of output or process	The group level splits division categories by biological, physical or cultural type or process	This column illustrates some examples deriving from forest ecosystems
Provisioning	Nutrition	Biomass	Edible Non-Wood Forest Products
		Water	Freshwater deriving from forests
	Materials	Biomass, Fibre	Timber, biomass, fibres, cork
		Water	Water
	Energy	Biomass-based energy sources	Firewood
Regulation & Maintenance	Mediation of waste, toxics and other nuisances	Mediation by biota	Decomposition/mineralization in forest soils, phytodegradation
		Mediation by ecosystems	Bio-physicochemical filtration/sequestration/storage/accumulation of pollutants in forest soils, green infrastructures to reduce noise and smells
	Mediation of flows	Mass flows	Erosion/ landslides/avalanches protection; vegetation cover protecting/stabilising terrestrial and coastal ecosystems
		Liquid flows	Flood protection by appropriate land coverage
		Gaseous / air flows	Vegetation that serves as shelter belt; vegetation that enables air ventilation
	Maintenance of physical, chemical, biological conditions	Lifecycle maintenance, habitat and gene pool protection	Pollination by bee and other insects; seed dispersal by birds, animals, insects; habitats for plant and animal nursery and reproduction
		Pest and disease control	Pest and disease control
		Soil formation and composition	Maintenance of bio-geochemical conditions of soils, including fertility, nutrient storage, or soil structure; includes biological, chemical, physical weathering and paedogenesis); by decomposition/mineralisation of dead organic material, N-fixing, nitrification, etc.
		Water conditions	Maintenance / buffering of chemical composition of freshwater column and sediment to ensure favourable living conditions for biota e.g. by denitrification, re-mobilisation/re-mineralisation of phosphorous, etc.
		Atmospheric composition and climate regulation	Global climate regulation by greenhouse gas/carbon sequestration; Modifying temperature, humidity, wind fields; maintenance of climate and air quality and regional precipitation/temperature patterns
Cultural	Physical and intellectual interactions with ecosystems and land-/seascapes [environmental settings]	Physical and experiential interactions	Bird watching, nature photography; walking, hiking, climbing, kayaking, and leisure hunting
		Intellectual and representational interactions	Subject matter for research both on location and via other media; historic records, cultural heritage; Ex-situ viewing/experience of forests through different media; sense of place, artistic representations of forests
	Spiritual, symbolic and other interactions with ecosystems and land-/seascapes [environmental settings]	Spiritual and/or emblematic	Emblematic plants or animals, e.g. national symbols such as silver fern of New Zealand; spiritual plants or animals, e.g. animal spirits of First Nations of America
		Other cultural outputs	Enjoyment provided by wild species, wilderness, forests ecosystems; willingness to preserve plants, animals, forests ecosystems in general, but also landscapes for the experience of future generations; moral/ethical perspective or belief

Source: modified from Haines-Young and Potschin (2013)

1.2.2 Market failures and solutions for sustaining ecosystem services: from state provision to Market Based Instruments

From ecosystem services, including those provided by forests, benefit communities, both local and global. However, not all forest uses generate financial returns commensurate with their "true" economic value (Landell Mills and Porras, 2002). Some of these services, in the form of goods or benefits, such as timber, are traded in markets and generate incomes for producers and other actors involved in the supply chains; others, such as water quality maintenance or soil formation, have limited access to markets. One of the most important reasons because market fails to emerge is that many ecosystem services provided by forests fall into the category of positive externalities (any uncompensated benefits) and public goods. Public goods are a special class of externalities distinguished by their non-excludability and non-rivalry. Where good consumption by one individual does not reduce availability for its consumption by others (i.e. non rival) and when no one can be effectively excluded from benefitting from the good (i.e. non-exclusive) market reveals inability to provide a socially efficient ES provision (Table 1.2). Economists refer to public goods as "market failures" (Samuelson, 1954; Coase, 1960): people can benefit from them without contributing to their creation or sustainment. This is referred as the "free rider problem", or in case people contribute for a little but not sufficient part, the "easy rider problem". This is likely to lead to degradation of forest ecosystems, or to abandonment of forest management, resulting in a consequent under provision of the service, with substantial economic and social losses to society (Robertson and Wunder, 2005).

Table 1.2 Illustrating excludability and rivalry with examples from forest ecosystems

Excludability / Degree of rivalry	**Excludable (can limit access)**	**Non excludable (cannot or do not limit access)**
Rival: consumption by one reduces options for others	Private good: e.g. timber	Common pool or open access resources: e.g. recreation in forest with congestion effect
Non-rival: consumption by one has no effect on the consumption option for others	Club good: e.g. watershed protection services, ecotourism in protected areas, hunting clubs	Public good: e.g. forest biodiversity non-use values, climate change mitigation provided by forests

Source: modified from Wunder and Thorsen (2012).

Among the policy instruments available to deal with issues related to natural resource management there are information and education and command-and-control regulation. Information and education refer to the instruments that aim at resolving information-related market failures due to information asymmetry (Richards, 1999). Prescriptive command and control regulations (CAC), also called direct or traditional regulations, are based on the premises that the government is the regulator, it sets the objectives and it decides the instruments for accomplishing these objectives and to enforce the rules. For example, the government decides the activities which are allowed or prohibited, prescribes practices, determines quality standards (e.g. level of pollutants) and protects resources (e.g. with protected areas) (e.g. Cubbage et al., 2007; Brown et al., 2006).

However, to preserve and sustain ecosystem services provided by forests, especially where public funds for conservation are limited, there is an emerging agreement that we cannot rely on these types of instruments only (Koziell and Swingland, 2002; Sanchirico and Siikimaki, 2007).

At present, ES are reaching economic decision-making through the promotion of Market Based Instruments (MBI) and there is a clear trend in the conservation world in their favour (Gómez-Baggethun et al., 2010; Pattanayak et al.,2010; Pirard and Lapeyre, 2014). Also European Union supports their application: in the "EU Biodiversity Strategy 2020"[1] is stated that "[European Union] *will promote the use of innovative financing mechanisms, including Market Based Instruments*".

Stavins (2001) defined Market Based Instruments as: ''*regulations that encourage behaviour through market signals rather than through explicit directives*''. The initiative on the Economics of Ecosystems and Biodiversity (TEEB, 2009) stated that: ''*Market-based instruments, such as taxes, charges or tradable permits can, if carefully designed and implemented, complement regulations by changing economic incentives, and therefore the behaviour of private actors, when deciding upon resource use. When set at accurate levels, they ensure that the beneficiaries of biodiversity and ecosystem services pay the full cost of service provision. Experience shows that environmental goals may be reached more efficiently by market-based instruments than by regulation alone. Some market-based instruments have the added advantage of generating public revenues*''.

Beyond the advantage of being cost-effective and of representing dynamic incentives for technology innovation and diffusion (Stavins, 1998), other advantages of MBI include greater flexibility of the management of the resources and to changing conditions, and the possibility to apply specialized knowledge at the operational level (Rolfe and McCosker, 2003).

Market Based Instruments are not idealistic seen as "the" solution, but they can provide an alternative or be complementary to coercive laws. Specifically, MBI are sometimes more appropriate to be applied at the local or regional level, as the contexts and the incentives that face resource users and providers may be unique to a particular place (Windle et al., 2005).

Several definitions of MBI have been coined, but still there is confusion in their explanation and underneath theory. Underlying this concept, Gómez-Baggethun and Muradian (2015) reported that in the literature related to MBI, the most important common characteristic of these instruments is the expectation that they can efficiently lead to economic gains when accomplishing environmental objectives, with respect to CAC instruments, due to their expected higher degree of flexibility.

The term MBI serves as a catchall for all instruments with a price component. MBI category includes instruments that attribute a price to nature, in different ways. This does not imply that the attributed price is revealing the economic value of the ecosystem service in question, since the price could be defined in relation, for instance, to the production or opportunity cost (Pirard, 2012). For example, the conservation of a plant species leaving in Alpine meadows, strictly dependent to a precise agricultural management practice, may be associated to the agricultural management cost, rather than to the economic value of biodiversity. The use of MBI neither implies the creation of a "real market". In fact, it has been suggested that two people may trade, but there is the need of having at least three persons to have a market, so that there is competition in at least one of its two sides[2] (Sullivan and Sheffrin, 2003). Differently, MBI applications often happen in form of bilateral and mutually negotiated agreements between ES producers and users (Wunder and Vargas, 2005). Moreover, many

[1] Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the regions our life insurance, our natural capital: an Eu Biodiversity Strategy to 2020 /COM/2011/0244 final.

[2] Moreover, in a competitive market, there have to be much more buyers and sellers.

times, the applications of MBI to ES does not lead to a commoditization in the strict sense of the term, that is the process through which a good or service become replaceable with a similar one. On the contrary, ES are characterised by high complexity.

All in all, the main common characteristic of MBI is *"the use of monetary values in one way or another (change relative prices, use of economic incentives) through a commodification process*[3] *– to be understood here as considering nature from a utilitarian perspective with associated monetary values, not as creating commodities with standard units"* (Pirard, 2012).

The main common characteristic of Market Based Instruments is the use of monetary values in one way or another through a commodification process

Market Based Instruments constitute a heterogeneous group and several types can be described. Many authors listed and classified MBI, in different ways. A wide used classification broadly distinguishes MBI into three groups: i) price-based, ii) quantity-based, and iii) market friction reducing mechanisms (Stavins,1998; Stavins, 2001; Windle et al., 2005; Brown et al., 2006; Cubbage et al. 2007; Prokofieva et al., 2011). According to the authors, these MBI groups are based on different operational principles: "price-based MBI" influence behaviour by attributing or modifying prices for environmental products; "quantity based MBI" influence behaviour by determining (or modifying) rights associated with the use of natural resources; "market friction reducing mechanisms MBI" influence behaviour by making existing markets work better to achieve environmental outcomes.

However, Pirard (2012) and Pirard and Lapeyre (2014), while recognising the usefulness of previous studies to analytically characterize MBI, contended that these are mostly based on inductive reasoning. On the contrary, Pirard made a categorization based on deductive reasoning. This aims at distinguishing between the various instruments on the basis of their intrinsic economic characteristics, the nature of their relations to the markets and the nature of the market that is considered with the instrument[4].The types, as well as their main characteristics are listed hereafter and summarised in Table 1.3.

i. **Direct deals**[5] include all deals that are created in view of exchanging environmental products. Examples are the several markets set to exchange Non-Wood Forest Products (NWFP); or the trade of genetic resources, or ecotourism. Pirard argued that may be challenging to put, for example, NWFP and ecotourism on the same level. Indeed, direct deals can substantially differ each other's, and the abilities to ensure conservation and provision of ES (or conservation of a land use likely to secure that ES) can highly vary. While transactions related to ecotourism can easily result in maintaining the area in question, and broadly the ecosystem, the commercialization of NWFP is not always based on sustainable harvesting and it may lead to depletion of the given species or broadly to ecosystem degradation. The ability of markets to contribute to provision of ES may depend on scale and magnitude at which extraction is conducted, management and harvesting practices, stakeholders involved.

[3] "**Commodification**" is a Marxist term for things being assigned economic value which they did not previously possess, while "**commoditization**" is defined as the process by which goods that have economic value and are distinguishable in terms of attributes become simple commodities in the eyes of the market. The term commodity is used for an economic good or service when the demand for it has no qualitative differentiation across a market.

[4] This framework utilises generic names, which do not refer to the names of existing instruments such as mitigation banking or payments for ecosystem services and for this reason is not as detailed as a list of specific instruments would be.

[5] Pirard named this category "direct markets", while we prefer to call it "direct deals", being the term "market" comprehensive of the entire category of instruments.

ii. **Tradable permits** refer to the mechanism of exchanging permits/quotas/credits/certificates among actors for the use of a resource. The system of tradable permits can be applied in different ways: cap-and trade systems for greenhouse gas emissions, as in the EU Emission Trading System[6]; or mitigation banking, where, for instance, a builder who degrades biodiversity with his activity purchases certificates issued for land restoration. Tradable permits have been used also in fishery, as in the case of European Union, which periodically sets the total allowable catches[7]. Total allowable catches are catch limits for most commercial fish stock, expressed in tonnes, which are shared between member states as national quotas. The rationale behind tradable permits instrument is to create a new market for an environmental resource, with the aim of sustainably manage a resource with scarcity. The markets created with this type of instrument, in the majority of cases, spring from a policy decision. For instance, the carbon credit market, which involves the exchange of tradable permits under mechanisms such as Emissions Trading System (ETS), Clean Development Mechanism (CDM) and Joint Implementation (JI)[8], would have not taken off without the definition of Kyoto Protocol. However, there are exceptions: voluntary carbon markets stand as an exception in this category, as they are not derived from publicly led commitments. Markets created through the use of tradable permits are then expected to autonomously and freely reach cost-efficient objectives.

iii. **Regulatory price signals** work by assigning, on a mandatory basis, a price to environmental impacts through the imposition of positive (e.g. subsidies and grants) or negative (e.g. taxes and charges) incentives. This approach is based on the work of Pigou (1932). We refer to environmental taxations when authorities impose a tax to those activities, such as air pollution, that generate negative externalities. In reverse we talk about subsidies when funds are utilised for rewarding those that make activities with positive associated externalities. Examples are agri-environmental measures within the EU Common Agricultural Policy (CAP)[9], which provides payments to farmers who voluntarily subscribe to environmental commitments related to the preservation of the environment and territory of rural areas[10].

iv. **Voluntary price signals** follow the same rationale of the previous instrument, but signals are sent on a voluntary basis. In this mechanism, producers and consumers voluntary promote products and services with positive environmental externalities. An example of this is certification and use of standards, that lets the producers of products that are linked to positive externalities, to be awarded with a premium price, or more visibility in the market given by consumers that appreciate their efforts.

[6] http://ec.europa.eu/clima/policies/ets/index_en.htm
[7] http://ec.europa.eu/fisheries/cfp/fishing_rules/tacs/index_en.htm
[8] http://unfccc.int/kyoto_protocol/mechanisms/items/1673.php
[9] http://ec.europa.eu/agriculture/cap-post-2013
[10] http://ec.europa.eu/agriculture/envir/measures/index_en.htm

Table 1.3 Types of Market Based Instruments for ecosystem services

Type	Exclusive characteristics	Specificities	Relation to markets	Examples of application
Direct deals*	Deals where an environmental product is directly traded between economic actors	Can be framed at the international, national, regional, local level, at a great variety of scales and deals	Proximity to the market definition depends on cases and the degree of commodification	Non-wood forest products, ecotourism
Tradable permits	Ad hoc markets where users of an environmental resource need to purchase ''permits'' that can be further exchanged among resource users	Designed to either serve a clear environmental objective (with biophysical indicators) or based on acceptable social costs (market price for carbon)	Creation of a specific market for a given environmental objective, information are expected to be revealed	Carbon emission quotas in the European ETS, voluntary carbon markets, mitigation banking for biodiversity
Regulatory price signals	Consist in regulatory measures that lead to higher or lower relative prices	Part of a fiscal policy with environmental objectives and control by public authorities	Based on an existing market	Eco-tax (punish activities with negative externalities), agro environmental measures (reward activities with positive externalities)
Voluntary price signals	Consist in schemes whereby producers send signals to consumers that environmental impacts are positive (in relative terms) and consequently gain a premium on the market price	It depends to the willingness to pay by consumers	Uses existing markets to identify and promote virtuous activities	Certification (e.g. Sustainable Forest Management)
Reverse auctions	Mechanisms whereby candidates to service provision set the level of payment (if accepted) in response to a call by public authorities to remunerate landholders	Aimed at revealing prices and avoiding free-riding and rent seeking	Create an auction-based market that favours competition among bidders for achieving cost-efficiency	Payments for ecosystem services (e.g. Bush Tender in Australia)
Coasean-type agreements	Ideally spontaneous transactions, without public intervention) for an exchange of rights in response to a common interest of the beneficiary and the provider	Require clear allocation of property rights; they are highly site-specific and difficult to replicate on a large scale	Usually not following market rules, more of a contractual nature	Payments for ecosystem services (*sensu* Wunder), conservation concessions

Source: modified from Pirard (2012).
Note: * Pirard named this category "direct markets", while we prefer to call it "direct deals", being the term "market" linked to all the types of instruments

v. **Reverse auctions** are types of auctions where sellers compete to obtain the business from the buyers. This approach is for example applied in the Bush Tender Programme[11] in Victoria, Australia. In this, aiming at improving native vegetation on private land, private owners tender for agreements to better manage their resources. In this example, those that offer the best value for money receive payments from Department of environment and primary industry. According to Salzman (2005) this type of payment scheme effectively creates a market dynamic, where potential

[11]http://www.depi.vic.gov.au/environment-and-wildlife/environmental-action/innovative-market-approaches/bushtender

purchasers bid against the others.

vi. **Coasean type agreements** derive the name from the theorem of Ronald Coase, which in 1960 advocated that, if transactions cost is sufficiently low, economic agents trade externalities more or less spontaneously, without public intervention and with efficient results. Examples of this type of instruments are Payments for Ecosystem Services (PES). PES are voluntary transactions where a defined environmental service, or a land use likely to secure that service, is transacted. Those who benefit from an environmental service (e.g. users of clean water) pay for such service and those who contribute to generating the service (e.g. upstream land users) are compensated for providing it (Wunder, 2005; Pagiola and Platais, 2007). Payments should cover at least the perceived opportunity cost of service provision, but should not exceed the social value of the incremental environmental service delivered (Prokofieva et al., 2012).

Due to ecosystem services' heterogeneity and complexity, and due to the fact that the contexts in which the attribution of economic value to ES occurs can highly vary (in terms of presence/absence of property rights and regulation of ES provision, stakeholders involved etc.), sometimes only a combination of MBI is able to describe the situation. That is, for specific contexts, the commodification of a given ES occurs through an overlapping of different MBI.

1.3 Application of MBI to Non-Wood Forest Products and to climate regulation deriving from the carbon sequestration function of forests

The general scope of this research is to analyse the application of Market Based Instruments to forest ecosystem services. Due to the vast array of forest ecosystem services and of goods and benefits that derive from them, one category of goods, and one of benefits deriving from forests, were selected. The choice was driven by the logic of focusing on those which, at present, have experienced a significant and considerable commodification. As previously stated, according to the literature on MBI for ES, commodification does not necessarily implies the creation of standard units, but it means considering nature from an utilitarian perspective, with the association of a monetary value.

Many forest goods and benefits have experienced commodification. This is, for instance, the case of water, for whose provision in Europe in 2013 more than $60M have been paid, mainly by privates, through the conservation of water-critical ecosystems (Bennett and Carroll, 2014). This is also the case of habitat conservation, which experienced association of monetary values through biodiversity and mitigation banking initiatives[12]. However, even in presence of manifold examples worldwide, the management of many goods and benefits such as water and biodiversity is still mainly associated to the use of laws, instead of prices. In the European Union, for example, from October 2000 is in place the "EU Water Framework Directive"[13], with the purpose of establishing a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater. The first point of

[12] For cases of MBI applications to water and biodiversity refer, for example, to the publications of Ecosystem Marketplace "Beyond carbon: biodiversity and water markets" (Ecosystem Marketplace, 2009) and to the publication on the state of watershed investments (Bennett and Carroll, 2014).

[13] Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy.

the Directive states that "*Water is not a commercial product like any other but, rather, a heritage which must be protected, defended and treated as suc*h", underlying that this resource must not be managed only through the use of Market Based Instruments, but with law. Similarly, even if for habitat conservation many examples of Payments for Ecosystem Services do exist, habitat conservation in Europe is mainly pursued through the use of law instead of prices. The Habitats Directive[14] (together with the Birds Directive[15]) represents the cornerstone of Europe's nature conservation policy, and it based on Natura 2000 network of protected sites and a strict system of species protection.

On the contrary, for the significant commodification that they have experienced, Non-Wood Forest Products (NWFP) as general category of goods, and climate regulation, deriving from the carbon sequestration function of forests, as a benefit, were selected.

Non-Wood Forest Products and climate regulation, deriving from the carbon sequestration function of forests, have experienced a wide process of commodification. They are the objective of the present research

The following paragraphs illustrate the process of commodification that NWFP and climate regulation, deriving from the carbon sequestration function of forests experienced; together with this, is provided the state of the art of the application of specific MBI to the products in question ("direct deals" and "voluntary price signals", for NWFP and "tradable permits" for forest carbon, whose choice is justified by the preliminary results presented in Chapter 3.1).

Non-Wood Forest Products and Services (NWFP&S) markets, like any other markets, are the physical or non-physical places where sellers exchange goods and services, formally or informally, with buyers for money. Broadly, NWFP&S markets can be of three types (Pettenella et al., 2006):

i. mass market: products or services on the mass market are undifferentiated and are aimed at reaching a wide range of potential buyers;
ii. specialized market: specialised NWFP&S have high added value, they have recognisable characteristics, such as quality or origin, or they are innovative products. They are not aimed at reaching a wide number of consumers, but rather a smaller, niche, segment of the market;
iii. complementary NWFP&S market: complementary NWFP&S associate products with services. This type of market connects products with activities, in many cases related to tourism and recreation. The characteristic of complementary products and services is the combination of relationships and territorial features, which gives values capable of differentiation from similar other areas (Gios and Rizio, 2012). The complementary NWFP&S play an important role in the promotion of local rural development strategies that foster local business and networks (Pettenella et al., 2006; Pettenella et al., 2007).

Examples of the different types of market are illustrated in Table 1.4.

[14] Council Directive 92/43/EC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora
[15] Council Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds

Table 1.4 Characteristics of NWFP&S according to the different types of market

NWFP&S type	Products		Services	
	Description	Examples	Description	Examples
Mass produced	Raw material with low level of differentiation, large number of consumers easily recognized, high competition, price sensitive widely available	Berries (Finland); Cork (Portugal)	Public goods, not well differentiated	Recreational activities without a fixed quota
Specialised	Niche products, high added value, unique territories, very well differentiated products, high innovation: they are available in limited quantities or under special or seasonal environmental conditions	Birch sap (Finland); Truffles (Italy)	As for commodities in specialized markets, but with references to services	Migratory birds watching

Complementary products and services	**Products and services**	
	Description	**Examples**
	Products and services are offered and consumed as complementary, usually in a specific territory	Truffles and tourism (Croatia); mushrooms and tourism (Italy)

Source: modified from Pettenella et al. (2006) and Pettenella et al. (2007)

1.3.1 Non-Wood Forest Products

Non-Wood Forest Products (NWFP), are defined as "*products of biological origin other than wood derived from forests, other wooded land and trees outside forests"* (FAO,1999). The acronym NWFP comprises products such as cork, seeds, nuts, acorns, forest fruits, mushrooms, truffles, medicinal herbs, chestnuts, litter, foliage, gums, resins and essential oils.

Non-Wood Forest Products are products of biological origin other than wood derived from forests, other wooded lands and trees outside forests

NWFP, when not subject to private ownership, are characterized by rivalry, because their consumption by some reduces options for others, and by non-excludability, because none excludes their collection. This is typically the situation of many developing countries, where forest dependent communities base their livelihoods also on NWFP, which can be, in most of the cases, freely collected. This is also the case of some North European countries, where Everyman's right grants to everybody the right to pick berries, mushrooms, flowers, dry twigs and branches, cones and nuts found on the forest floor in all forests, as long as these products are not protected species[16]. For these

[16] There are some exceptions: mosses and lichens and fallen trees are not allowed to be collected on land owned by somebody else. There is no right to dig the land and to drop or leave litter. Finland's Penal Code mentions the most important natural products which may be collected on other people's land. Many other plants may also be collected unless they are protected under the Nature Conservation Act. In Lapland, the Ministry of Agriculture and Forestry may deny to non-resident people gathering on state owned land, if the collection of NWFP is established to having significant importance for local people's livelihood (Bauer et al., 2004).

characteristics, NWFP are commonly described as a common pool, or open access resource (e.g Wunder and Thorsen, 2012). Sometimes the relative abundancy of NWFP with respect to the pressure over the resource can even place NWFP in the public good category (non-rival and non-excludable).

However, in some countries, such as many EU countries, demand for these products was so high that public authorities introduced property rights to control their harvesting (Bauer et al., 2004). Regulations were mostly set for limiting the overexploitation of the resources. NWFP have therefore experienced the transition from “common pools” to “private goods”.

On the other hand, no matter which the NWFP-related property rights are, many NWFP have been commercialised, from immemorial times, in markets all around the world. Think of the spice trade between Asia and Europe, which found its way through the Middle East before the beginning of the Christian Era. Traded locally, regionally, nationally or internationally, NWFP such as gum Arabic or cork, or specific herbs have widely experienced a process of commodification. Some others, on the contrary, did not find possibilities of market.

The socio-economic contribution of these products to livelihood, when collected in wild or semi-wild (see Box 1.2), is today recognised as an essential component of the modern concept of sustainable forest management (MCPFE, 2003; Vantomme and Walter, 2003; The Montreal process, 2009). The managing also for NWFP provision gives additional economic value to forests. NWFP commercialization, by increasing the economic value of the forests, is promoted as a strategy for both conserving forest ecosystems and contributing to the livelihoods of people that depend on forests (UN, 2000; Wilsey and Radachowsky, 2007). However, some issues can challenge NWFP commercialization (Box 1.1).

Box 1.1 Issues that can challenge NWFP commercialization

Numerous and diverse issues can challenge NWFP commercialization. Wilsey and Radachowsky (2007) report that the numerous potential challenges described in the literature can be ascribed to three general categories of concerns. Often these are interconnected.

i. Ecological concerns are related to the potential for negative consequences that harvesting can have to NWFP populations themselves, including decrease of genetic diversity, and broadly to animals and plants communities, habitats and ecosystems (and Levey, 2002, Murali et al. 1996, Ticktin and Shackleton, 2011);
ii. Economic concerns refer to the potential failures of market strategies due to factors such as market environment, value chain characteristics, economies of scale etc. An intrinsic problem of NWFP is that their nature of wild products cannot in many cases feed the global appetite for resources and this can push the production to shift toward domestication and cultivation (Homma 1996) (refer to Box1.1);
iii. Socio-political concerns are related to contextual elements of NWFP value-chain’s actors (in particular harvester and producers), in terms of tenure and rights and effects on the broader contribution of NWFP to rural livelihoods. Often there can be unintended and disruptive effects caused by commercialization (Wilsey and Radachowsky, 2007).

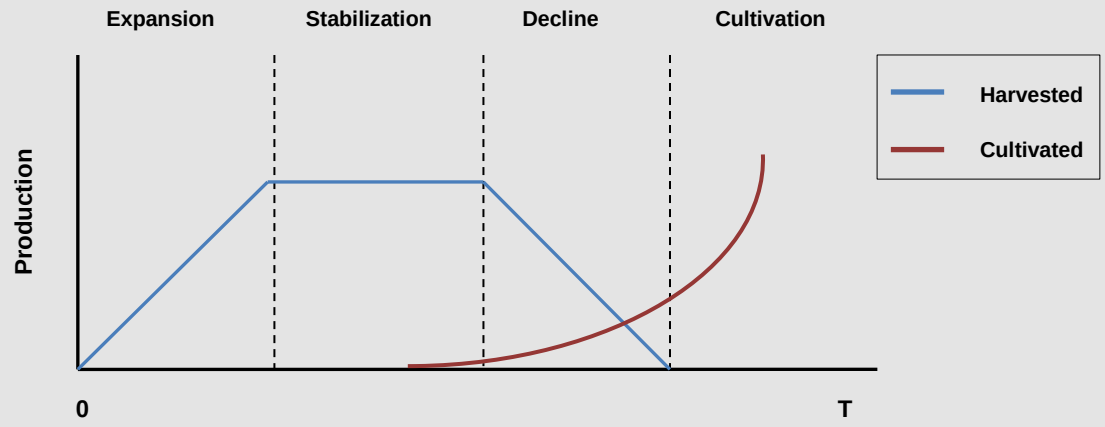
Box 1.2 Wild, managed, and cultivated NWFP

According to their management options, Belcher et al. (2005) subdivided NWFP in three main categories,

i. "Wild products" are harvested from forests, or other wooded lands, with little to no structural transformation. The regeneration of the species is dependent to natural processes; forests follow natural succession stages. These systems tend to require low labour and provide low products per unit area;
ii. "managed products" are the outputs of forests which are partially transformed through activities, such as weeding or canopy opening, in order to foster the production of the targeted species, which still regenerate through natural processes. Natural succession of forest, as well, still functions. Multiple uses of forest is possible and a relatively high biodiversity is maintained. As logical, these systems require more labour of the previous category;
iii. "cultivated products" are the outputs of plantations and crop systems. In these, forests are completely transformed and they lose their characters of naturality. This option requires even more labour and it commonly gives more outputs per unit.

Homma's theoretical model of extractive production suggests that over time and space, the collection of natural products shifts from harvesting in the wild to cultivation and/or to other, less expensive, alternatives (Homma, 1996) (Figure 1.2).
Although crop systems are able to provide more outputs per unit, Pierce et al. (2008) deduced that during the process of transition from forest to farm, the integrated ecosystem conservation and livelihood benefits associated with collection are likely to decrease.
In contexts such as European landscapes, whose pattern have been shaped from millennia by people, forests have been in most of the cases transformed, also for increasing NWFP production. In the European context, following Belcher's classification, both "wild" and "managed products" are likely to be linked to the delivery of the associated benefits.

Figure 1.2 Homma's theoretical model of extractive production system dynamics



Source: Homma (1996)

1.3.1.1 Economic importance of NWFP in European Union and Italy

Non-Wood Forest Products have a fundamental role in the rural economy and their harvesting and commercialization represents a source of income as well as a social behaviour all around the world (Burgener and Walter, 2007; Shackleton et al., 2011).
Estimates say that globally NWFP play a key role in the livelihoods of more than 300 million people, especially in rural context (Byron, 1997 in MEA, 2005) both for subsistence (food,

medicine, building material, traditional uses) - particularly in developing countries[17]- and for trade. Understanding NWFP values helps to highlight their importance in national economies and forest management strategies.

Despite their importance, there is a lack of data on NWFP production and trade. Few countries monitor their NWFP systematically, so an accurate assessment is difficult. Attempts have been made by FAO, in the Global forest resource assessment (FAO, 2005; FAO, 2010). However FAO (2015) stressed the difficulty to obtain reliable and consistent data on NWFP, mostly because globally the majority of NWFP is collected for household consumption and does not enter the commercial marketplace, or illegally/informally enter. Data on non-commercial values are generally unreliable or absent and data on the commercial value is certainly a substantial underestimate of the overall picture. Moreover, data on NWFP is often mixed with information on cultivated products. In addition, NWFP have a high degree of heterogeneity in terms of source, production systems and end uses, and each group has a high variety also in trade channels. NWFP market cannot be considered a unique market, but rather a sum of smaller markets. The lack of clear definitions of NWFP terminology and the absence of a relevant product classification system further contributes to a high level of dispersal of data, both on production and trade. This also makes difficult to aggregate country statistics to regional and global levels (Vantomme, 2003).

In Europe, there is a growing interest for NWFP and for the important role that their commercialization can play in providing economic value to European forests. In recent times, the commercial viability of NWFP has been enhanced because of a synergic number of factors (Mantau et al., 2001, Merlo and Croitoru, 2005) :

i) the growing demand for environmentally, socially friendly and healthy products, jointly with the rediscovery of traditional values and activities;
ii) the decreased profitability of traditional forestry based on wood;
iii) policies in support of the sector, and in particular the rural development policies.

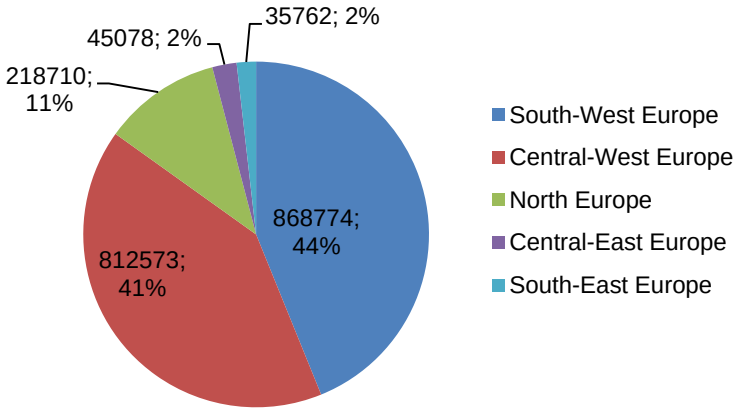
As in the rest of the world, also in Europe there is difficulty of inserting NWFP in comprehensive forest surveys. As it is stressed by the report on the State of Europe`s Forests, this is mainly because most of the products are site-specific and have only local importance (Forest Europe, UNECE and FAO, 2011). The report indicates that the total value of NWFP in the European region in 2011 was equal to € 2.763 billion, of which 83% was made up by plant products. This value has almost tripled since the 2007 assessment, even if this is partly due to the improved reporting. Nevertheless, the same data have been re-evaluated by FAO (2015) at €4.53 billion for the same geographic area and year, showing a persistency of data unreliability.

Even if in the framework of shortcoming of data, Forest Europe highlighted that the importance of NWFP differs among European countries (Figure 1.3). In the Mediterranean region, NWFP may be of greater importance than wood products (Merlo and Croitoru, 2005). In particular, in central and south west European regions, NWFP have an important value also with respect to the roundwood production (Figure 1.4)[18].

[17] About 80% of the population of the developing countries use NWFP for health and nutritional needs (http://www.fao.org/forestry/nwfp/en/), 150-200 million of indigenous people, in over 70 countries, depend on NWFP for food security, medicinal, culture, traditions, religion (CIDA,1998 in MEA,2005).

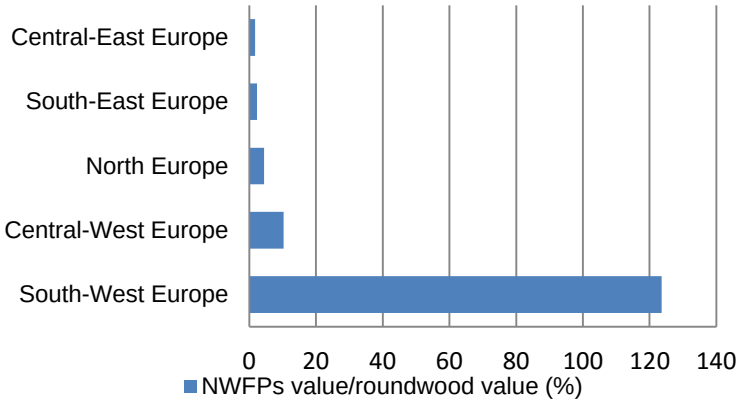
[18] The main products identified are Christmas trees, mushrooms and truffles, fruits and berries, cork, seeds, game products and honey.

Figure 1.3 Share of total value of marketed NWFP (plant products) in 2010: absolute values, given in EURx1000, and percentage



Source: modified from Forest Europe, UNECE and FAO (2011) data

Figure 1.4 Annual value of NWFP as % of the annual value of industrial roundwood in EU regions in 2010



Source: based on Forest Europe, UNECE and FAO (2011) data

In Italy, NWFP such as wild mushrooms, truffles, chestnuts, pinenuts, acorns, cork, as well as hundreds of medicinal plants, are historically importance. In general, the process of urbanization caused a decline of the collection of NWFP. However, the situation substantially differs from product to product and from region to region, and in some contexts there have been a socio-economic rediscovery of some specific NWFP. NWFP, once used and consumed only in the production areas, especially for livelihoods, are also gaining the interest of other consumers, living in urban areas (ISEA, 1983). The commercialization of these products has the potential of increasing the value of the forests of many areas which suffered the process of management abandonment.

The economic value attributed to NWFP in Italy is today confirmed by the organization, in some regions, of associations of producers and by the rise of initiatives of commercial promotion and enhancement, such as the definition of origin and territorial labels (Protected Geographical Indication, Protected Designation of Origin, Traditional Speciality Guaranteed),

in accordance with the EU Regulation 510/2006[19] (Pettenella, 2009).

In the process of NWFP valorisation an important role was played the revision of property rights (Croitoru and Gatto, 2001). For example, from the Thirties, laws are in place for the harvesting and the commercialization of medicinal plants (e.g R.D. n.772/1932[20]; L. n.1724/1940[21]; L. n.1421/1942[22]). Another example is the one of mushrooms: because of human pressure over the resource was too high, laws for mushrooms collection were established. Some regions and autonomous provinces, such as Autonomous Province of Bolzano (1972) Autonomous Province of Trento (1973), Valle d'Aosta (1976), Veneto (1974), Liguria (1979), Emilia Romagna (1977), Umbria (1980) and Molise (1982) were pioneers in the definition maximum quantity allowed for the collection. With the introduction of the national law on the collection and marketing of fresh and preserved wild mushrooms (L. n. 352/1993)[23] it was defined that all the regions and autonomous provinces have to regulate the collection and the authorization for the collection. The regions also establish the maximum quantity of mushrooms to be collected for each species and the areas in which the harvesting is allowed, the collection period and the species which can be traded. The sale of spontaneous mushrooms is subjected to municipality's authorization. Other laws[24] regulate the trade of mushrooms, which must be done after a mycological inspection, and introduced the qualitative mentions under which mushrooms have to be traded.

The majority of Italian regions, for mushroom collection, adopted the use of picking permits, with specifications that highly differ for region to region (e.g. who has to pay the permit, who is exempted, cost of the permits, who cash in the payment, how the revenues are used etc.). According to this mechanism, a person that is willing to collect mushrooms is enabled to harvest against the payment of a given sum of money, which usually is given to municipalities or comparable competent authorities. Following Pirard's categorization of MBI, this example falls in between the "regulatory price signal" mechanism, which consists in assigning, on a mandatory basis, a price to an environmental product/service, or impact, and "tradable permits", which refer to the mechanism of exchanging permits/quotas among actors for the use of the resources.

Regarding quantities and values of NWFP produced and traded as physical products, the Italian Institute of Statistic (ISTAT) was used to report data with reference to the most valuable Italian products, such as chestnuts, pinenuts, mushrooms, white truffles, black truffles, hazelnuts, blueberries, acorns and two types of cork (Table 1.5). However, information reported by ISTAT is not complete, both because the informal part of the production is not tracked, and because of leaks in statistical data reporting by Italian regions.

[19] Council Regulation (EC) N. 509/2006 of 20 March 2006 on agricultural products and foodstuffs as traditional specialities guaranteed

[20] Regio Decreto 26 maggio 1932, n. 772 (*Elenco delle piante dichiarate officinali*)

[21] Legge 30 ottobre 1949, n.1724 (*Disciplina della raccolta e della vendita di camomilla*)

[22] Legge 9 ottobre 1942, n. 1421 (*Disciplina della raccolta e del commercio della digitale*)

[23] Legge 23 agosto 1993, n. 352 (*Norme quadro in materia di raccolta e commercializzazione dei funghi epigei freschi e conservat*i)

[24] Such as law on the gathering and commercialization of fresh and preserved mushrooms (D.P.R: 14 luglio 1995, n. 376 [*Regolamento concernente la disciplina della raccolta e della commercializzazione dei funghi epigei freschi e conservati*]). The law regulates the mycological inspectorate (criteria for the issuance of mycological certificates, etc.). The sale of fresh mushrooms is subjected to municipality's authorization, and only those sellers recognised as adequate in identifying mushroom species can sell the product. Moreover, for selling mushrooms a sanitary authorization is needed. Another law sets that the dry mushrooms on sale must be accompanied by the denomination extra, special, commercial, crumbs, in powder, depending on the quality of mushrooms (D.M. 9 ottobre 1998 [*Menzioni qualificative che accompagnano la denominazione di vendita dei funghi secchi*]).

Unfortunately, ISTAT suspended the reporting of forest and NWFP statistics in 2011[25]. At that moment, figures from ISTAT showed a consistent national production for several products, even with a general, constant, decline through years (Table 1.5).

Table 1.5 Production of NWFP in Italy 1940-2010, in 1000 tons

	1940	1950	1960	1970	1980	1990	2000	2010
Chestnuts	268.1	258.5	165.7	72.4	63.4	49.6	63.2	51.3
Pinenuts	2.87	3.24	3.83	4.92	1.57	1.85	3.34	0.63
Cork*	9.51	12.82	12.29	15.19	15.38	7.8	14.44	8.39
Wild mushrooms	10.14	4.76	9.14	8.6	1.21	1.79	1.12	1.33
Acorn	75.61	112.54	92.91	73.73	13.65	3.97	2.73	0.41
Hazelnuts	3.0	3.1	3.6	5.3	6.2	6.9	7.0	7.0
Truffles		0.0304	0.0764	0.0838	0.0714	0.1074	0.0979	
Blueberries		0.3676	0	0.346	0.5228	0.0732	0.1258	

Source ISTAT [25]

Note: *Two types of cork are gathered together (*sughero gentile* and *sugherone*)

For some fruits and nuts, due to their economic, social or environmental importance, the Italian Ministry of Agricultural, Food and Forest Policies set specific National plans. For example, the aim of the Ministerial Decree on the value chain board on shell fruits (D.M. n. 4824/2011)[26] was to gather experts and supply chain actors in order to develop a plan for enhancing the sector of shell fruits (chestnuts, hazelnuts, almonds, walnuts, pistachios, carobs), through commercialization. Some of the fruits are actually cultivated products, falling therefore out of the objective of the present study. However, chestnuts are not, being considered semi-wild agro-forestry products. In 2010 the Ministry of Agricultural, Food and Forest Policies developed the National plan of the chestnuts sector 2010/2013 (Ministero delle politiche agricole alimentari e forestali, 2010). After that version, the Plan has not been renowed. According to the document, the chestnuts woodlands cover around 780,000 ha in Italy, which is around 7.53% of the Italian forest surface. The surfaces of Piedmont, Tuscany and Liguria account for more than 50% of the national chestnuts heritage. Other Regions have chestnuts areas higher than 30,000 ha, such as Lombardy, Calabria, Campania, Emilia Romagna and Lazio. According to the Plan, the Italian production in 2010 was about 50-70,000 tons (a quantity higher than the one reported by ISTAT- Table 1.5). The Plan also reports that Italy is the main global exporter of chestnuts in terms of value (63.56M$) and the second in terms of quantity traded (17,442 tons), after China (Italian chestnuts in the International market are sold at higher price with respect to Chinese ones).

The Plan underlines the importance of the export for the chestnuts sector, which is able to gather on average 35-40% of the Italian production. The most important regions for export are Campania and Piedmont.

[25] The available data are reported in the national time series of wood and non-wood products of the forest http://seriestoriche.istat.it/index.php?id=7anduser_100ind_pi1%5Bid_pagina%5D=36andcHash=03f6ebd7aeaceeccd0e3fa1e729f8268).

[26] Decreto Ministeriale 10 marzo 2011, n.4824 (*Tavolo filiera frutta in guscio*)

In the latest years chestnut production has been strongly affected by diseases such as chestnut blight (*Cryphonectria parasitica*) and Ink disease (*Phytophthora cambivora*, *Phytophthora cinnamomi*). Recently, the Italian production has been dramatically halt by the chestnut gall wasp (*Dryocosmus kuriphilus* Yasumatsu), which is considered one of the most harmful insects in the world for chestnut fruit production[27].

Problem statement

Globally, as in Europe, as in Italy, the lack of information on many statistical data and NWFP markets, in terms of dimension and structure, quantities and values traded, represents a barrier for decision making, both at level of enterprises and governments. Key issue risen by FAO's studies revealed that the best available NWFP statistics are those on NWFP that are internationally traded (Vantomme, 2003). Researches on NWFP market shall therefore start from the analysis of the international market. On the other side, for the strict link that these products have with local cultures and traditions, for addressing the market structure, the best scale is the local one.

1.3.1.2 NWFP supply chains

As for any other types of products, the commercialization of NWFP can be articulated in supply chains. Supply chain is defined as "*a system whose constituent parts include material suppliers, production facilities, distribution services and customers linked together via the feed forward flow of materials and the feedback flow of information*" (Steven,1989). Another supply chain definition is "*the network of all the individuals, organizations, resources, activities and technology involved in the creation and sale of a product or a service, from the delivery of source materials from the supplier to the manufacturer, through to its eventual delivery to the end user*".
The two definitions underline the concept of economic actors organized in a network and the coordination of the economic actors, within the common scope of the delivering to customers. The economic actors of a theoretical NWFP supply chain can be identified in:

i. producer: economic actor who gathers NWFP from forest or other wooded land for commercial purposes[28];
ii. processor: economic actor involved in the NWFP supply chain that purchases raw NWFP to transform them into a final or semi-finished product;
iii. wholesaler: intermediary actor that trades between two or more actors, and does not sell the products to end-users;
iv. retailer: actor of the NWFP supply chain that sells goods to the end user.

Sometimes the roles can overlap. As for other products, there could be vertical integration, that is, an enterprise is engaged in different part of the supply chain, owning, at different degrees, its upstream suppliers and its downstream buyers. On the contrary, horizontal integration refers to a strategy where an enterprise acquires production units for outputs which are similar, resulting in handling the same part of the production process. Horizontal

[27] Native to China, it was firstly accidentally introduced in Japan (1941), than the international trade of chestnut let the gall wasp spread to Korea (1963), United States (1974) and to Italy in 2002. For fighting it, the Italian Government through the Ministerial Decree 22675/2011 allocates loans to the regions for the building of centres for the multiplication of *Torymus sinensis* Kamijo, a natural antagonist of the *Dryocosmus kuriphilus* Yasumatsu.
[28] Actors that do not commercialise the products were excluded.

integration is similar to horizontal alliance; the second occurs when two or more organizations make an agreement with a common scope, which usually is cost reduction, or improved earnings, or improved service for the customers. Horizontal alliances typically occur when two enterprises decide to sell together complementary products and services (horizontal alliance for sale); or when two enterprise undertake economic activity together (joint venture horizontal alliances); or when two enterprises co-brand their products and services in a specific geographic region (geographic-specific horizontal alliance) (Kuglin and Hook, 2002). The difference between horizontal integration and horizontal alliance is that in the case of a horizontal alliance, the companies define a contract, but remain independent.

Forms of integration are cooperatives, which are groups of persons united voluntarily with a common economic, social, or cultural interest through a jointly owned enterprise, which is democratically controlled. Cooperatives can be for profit or non-profit, and their members can be the persons that use the services (consumer cooperative) or the same persons that work in the cooperative (worker cooperative)[29]. When the cooperative is run by volunteers, for different types of goals, is defined as a voluntary cooperative. The most basic form of voluntary cooperative is a voluntary association, which in Italy is usually not for profit.

NWFP supply chains can highly vary in complexity, ranging from international supply chains to very short supply chains. Being several NWFP edible products, they are traded through the so called "food supply chains". Short Food Supply Chains (SFSC) are a type of these.

SFSC have established in parallel to conventional food chains, as an alternative to the globalized agri-food model (Galli and Brunori, 2013). The concept of SFSC recently emerged within the debate on "alternative food chains" (Ilbery and Maye, 2005), "alternative food networks" (Goodman and Goodman, 2009) and "sustainable food chains" (Roep and Wiskerke, 2006).

Short Food Supply Chains are those supply chains that are able to generate forms of connection between food producer and food consumer, no matter the number of times a product is handled or the distance over which it is delivered.

Short Food Supply Chain is a term that describes a broad range of food production-distribution-consumption configurations. Marsden et al. (2000) defined SFSC those supply chains that are able to generate forms of connection between food producer and food consumer, no matter the number of times a product is handled or the distance over which it is delivered. What is crucial is the fact that the product reaches the consumer embedded with information. Information could be printed on the packaging of the product or communicated at the point of retail, or being an asset well known by customers. SFSC "*enables the consumer to confidently make connections and associations with the place/space of production, and, potentially, the values of the people involved and the production methods employed*".

Marsden et al. (2000) and Renting et al. (2003) identified three different types of SFSC, with respect to its organisational structure:

i. face-to-face SFSC: consumers buy a product directly from the producer/processor on a face-to-face basis and trust. The distance can be either physically short (e.g. farm market) or virtually short (e.g purchasing on internet);

[29] There are other types of cooperatives, such as housing cooperatives and credit unions cooperatives.

ii. spatial proximate SFSC: the space extends beyond the direct interaction. Products are retailed in the specific area of production, such as a region, and consumers, when purchasing, are aware of the “local” nature of the product;
iii. spatially extended SFSC: the distance is bigger, and consumers are put in connection with the area of production, even if they do not have personal experience of that area (e.g. through the use of territorial labels and/or certification).

Interest in SFSC is growing due to their potential to contribute to more sustainable food systems. The application of the SFSC to agriculture is considered one of the most important tools to strengthen rural development, by positively interacting with economic, social and environmental key issues (Goodman and Goodman, 2009; Bertazzoli et al., 2010). Same conclusions may be gleaned for products coming from the forest.

Galli and Brunori (2013) wrote that SFSC operate in very different social, economic and political contexts. For this reason, the authors suggested that no common description of the sustainability impacts of SFSC can *a priori* be provided, as they vary from chain to chain. Nevertheless, scientific literature shows that both close physical and close social proximity, in the majority of cases, have favourable impacts on the sustainability of products. Galli and Brunori systematically classified the sustainability aspects of SFSC under the categories of "health and well-being", "environmental", "social" and "economic" sustainability. In particular, the social sustainability is related to the capacity of SFSC to contribute to the fairness among supply chains actors. According to Renting et al. (2003) and Brunori et al. (2011), SFSC make easier to establish fairness because they facilitate consumers’ willingness to pay for products they know and trust, therefore allowing producers to receive a better income; they also implicate the recognition by consumers of producer’s work, methods and place of production. Besides the impact at supply chain level, the meanings attributed to a product, in a certain territory, develops a sense of pride and belonging (Peters, 2012). In the cases where the products traded are linked to local traditions, the commercialization through SFSC also strengthens local culture and identities. SFSC are recognised as favouring interactions between community members, thus strengthening their social capital in terms of networks, inclusion, knowledge and social cohesion (Galli and Brunori, 2013).

The economic sustainability of SFSC is linked to the fact that the enterprises involved in SFSC are typically small and medium enterprises (SME). This mainly occurs because SME are usually less competitive in traditional, “more industrial”, supply chains, because of the lack of economies of scales and organization models. Therefore, SFSC can represent a solution to increase economic viability for SME, providing a better access to the market (Galli and Brunori, 2013). Another characteristic of SFSC is that they take place in contexts where small producers have not advantageous market access. In this framework SFSC are developed as collective economic initiatives, they strength links among local supply chains’ actors and mobilize resource in a synergetic way (Schermer et al., 2006).

By preserving and supporting SME and small farmers/producers, and by encouraging local activities, which are the *fulcrum* of rural economies, SFSC can contribute to rural development (Rosset, 1999; Marsden et al., 2010). However, operating in SFSC also faces barriers, especially in terms of investments: the competition with bigger enterprises that operate in more industrial supply chains may be hard to deal with.

For what concern environmental impacts, SFSC have not by definition a reduced environmental impact, in terms of production, processing, transportation and disposal impact,

with respect to longer supply chains. However, the fact that the products reach the consumers embedded with information means that consumers are likely to be informed about the method of production, which is therefore generally expected to be highly sustainable. SFSC initiatives are often connected to the attachment to nature and seasonal processes in agriculture (Lamine, 2005), and they can similarly be in forestry. Often SFSC are based on local varieties, which are well adapted to local environment (Brunori et al., 2012) and therefore can help the traditional territorial management.

1.3.1.3 NWFP certification

Among the Market Based Instruments, voluntary price signals, and in particular certification, that is "*the provision by an independent body of written assurance that the product, service or system in question meets specific requirements*" (ISO,2015)[30], has been promoted as a solution to address the many ecological, economic, and social challenges associated with NWFP commercialization (refer to Box 1.1) (Viana et al, 1996, Shanley et al. 2002, Wilsey and Radachowsky, 2007).

This is especially true when referring to third party certification, that is, when an independent assessment of a separate accredited third party is conducted. Numerous studies underline that opportunities exist to promote NWFP management and trade through certification[31] (Shanley et al., 2002; Vantomme and Walter, 2003; Burgener and Walter, 2007; Shanley et al., 2008).

Benefits of the use of certification for NWFP can be manifold, ranging from the social sphere, with the strengthening of harvesting rights and broadly the empowerment of local actors, to the economic one, with the creation of additional value and price premium, improved market access, increased efficiency and transparency of the market processes; to the environmental sphere, with the conservation of habitats and species.

However, certification for NWFP is not an easy way down. In 2008, Shanley et al. defined NWFP certification as being "*still in its infancy*". As Shanley et al.(2002) and Burgener and Walter (2007) state, NWFP are a more difficult group of products to certify than timber, due to an array of factors, including their diverse and peculiar nature and social and ecological complexity.

Basic legal factors can limit from the beginning the applicability of certification. A common characteristic of many NWFP is indeed that they are often informally/illegally gathered (Pierce et al., 2008). This can undermine certification, since resource rights it is a fundamental prerequisite for undertaking the process (Pierce et al., 2003).

Economic barriers to certification exist especially when the cost of certification is not affordable. This often happens, because harvesting in the wild requires high labour inputs for low values and for this reason NWFP suffer from diseconomies of scales (Pierce et al., 2008). In addition, the production of many NWFP is also strongly affected by seasonality, which creates discontinuity. Moreover, NWFP are often traded on small scales and in local markets; many products are relatively low in value and with small margin profits because trade systems are not structured for big scale commercialization (Pierce et al., 2003;

[30] International Standard Organisation (ISO) website, http://www.iso.org

[31] First-party certification (or internal audit) occurs when someone from the organization itself audits a good or service to ensure it meets the procedure that the organization has specified. Second party audit is an external audit: one organization audits another under a contract or agreement. Third-party certification involves an independent assessment declaring that specified requirements have been met. In this respect, a certification body is a third-party, accredited body which is entitled by an accreditation body.

Burgener and Walter, 2007). These values chains are also often complex and informal, determining a dispersion of the products and making tracking difficult, as well as making variable the quantity and the quality, issue negatively considered in the certification process (Pierce et al., 2003; Walter, 2006).
Ecological and technical challenges for certification do exist as well, namely the scarcity of ecological information regarding the multiple and diversified NWFP. For some species, the definition of the sustainable harvesting level could represent a difficult assessment (Walter, 2006). Finally, the end-uses of NWFP are very wide, comprising food and food additives, cosmetics, pharmaceuticals components and handcrafts. The classification of all these end products inside a unique "*label*" is still a challenging topic, and therefore a certification of "NWFP" is an even less simple exercise.
A range of certification schemes that can be applied to NWFP exist in the market. They can be differentiated according to the specific focus they have, that usually fall under one of the tree dimensions of sustainability: environmental friendliness, economic viability and social equity. A certification scheme rarely addresses all three dimensions, but focuses only on some aspects of the sustainable use of NWFP (Vantomme and Walter, 2003). However, overlaps and potential synergies between the different certification schemes exist.

Problem statement

Despite the high importance of all three dimensions of sustainability, the ecological sphere should be particularly considered in NWFP certification: since the collection and supply chains are logically based on the presence of the resources, undermining the sustainability of NWFP populations and ecosystems would mean jeopardising both the socio and economic spheres as well. Therefore, an assessment on whether different certification systems contain ecological specifications for NWFP (such as quantity/period/methodology of harvesting), for understanding whether its application lead to a sustainable NWFP collection is needed.

1.3.2 The climate regulation that derives from carbon sequestration function of forests

The climate regulation that derives from carbon sequestration function of forests, which is comprised in the "regulation & maintenance" class of services according to the CICES categorization (Table 1.1), is typically a public good. It is characterized by non-rivalry, because the use by one has no effect on the consumption options of others, and by non-excludability, because no one can limit its access.
From 1988, the International Panel on Climate Change (IPCC)[32] provides the world with scientific view on the current state of knowledge in climate change and its potential negative environmental and socio-economic impacts. IPCC's data show a clear trend toward global warming, mainly due to the increasing concentration of greenhouse gases (GHG) in the atmosphere, due to anthropogenic activities. Recognising these evidences, in 1997 the Kyoto Protocol (KP) was adopted, and entered in force in 2005. The Kyoto Protocol, which is linked to the United Nations Framework Convention on Climate Change (UNFCCC), commits its parties by setting internationally binding emission reduction targets, under the principle of "common but differentiated responsibilities."
Kyoto Protocol also recognised the role of forests in mitigating climate change. Deforestation

[32] http://www.ipcc.ch

and forest degradation today contribute to 10-15% of global GHG emissions (e.g. Schlamadinger and Marland, 1996). It has been estimated that EU forests currently produce a climate mitigation impact of about 13% of the total European Union emissions (Nabuurus et al., 2015)[33].

For the undisputable role played by forests, to fulfil their commitments to limit GHG emissions under KP, according to KP's articles 3.3 and 3.4 (UNFCCC, 2005b), industrialized countries listed in the KP's Annex I can use land-based activities, such as reducing deforestation, establishing new forests (afforestation and reforestation) and other vegetation types, and managing agricultural and forestlands to maximize their function as a "carbon sink" (Schlamadinger et al., 2007). The Italian Government, for example, during the first KP's commitment period (2008-2012) gave land-use, land-use change, and forestry (LULUCF) activities a prominent role in fulfilling its KP commitment. According to EEA (2014), Italy accounts for the largest amounts of credits to be accounted from LULUCF activities within the 15 European Union member countries. This amounted to 75.3 gigagrams (Gg) of carbon dioxide equivalent (CO_2eq), which is about 26% of the aggregated LULUCF net removals of credits accounted by EU-15 (293mGg CO2eq; EEA ,2014).

As an additional way of meeting reduction targets, the KP introduced three market-based mechanisms[8], Emissions Trading, Clean Development Mechanism (CDM) and Joint Implementation (JI), thereby creating what is known as the "carbon market". The flexible mechanisms allow Annex I parties to meet their targets by reducing emissions or removing carbon from the atmosphere in other countries in a cost-effective way. The Emissions Trading allows countries that have emissions to spare to sell the emissions in excess to countries that are over their targets. The JI enables industrialized countries to carry out projects with other developed countries, while the CDM allows investment in projects that reduce emissions in developing countries. What is exchanged between countries is a new commodity that was created in the form of emission reductions or removals: the "carbon credit".

Alongside compliance markets[34], voluntary initiatives to reduce emission rose up internationally, and also in Italy. In the voluntary market companies, individuals and organizations buy emissions reduction credits to counterbalance their carbon emissions on a voluntary basis.

The mechanism implemented through the compliance and voluntary carbon markets is typically the one of the Market Based Instrument "tradable permits". Through the application of the "tradable permit", the carbon credit, and also the one deriving from forests, has become the standard unit globally traded. The carbon sequestration function of forests has this way experienced a transition, becoming a private good, and it has also experienced a process of commodification. Wherever they take place, activities that mitigate GHG emissions contribute equally to reduce global climate change. This, together with the wide diversity in cost of abatement across regions, is the basic principle for a carbon market, as a cost effective solution to reduce global GHG emissions.

[33] This includes both the action of forests and harvested wood products as a carbon sink and carbon stock, and the substitution effect of forest products for fossil-based materials and products

[34] Beyond KP based market, other compliances markets exist, namely the California/Western climate initiative, the Australia carbon farming initiative, the New South Wales greenhouse gas abatement scheme, the Chicago climate exchange initiative (no longer existing (and the New Zealand emission trading scheme. Compliance markets are marketplaces through which regulated entities obtain and surrender emissions permits or offsets to meet predefined regulatory targets.

The following paragraphs illustrate the tradable permits instrument application to the climate regulation that derives from carbon sequestration function of forests in the compliance and in the voluntary forest carbon markets.

1.3.2.1 State of the forest carbon finance

According to the "State of forest carbon finance 2015", a publication of Ecosystem Marketplace that every year monitors the payments done for forest carbon worldwide, over the past six years, $5.1billions have been committed by governments, companies, and individuals (Goldstein and Neyland, 2015). In this framework, the year 2014 saw the most payments for forest carbon offsets ever: companies, governments and individuals committed $705 million in financing the forestry sector with the purpose of emission reduction. In 2014 the payments were channelled in different types of finance, as illustrated in Figure 1.5:

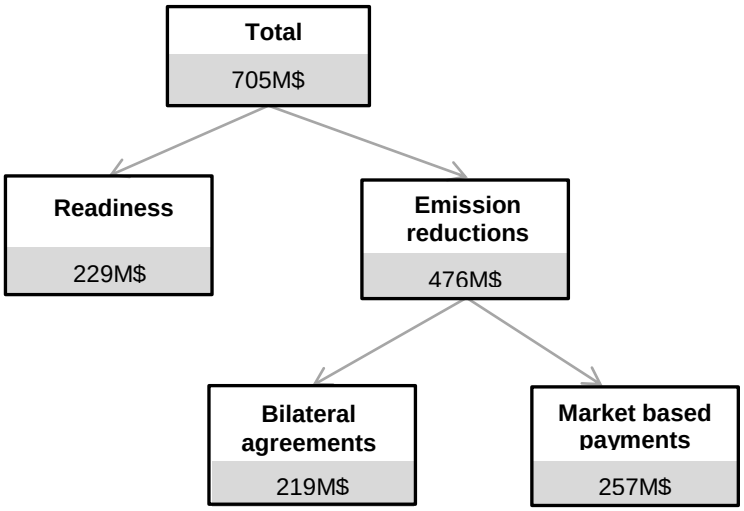
- public sector (mostly) has committed $229M to finance Reducing Emission from Deforestation and Forest Degradation (REDD+) readiness initiatives in developing countries. REDD+ readiness initiatives refer to the mechanism according to which industrialised countries finance developing countries with tropical forests for preparing their forest institutions, their laws, for consulting and engaging stakeholders and for setting pilot activities and strategic plans for REDD+. From 2009 to 2014, 13 tropical countries[35] have benefitting from this mechanism, for a total amount of $2.8B;
- $476M were spent for emission reductions activities, divided in two different types of finance:
  - bilateral agreements, which are result based agreements between two parties. The donor party defines an amount of money that will be disbursed if the emission reductions will be achieved by the beneficiary party, and the letter of agreement is signed by the two parties. Once emissions reductions are achieved and verified, the pledges become contracts, and the payment occurs. In 2014, $219M were disbursed under this type of mechanism. From 2008, $1.1B were paid in total, by three donors[36];
  - in 2014, several types of actors contracted a record 34.4 $MtCO_2eq$ for emission reductions in forest projects through compliance and voluntary carbon markets, at a total value of $257M. Table 1.6 illustrates volumes, values and prices of the two markets in 2014 and over time.

Prices of the forest carbon tonne in 2014, as usually, highly varied, depending on project type, location, standards utilised and stakeholder involved. In 2014 offset prices from 0.5$/t to 53$/t were recorded, with an average price of 5.4$/t in the voluntary market, and more than the double in the compliance market (in the compliance markets prices have always been higher). On the total, about a third was sold between 4 and 7$, and 21% at less than 2$, and this credits typically derived from large projects and from land use activities that require low inputs of time and labour, since also in this market economies of scale contribute in determining the commodity price.

[35] Indonesia ($757M), Brazil ($632M), Mexico ($449M), Democratic Republic of Congo ($263M), Peru ($148), Ghana ($98M), Tanzania ($94M), Vietnam ($84M), Colombia $64M, Liberia $47M, Papua New Guinea $45M, Ethiopia ($40), Ecuador ($23M).

[36] The first bilateral agreement was signed in 2008 by Norway, Germany and Petrobas (a semi-public Brazilian multinational energy corporation) with Brazil's Amazon Fund, with payments to date of $904M ($122M in 2014); the second was signed in 2009 between Norway and Guyana with payments to date of $190M ($80M in 2014); the third was signed in 2012 between Germany (with the initiative REDD early movers) and the State of Acre, Brazil with payments to date of $17M ($17M in 2014).

Figure 1.5 Type of forest carbon finance and payments in 2014



Source: elaboration from Goldstein and Neyland, 2015

Table 1.6 Market based payments for emission reduction in 2014 and over time worldwide

	Value ($MtCO_2eq$)		Value($M)		Average price ($t)
	2014	All years	2014	All years	2014
Total voluntary markets	23.7	156.1	128	933	5.4
Total compliance markets	10.6	37.7	129	329	12.7
Grand total	34.4	193.4	257	1268	7.4

Source: Goldstein and Neyland, 2015

Concerning the location of the projects from where carbon tonnes originate, in 2014 the great majority derived from Latin America (10.9 MtCO2eq/ $46.1M$), especially Peru and Brazil, followed by Asia (Figure 1.6). Compliance markets drove also financing to projects in United States. Europe[37] is the continent where the lower amount of forest carbon tonnes originates from.

Developing countries have always been the place where the majority of the projects have been implemented: if we consider all years since 2008, the great majority of tonnes and value has come from projects located in developing countries (130.5Mt compared to 48.2Mt of developed countries; $699M compared to $353M of developed countries). Arguably this is driven by the purpose of conservation of tropical forests but also by cost-efficiency logics.

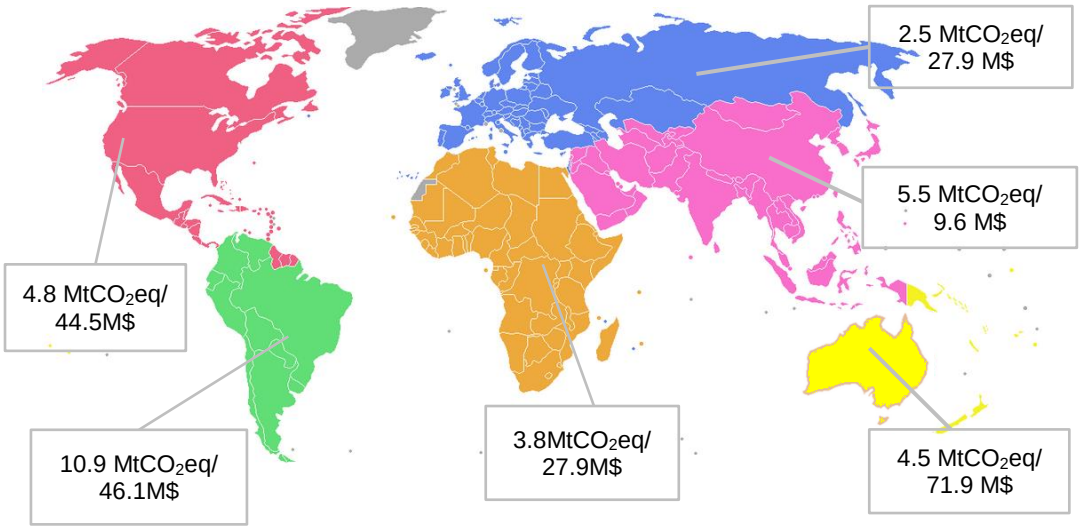
Projects can be characterised according to the types of activity that generate carbon credits (Box 1.3). In 2014, the project type that committed the majority of volume and value globally was REDD+. 41 avoided deforestation projects transacted 16.1 $MtCO_2e$, confirming to be the most utilised activity. REDD+ projects are usually very large in scale, often avoiding emission of half a million tonnes per year.

In the latest Ecosystem Marketplace's publication, flows of transacted volume and value for buyer region were recorded only for the top 13 buyers. Therefore is not possible to determine

[37] Europe as a continent, not only European Union.

the role of European Union as a buyer[38]. However, the previous publication showed that in 2013 Europe was the first continent in the world in terms of transacted tonnes (12.9 Mt), suggesting that also for 2014 Europe should had have a relevant role as a buyer.

Figure 1.6 Transacted volumes and values by continent in 2014



Source: elaborated from data of Goldstein and Neyland (2015)

Problem statement

For what concern Italy, the voluntary forest carbon market was not monitored and analysed before the implementation of the project "Nucleo del Monitoraggio del Carbonio" of National Institute of Agricultural Economics (Istituto Nazionale di Economia Agraria-INEA), to which the present work of thesis took part. The project aims at monitoring and analysing the voluntary Italian forest carbon market, for filling the gap in information and also for transmitting data to the Ecosystem Marketplace for its global survey, which is now actually happening.

Results of the Italian survey are shown in § 3.3.2.

Regarding the compliance markets, being forestry projects excluded from the Emission Trading Scheme, the Clean Development Mechanism is the main compliance forest carbon market that interests European Union, and Italy[39]. As was said before, this flexible KP mechanism allows public and private entities from Annex I Parties to finance greenhouse gas reduction activities, including forest activities (UNFCCC, 2005a), in non-Annex I developing countries. In return, Annex I Parties obtain certified emission reductions (CERs) that are countable against emissions targets.

The Clean Development Mechanism has been implemented using hundreds of different methodologies (UNFCCC, 2013a) targeting a wide array of sectors, with more than 7,600 emission reduction projects registered in over 90 countries, with about 1.6 billion CERs issued (UNFCCC, 2011a).

[38] Some European Union countries are in the top13: Germany ($18.2M), The Netherlands ($5.4M), France ($1.1M), Sweden ($0.1M).

[39] REDD+ mechanisms interests Europe, with some countries very active in financing, but not Italy.

Box 1.3 Forest project types

Carbon credits can be obtained through several carbon emission reduction activities in forest. The most important are those that follow:

- Afforestation/Reforestation (A/R): the establishment of forest on areas without forest cover (afforestation when there was not a forest in that area, reforestation when a forest is re-established in the area) capturing carbon in new tree biomass and other carbon pools. Emissions reductions occur through additional sequestration;
- Agroforestry: land is managed using combined agricultural and forestry strategies, sequestering carbon in trees and/or soil and reducing carbon emissions compared to business-as-usual agricultural practices. Emissions reductions may occur through additional sequestration and/or avoided emissions;
- Improved Forest Management (IFM): existing forest areas are managed to increase carbon storage and/or to reduce carbon losses from tree cuts other silvicultural practices. Emissions reductions may occur through additional sequestration and/or avoided emissions;
- Reduced Emissions from Deforestation and forest Degradation (REDD and REDD+): existing forest areas with demonstrable risk of land-use change or reduced carbon storage are conserved, resulting in the avoidance of a business-as-usual scenario that would have produced higher emissions. Emissions reductions occur primarily through avoided emissions. With the negotiations in Cancun in 2010 it was defined the "plus" as encompassing reduced emissions from deforestation and forest degradation, as well as additional efforts to sustainably manage forests, and conserve and enhance carbon stocks;
- Sustainable Agricultural Land Use (SALM): Land is managed to increase carbon stocks in the agricultural areas. Project activities may especially include better agricultural practices.

Source: Goldstein and Gonzales (2014)

During the KP's first commitment period (UNFCCC, 2005b), and so far also for the second commitment period (UNFCCC, 2011b), afforestation and reforestation (A/R) projects were the only forest types allowed in CDM, excluding activities such as REDD and IFM.
Despite the success of the CDM, the number of registered forestry-based projects under this mechanism has been limited. According to the UNFCCC (2011a), only 55 A/R projects were registered worldwide. According to many stakeholders, one of the main reasons for the failure of A/R in the CDM has been the complexity of preparing these projects (UNFCCC, 2013b). This includes financial, administrative, and governance issues; such as the mechanism's bureaucracy, the temporary nature of forestry based credits, and the length of time an A/R CDM project takes to gain revenue. As a result A/R CDM project have high transaction costs (e.g. Jindal et al., 2008; Thomas et al., 2010) and constraints associated with knowledge and skills, such as the complexity of early methodologies and other social factors (Thomas et al. 2010; World Bank, 2011). Other reasons include the restriction of forestry projects to only A/R activities, and their exclusion from the EU Emissions Trading Scheme, both of which made CDM a niche topic (Arens, 2013).

Problem statement

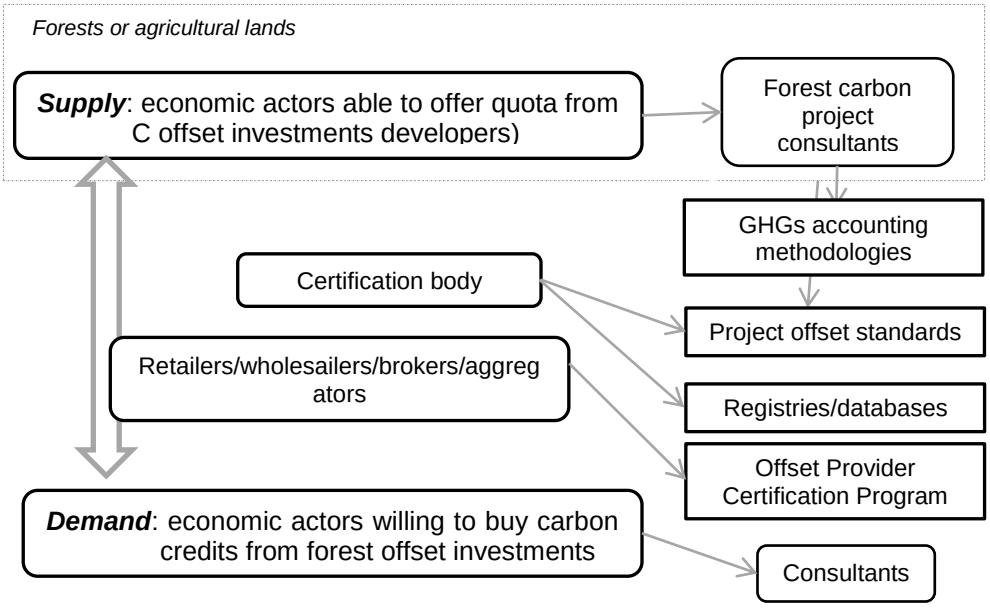
There are no publications on the Italian participation in the Clean Development Mechanisms' forest sector, in terms of number of projects, their dimension, the obtained climate benefits in terms of sequestered CO_2eq, the financing and benefits sharing.

1.3.2.2 Forest carbon supply chains

Several actors are involved in the forest carbon credits supply chain (Figure 1.7). The supply side is made up by the actors that develop forest carbon projects or that are able to put in the market carbon credits deriving from forest activities. In many cases external consultants develop the project, and they do it using GHG accounting methodologies and in compliance with forest carbon standards. Certification bodies evaluate the goodness of the projects against standards' requirement: when verified, the forest carbon offsets are entered in registries. Registries hold and transfer carbon offsets, which are given unique serial numbers to track them throughout their lifetime, and can also retire offsets. Compliance carbon markets each typically utilize their own proprietary registry system. In the voluntary market, there are independent registries.

The demand side is made up by the actors that are willing to buy carbon credits from forest offset investments. They also can rely on consultants. Actors that can be in between supply and demand are wholesalers/retailers/brokers, which usually buy forest carbon credits in bulk and then resell them to the demand actors according to their preferences.

Figure 1.7 Actors involved in the supply chain of forest carbon credits in the voluntary forest carbon market

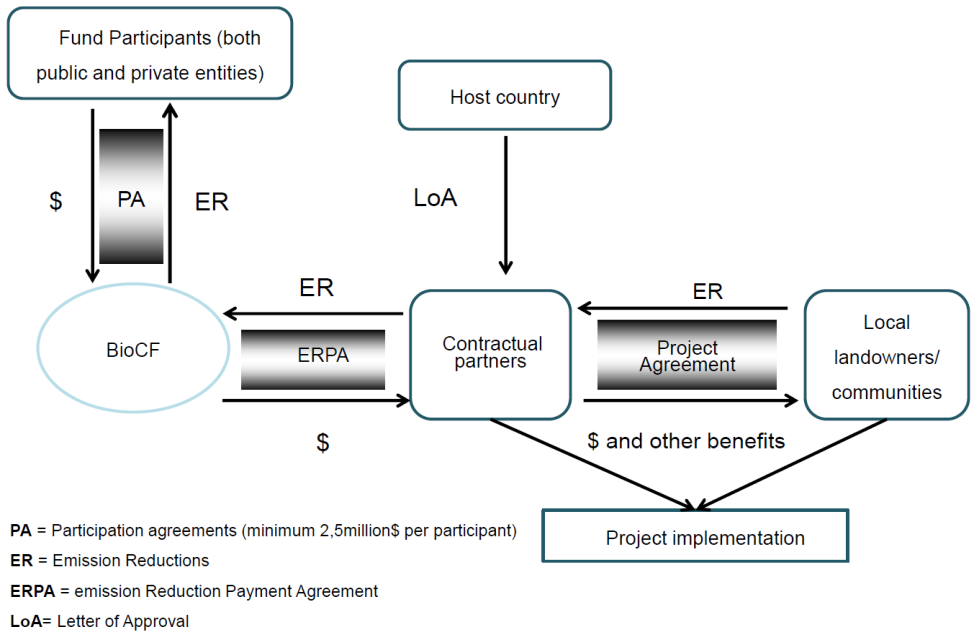


In the compliance market the actors involved are usually different, and this depends to the scheme implemented. For the Clean Development Mechanism there is a Governmental part involved in the financing.

In Italy, the responsible party is the Ministry for the Environment, Land, and Sea. The Ministry entered into an agreement with the World Bank for a carbon fund, the BioCarbon Fund (BioCF). The BioCarbon Fund, administered by the World Bank is a public-private sector initiative mobilizing financing, and it was the first carbon fund in the world to focus on land use (The World Bank Group, 2015). On behalf of its investors, the BioCF purchases carbon emission reductions from projects in developing countries through the so called Emission Reductions Purchase Agreements (ERPAs). The emission reductions are subsequently transferred by BioCF to the participants pro rata their financial participation in the Fund (World Bank, 2011). The BioCF investors can choose to use these reductions

within the Kyoto Protocol or for other greenhouse gas emission reduction regimes.The payment benefits the project stakeholders (that is, contractual partners: governments, private companies, NGOs, research institutions, local communities, and landowners) as per benefit-sharing arrangements agreed with each individual project (The World Bank Group, 2015). The mechanism works as illustrated in Figure 1.8.

Figure 1.8 The BioCarbon Fund mechanism for financing A/R CDM projects



Participants to the BioCF (both public and private sector) are required to commit a minimum of $2.5 million into the Fund (World Bank, 2007). According to The World Bank Group (2015), the BioCF Fund invested about $90 million in 25 projects that have restored 150,000 hectares of degraded lands and reduced deforestation in over 350,000 hectares of land. 80% of the BioCF funding has been utilized for A/R projects under the CDM, and thus far BioCF is the main funding source for A/R CDM activities. Each CDM project may not be entirely financed by the BioCF, but also by external public and private entities, as well as by other WB Carbon funds, in variable proportions. For each CDM project, the entire amount of the emission reduction is not purchased by the BioCF.

1.3.2.3 Standards for forest carbon and co-benefits

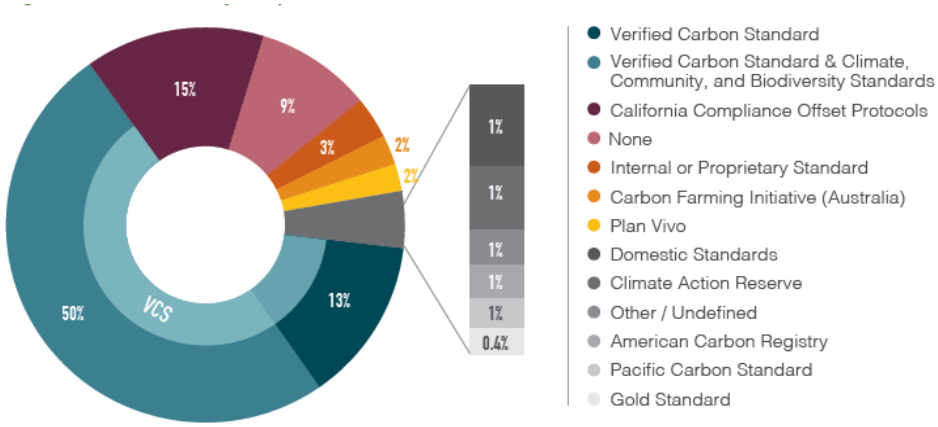
Since the forest carbon tonne is not a tangible commodity and its use is not directly experienced by customers, like other services (e.g. recreational service), it is difficult for the buyer to trust in its "quality". Origin of the carbon tonne, accuracy of its accounting, as well as assurance that the forest carbon projects do not deploy environment and do not bring negative social and economic impacts for local communities, led to the creation of many standards aiming of increasing credibility in the marketplace. Standards are "*set of project design, monitoring, and reporting criteria to which carbon offsetting activities and/or projects' environmental, social and other co-benefits can be certified or verified*" (Goldstein and Gonzales, 2014). Different types of standards for forest carbon projects exist in the market, ranging from those that assure quality of forest carbon accounting, to those that assure co-benefits (environmental, social and economics for local communities), to those that target particular situations, such as the strong inclusion of local communities. Combinations are

possible and rather, desirable and beneficial.

The use of standards and certification for forest carbon projects is today a globally used MBI. According to Goldstein and Neyland (2015) 91% of forest carbon offsets transacted in 2014 were developed under a third-party verified standard (Figure 1.9). The Verified Carbon Standard (VCS) held the main position, with 63% market share in 2014 (16.5 $MtCO_2eq$). More than three-quarters, under VCS, also used the Climate, Community, and Biodiversity (CCB) standard to assure other co-benefits. Other voluntary standards are the Climate Action Reserve (CAR) and the American Carbon Registry (ACR), both focused on North America and moving some of their projects under the California compliance protocols; Plan Vivo, which is focused on small-holder activities. Among the so called domestic standards there is the California compliance offset protocols (15% market share) and Australia's Carbon Farming Initiative, British Columbia's Pacific Carbon Standard, the UK's Woodland Carbon Code, New Zealand's Permanent Forest Sink Initiative, Japan's Verified Emissions Reduction Scheme, and China's Certified Emissions Reductions.

About 0.8 $MtCO_2eq$ did not use third party certified standards but internal/proprietary standards. 9% was not developed under a standard and almost all of these tonnes originated from developed country. This mainly happened because projects developers had relationships of trusts with buyers and therefore the use of certification was considered redundant.

Figure 1.9 Market share by standard, 2014



Source: Goldstein and Gonzales, 2014

Also the compliance market is ruled by criteria for carbon accounting and for assessing other benefits. The Clean Development Mechanisms, for afforestation and reforestation projects developed two types of methodologies: small-scale and large scale A/R methodologies. Small-scale A/R methodologies provide simplified approaches for project design and monitoring. Small-scale A/R project activities must fulfil two conditions: net anthropogenic removals must be less than 16 k tons of CO2eq per year; and the project activities must be developed or implemented by low-income communities and individuals, as determined by the host Party (UNFCCC, 2005c).

To contribute to sustainable development in the host countries is the other complementary goal of CDM. There is still no universally accepted definition to determine whether a CDM project contributes to sustainable development (Chomitz, 2000; Jung, 2005; UNFCCC, 2012b). Given this lack of an agreed operational definition on how to assess the CDM contribution to sustainable development, according to UNFCCC (2012b), two types of

assessment are possible on a project-by-project basis: i) "*how*" a CDM project contributes to sustainable development; and ii) "*how much*" a CDM project contributes to sustainable development (Olsen and Fenhann 2008; UNFCCC, 2012b).
For the first type of assessment, a list of sustainable development indicators against which a project can be assessed to show the nature of its contribution is required. UNFCCC (2012b) performed this type of assessment. Results show that, generally in all the sectors, almost all CDM projects claim a number of sustainable development benefits in the Project Design Documents (PDDs), but the sort of benefits changes according to project type. For the A/R sector, the most common claim is "stimulation of the local economy through employment creation and poverty alleviation", followed by "reduction of pollution", and also "engagement of local population" (UNFCCC, 2012b).

Problem statement

There are no studies on *how* Italian participated A/R CDM projects contribute to sustainable local development.

For assessing instead "*how much*" a CDM project contributes to sustainable development, "a number of indicators, a quantitative or qualitative measure for each indicator, and weights that allow the scores for the different indicators to be aggregated into an overall measure of the extent of the contribution to sustainable development" is needed (UNFCCC, 2012b). Only a few studies have attempted such an assessment, and they concluded that despite the number of claims in the PDDs, the contribution of the CDM to sustainable development in the host countries has been limited (Sutter and Parreño, 2007; Olsen, 2007; Gupta et al. 2008). In particular, Sutter and Parreño (2007) assessed the first 16 registered CDM projects (which includes every type of CDM), and while they found that a large part of the projects are likely to have resulted in real and measurable emission reductions, less than 1% were likely to contribute significantly to sustainable development in the host country, and none were fulfilling the two objectives simultaneously.

1.4 Objectives and research questions

The general objective of the research is to analyse the application of Market Based Instruments to Non-Wood Forest Products and to the climate regulation derived from the carbon sequestration function of forests (for the sake of simplicity, "forest carbon"). For this purpose, the preliminary specific objective is to identify which are the main MBI applied to NWFP and forest carbon worldwide, according to the scientific literature, and only after that, to proceed with the analysis of such MBI applications to NWFP and forest carbon.
The research has the following specific objectives and research questions.

i. To assess which are the most important Market Based Instruments types applied to NWFP and to forest carbon.
   - How is the MBI type, applied to NWFP and forest carbon, reflected in the scientific literature?

ii. For each of the most relevant MBI categories applied to NWFP and forest carbon, to analyse relevant examples, at a proper scale of analysis.
   a. "Direct deals" for NWFP:

- Which are the key NWFP for which Italy plays a key role in the international trade? What is the dimension of the key NWFP markets, in terms of quantities and values? Which is the position of Italy in the international trade of the given NWFP? Who are the other main actors?
- How are the regional markets of specific NWFP structured, in terms of number of economic actors, quantities, prices? What kind of supply chains and trade channels are there? Do NWFP originate from the region? How does the market keep alive? Are there in the region other relevant examples of MBI applications to specific NWFP? How do they work?

b. "Tradable permits" for forest carbon:
- Which is the dimension of the Italian Institutional forest carbon market, in the CDM example, in terms of number of projects and of volume of transacted carbon? How are the finance and benefits shared?
- Which is the dimension of the Italian voluntary forest carbon market, in terms of number of projects, of quantities of traded carbon and values, number of organisations involved?

c. "Voluntary price signals" for NWFP:
- Which are certification schemes of major interest for NWFP? Which are their scopes?

iii. To assess whether the application of the MBI to NWFP and to forest carbon, in the selected examples, is likely to deliver co-benefits or sustainability aspects.

a. "Direct deals for NWFP"
- Is "direct deals" application to NWFP, in the specific examples, likely to deliver sustainability aspects?

b. "Tradable permits for forest carbon"
- Is "tradable permits" application, in the CDM mechanism and in the voluntary carbon market likely to contribute to sustainable development for local communities or to the delivering of other co-benefits?

c. "Voluntary price signals" for NWFP
- Is the application of "voluntary price signals", namely NWFP certification, likely to lead to sustainable harvesting of the target NWFP?

2 Methods

The *Chapter* describes the methods adopted in relation to each issue investigated, that is i) how the MBI type application to NWFP and forest carbon is reflected in the scientific literature; ii) “direct deals” for NWFP, with the international trade analysis of the key NWFP for Italy, and the analysis of chestnuts and wild mushrooms market in Trentino-South Tyrol (the paragraph provides a description of the case-study region, the methods utilised for the supply chains analysis and those used in two in depth case-studies); iii) “tradable permits” for forest carbon, with the analysis of the Italian Institutional forest carbon market in the Clean Development Mechanism and the analysis of the Italian voluntary forest carbon market; iv) voluntary prices signal: certification of NWFP.
Jointly, the methods used for the assessment of whether the application of MBI to NWFP and to forest carbon is likely to deliver co-benefits are illustrated.

Contents

2.1 How MBI application to NWFP and climate regulation (carbon sink function of forests) is reflected in the scientific literature

In order to determine how is the Market Based Instruments type reflected in the scientific literature, the approach of Pirard and Lapeyre (2014) was used. The authors, with the aim of constituting a corpus of representative literature presenting the MBI application to ecosystem services, made a literature research on scientific databases. In the present research the approach was adapted to the goods and benefits which are objective of the study, NWFP and forest carbon. The Elsevier Scopus[40] database was used. The search was conducted by:

i. including all references (either in the article title, abstract, keyword) that included "market-based" AND
    a. "non-wood forest products" OR "non-timber forest products"[41] in the topic field.
    b. "forest carbon" OR "forest sink" in the topic field.

Then it was conducted a research calibrated on every MBI category, using the following keywords:

ii. "Market" AND
    a. "non-wood forest products" OR "non-timber forest products" in the topic field.
    b. "forest carbon" OR "forest" "credits" in the topic field.
iii. "Tradable permits" OR "quotas", OR "credits" OR "mitigation banking" OR "concession" AND
    a. "non-wood forest products" OR "non-timber forest products" in the topic field.
    b. "forest carbon" in the topic field.
iv. "Fiscal policy" or "tax" or "incentive" AND
    a. "non-wood forest products" OR "non-timber forest products" in the topic field.
    b. "forest carbon" OR "forest" "credits" in the topic field.
v. "Certification" OR "standards AND
    a. "non-wood forest products" OR "non-timber forest products" in the topic field.
    b. "forest carbon" OR "forest" "credits" in the topic field.
vi. "Auction" OR "tender"
    a. "non-wood forest products" OR "non-timber forest products" in the topic field.
    b. "forest carbon" in the topic field.
vii. "Payments for ecosystem services" AND
    a. "non-wood forest products" OR "non-timber forest products" in the topic field.
    b. "forest carbon" in the topic field.

Repetitions were excluded. The abstracts of the papers were read and it was assigned to a MBI type. Whenever an article cited more than a MBI, every single MBI was counted. References not dealing with the research were excluded.

Scopus more provides a focus on peer-reviewed scientific literature and excludes grey literature references, which surely represent a rich corpus. On the other side, it allows to

[40] http://www.scopus.com/

[41] The term NWFP excludes all woody raw materials. Consequently, timber, chips, charcoal and fuelwood, as well as small woods are excluded. Non-timber forest products (NTFP), in contrast, generally include fuelwood and small woods (FAO, 1999). For the purpose of the research on the scientific databases, both terminologies were included, because the two terms are by some used as synonyms.

base the analysis on a strictly scientifically-validated corpus.
In the case of Non-Wood Forest Products, they are multiple and diversified, and comprehend a wide range of species and ends products. Therefore, probably a specie-specific or targeted end-product search would have returned additional results. On the contrary, a research only on that corpus that precisely target NWFP as a category, rather than single species, permits to attribute the effectiveness of the MBI to the entire category.
Anyway, it has to be stressed that this research has more the need of emphasize the representativeness of the corpus, as opposed to exhaustiveness.
For the analysis of the articles, we focused on the most important points that characterize each article: the type of MBI discussed, the rationale for such an instrument and the positive or negative assessment.

2.2 Direct deals for NWFP

According to the analysis of the scientific literature, the most quoted Market Based Instrument for NWFP is "direct deals" (refer to results in paragraph 3.1). Therefore, the research targeted the application of direct deals to NWFP. Two levels of analysis were selected: the first focuses on the international NWFP trade of Italy (§ 2.2.1), while the second on the regional market of NWFP (§ 2.2.2).

The MBI "direct deals" includes all deals that are created in view of exchanging environmental products (see §1.2.2)

The first scale of analysis was selected because, according to Vantomme (2003), the most reliable data on NWFP quantities and values are those related to NWFP that are internationally traded. Export and import quantities and values are recorded by customs, which work with national level's reference. The national scale of analysis was for this reason selected, with the focus of Italy.
In order to study the NWFP markets and supply chains, the second scale of analysis was defined as being regional (NUT2)[42] level. An Italian region very rich in forest, Trentino-South Tyrol (Trentino Alto-Adige) was selected. Paragraph 2.2.2 provides a description of the case-study region and the methods utilised for the supply chain analysis. Further analyses were conducted, within Trentino-South Tyrol, at "in depth case study" level: the first case targeted the mushroom picking service organization in Fiemme valley (val di Fiemme), while the second a successful case of a chestnut producers association, Associazione tutela dei marroni di Castione.
For assessing whether the application of the MBI to NWFP, in the selected examples, is likely to deliver co-benefits, it was not possible to target the first level of analysis, that is the international scale. At the level of international trade it was indeed only possible to detect quantity and prices of NWFP, and no further indicators were available. Therefore, for this type of assessment only the regional level was considered, as described in § 2.2.2.
The direct deals analyses took place within the Work Package 3 of the StarTree - Multi-Purpose Trees and Non-Wood Forest Products - project[43], which is funded by the European Union through the European Commission's FP7 Cooperation Work Programme.

[42] In European Union, the Nomenclature of Territorial Units for Statistics (NUT) is a geocode standard for referencing the subdivisions of countries for statistical purposes. For each EU member country, a hierarchy of three NUTS levels is established. The subdivision of the country is referred to with 1 number. The second and third subdivisions levels are referred to with 2 and 3, with 2 level referring to the regional scale.
[43] http://star-tree.eu/

2.2.1 NWFP international trade analysis: focus on Italy

The products that follow under FAO definition "*products of biological origin other than wood derived from forests, other wooded land and trees outside forests*" (FAO,1999) are hundreds, maybe thousands, and include plant, animal and fungal species. For the purpose of the analysis of the international trade, it was firstly restricted the focus to plantae and fungi. Figure 2.1 shows, in red, the products that are objective of the research, which are further detailed in Table 2.1.

According to Vantomme (2003), for studying the International trade, the most widely used international product classification system, the Harmonised Commodity Description and Coding System, is very appropriate for NWFP accounting. The Harmonised Commodity Description and Coding System, generally referred to as "Harmonised System" or simply "HS", is a multipurpose international product nomenclature, developed by the Customs Cooperation Council of the World Customs Organisation[44]. As the term suggests, the HS is harmonised with other existing major international and national product classification systems. It comprises about 5,000 commodity groups, more than 200 countries use it as basis for their customs tariffs and for the collection of international trade statistics, and over 98% of the merchandise in international trade is classified in terms of the HS. It came into effect in 1988, and from that date, five versions of coding have been developed.

The HS adopts multi-digit coding, making it flexible for incorporating the reporting on NWFP. Within HS, a NWFP commodity group can refer to a single species, traded as raw material or "end-use" product; it may also refer to a group of different species used for the same "end product" category. For example, in the HS classification; "walnuts" are well defined up to the species level (*Juglans regia*) with a further specification of 'in shell' (0802.31) and 'shelled' (0802.32). An example of commodity group based on a single species is natural cork, traded as it is harvested (code 4501.10) or as stopper (4503.10); on the contrary, juices of wild or domesticated berries are considered in a unique code (2009.80).

A problem that may occur within HS is the change in coding definition, or merging of two codes, or split of a code in two different ones. This is commonly due to a change in economic value of a commodity[45]. When the commodity group changes its coding definition, the time series has to be rebuilt for any trade analysis.

To analyse some time series of the international trade, all the changes in the coding and definitions occurred from the first release of the HS coding were traced back. According to the selected NWFP types in Table 2.1, the data availability for the related commodity groups from the first HS release were reported. Despite many commodity groups were related to agriculture sector, the research considered all the codes that contain also, even if sometimes in minimal part, NWFP harvested in the wild. In Annex I, the HS codes for NWFP types and their presence along the five HS versions are reported.

The trade analysis was carried out using the available data for each single commodity listed in the table.

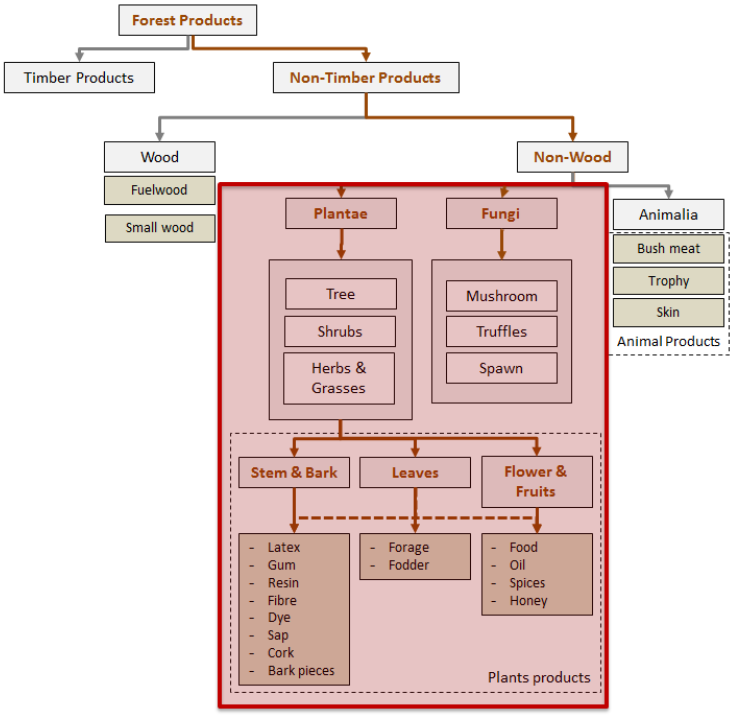
The majority of the codes, and the related definitions, has been quite stable over time, nonetheless only in the last revision 13 new commodity groups were added. Nuts and berries were the two NWFP types mostly affected by changes, highlighting the increment of

[44] WCO – www.wcoomd.org

[45] When a commodity starts to have a significant economic value in the international trade, a HS code is attributed to it; when, on the contrary, the value of a commodity significantly decreases, the code may be deleted or absorbed in another one.

economic interest on these NWFP, both cultivated and collected in wild.

Figure 2.1 Products of the forest according to FAO classification



Source: elaborated from FAO definition (FAO,1999).
Note: in red is highlighted the focus of the research

Table 2.1 List of NWFP objective of the research

Ecological position	NWFP category	NWFP types
Products of the stem, leaves or tree reproductive system	Stem-based Products (*tree is cut*)	Christmas tree
		Fibre
		bio-refining
		Tar
		Tannins
		Sorbitol and mannitol
	Leaf based products (*branches are removed from the stem*)	Essential oils
		Phytochemical
		Pigments
		Foliage
	Extracted from tree (*tree is kept alive*)	Sap
		Natural gums and resins
		Exudates
	Bark and cork	Bark products
	Fruits & flowers	Tree flowers
		Fruits
		Edible nuts
Tree dependent products	Wild fungi	Wild mushrooms
		Truffle
	Flower and bug substances collect by animals	Honey and Bee Products
Forest understory products	Berries	Berries
	Forest plants	Live tree/plants
		Medicinal and aromatic plants
		Mosses & lichens
	Litter	Litter
	Peat	Peat

Also the commodities generated from wild mushrooms were affected by a change in 2002,

with eight new commodity groups. Unfortunately, fresh truffles were merged with wild mushroom group in 2007, as well canned truffles were merged with the prepared wild mushroom. Also mosses and lichens have recently merged with two larger commodity groups, fresh and dry foliage, probably due to the small economic value moved in the international trade. Cork and cork products have not been affected by changes. Within the tannins commodity groups, tannins extracted "from oak and chestnut wood" were merged into the larger group of "vegetable tannin extracts". Finally, fresh and frozen nuts and berries have not been modified thanks to the large traded volumes.

Three NWFP types were excluded: berries were excluded due to the high level of agriculture production compared to the one wild harvested; foliage was excluded since many traded flows are reported in "number of units", quite difficult to convert in metric tons because of the high number of species involved in the trade; essential oils were excluded because the resinoids are by-products of the wood industries and there are also essential oils extracted also from agriculture products.

After the list of products was generated, for downloading data, one option would have been using the FAOSTAT FAO database[46]. However, FAOSTAT reports a too high level of aggregation, and therefore the trade of many NWFP could not have been detected. The choice fell on the use of UN Comtrade database[47], the main data source for tracking the international trade.

The analysis of Comtrade was carried out for defining, among all the NWFP listed under HS, which are the ones of main importance for Italy for the international trade. In specific, Italy was refereed to be a "key player" when it was found within the first five positions both in term of import or export for a given NWFP. The analysis of Comtrade targeted:

i. export of NWFP from Italy to the world;
ii. import of NWFP from the world to Italy;
iii. top five importers and exporters for that NWFP worldwide.

Data reported by Comtrade are a large amount and there is no formally recognized approach to clean the raw data (UN-ESCAP, 2009), but only a set of suggestions. The core problem for data cleaning is the un-match of the data reported for the same transaction between two countries. Any country should report the sum of exported and imported quantity and value of the commodities traded during the year; hence, all the trade flows should be reported twice among the countries, and the reported data should be the same. However, several countries do not report the information, or when they report, often the quantity and value information do not match. "Which country is reporting the correct information?" becomes a crucial question. UN-ESCAP (2009) suggested four different approaches to select the correct data for double reported trade, as shown in Table 2.2.

It was difficult to relay on one of the reported approaches. The main problem was the trade scale of the present analysis, which reaches the entire world for some NWFP. A further approach addressed by UN Statistic Unit was the "mirroring", used to fill the missing data with existing data reported by another country; however the estimated prices needed an additional cleaning before obtaining fair results.

After several trials, it was decided to design a standardized approach for all the NWFP commodities, based on the assumption that data on the quantity of the products are the key information to assess the price, since the economic value is always reported. It was selected

[46] http://faostat.fao.org/
[47] http://Comtrade.un.org/

the cleaning procedure that minimizes the standard deviation of the price. We found that the record containing the higher quantity, between the two records reported for the same trade flow, was addressing more reliable price outputs. This also minimized the standard deviation of price estimate. All the records containing the lower quantity were removed from the dataset.

Table 2.2 data cleaning approaches

Approach	Pro	Cons
Use the raw data as reported	No data cleaning	Double accounting of quantity and economic value of specific commodities: overestimation
Use an average of the reported data from each source	Fast data cleaning and database preparation	Problems on price estimation and quantity accountability
Use import data in preference to export data (the rationale is that many countries are much more strict in regulating imports than exports, and hence records are likely to be better)	Fast data cleaning and database preparation	Quantity underestimation and unreliable reporting of some developing countries
Use data from developed economies in preference to data from developing economies, or large economies in preference to small economies (this may be justified on the basis of assumed better reporting practices, or the law of large numbers)	Better comparison with Eurostat and US trade statistical bureau	Problems persist in trade data among developing countries

Note: source UN-ESCAP (2009)

The "*double-record-cleaning*" did not allow assessing directly the average international price for a NWFP commodity, so the quantities were classified in three categories (small, medium and large) in order to remove outliers or end product values, usually recorded under the same code. Similar procedure was implemented by Berthou and Emlinger (2011) in order to refine international trade data. In principle, lower quantities have higher price, and often the outliers are referred to quantity values of few kilograms, while average and high quantity value are linked respectively to end product and wholesaler prices level. Finally, we compared the average prices related to the large quantity category to real data or information collected among European industries dealing with the specific commodities, through internet searches and directly contacting them; the majority of the prices and trend outputs delivered in the present work was confirmed, with some exception, like dry mushroom, due to the high number of species contained in the code.

2.2.2 NWFP markets in Trentino-South Tyrol

The paragraph includes the description of the study area, the description of the NWFP of major economic interest in Trentino-South Tyrol, and it provides the methods used for analyse the supply chain and the in depth case-studies (one in Fiemme valley, targeting the organization of the mushroom picking service, and one in Castione, targeting the organization and the life of a chestnut producers association).

2.2.2.1 Description of the study area

Trentino-South Tyrol (Trentino-Alto Adige) is an autonomous region located in north east Italy (Figure 2.2). The special autonomy of the region derived from an agreement between Italy and Austria. Since 1972 most of the legislative and administrative competencies have been transferred from the central Italian government to the two autonomous provinces which

compose the region: Trentino (autonomous province of Trento), located in the southern part and Alto Adige/Südtirol/South Tyrol (autonomous province of Bolzano). While the other Italian provinces have administrative functions, the autonomous provinces of Trento and Bolzano have also legislative power in different fields: health, education, employment, transports and roads. The legislative function is up to the provincial council, elected by proportional representation.

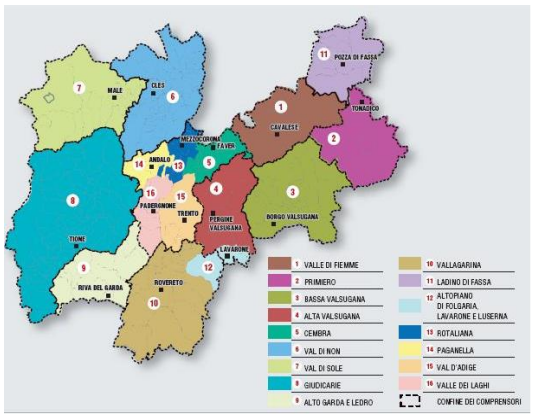
Figure 2.2 Trentino-South Tyrol

Trentino (autonomous province of Trento)

The province of Trento covers an area of 6,207 km^2 and the territory is mainly mountainous. Trento is the administrative centre and is the only municipality with more than 100,000 inhabitants.

The province of Trento is divided into 16 districts, 15 of which are named “valley communities” (*comunità di valle*) and one is called “Adige valley territory” (Territorio della Val d’Adige). These territorial bodies are administratively in between the province and the municipality (Figure 2.3).

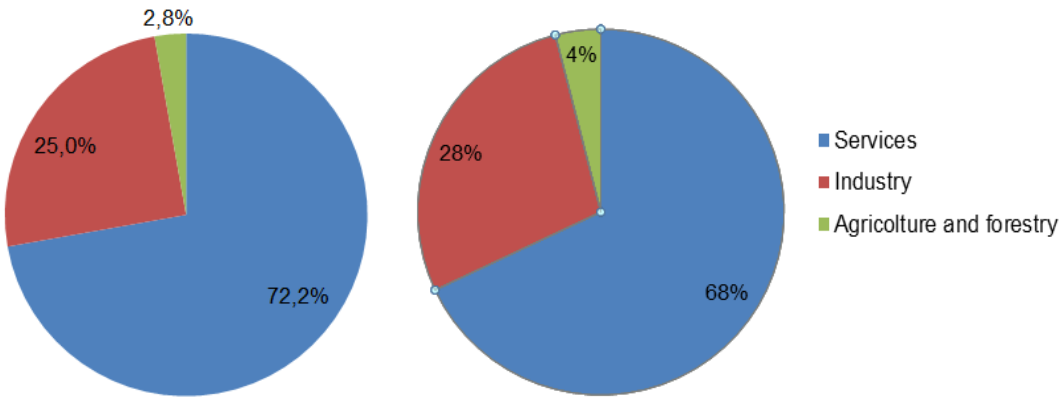
Figure 2.3 The districts of the autonomous province of Trento



The inhabitants in 2011 were 533,394, with an average population density of 85.6 inhabitants per km^2, which is very low compared to the Italian average of 197 inhabitants per km^2. The Gross Domestic Product (GDP) per capita, is around € 31,600 per inhabitant (Provincia Autonoma di Trento, 2014a). The rate of employment in Trentino is among the highest of

Italy. In 2012, the percentage of employed (between 15 and 64 aged) was 65.5%, against a national average of 56.8%.
The total added value in the province in 2011 was €15,04 M, divided per sectors as shown in Figure 2.4. The distribution of the number of persons employed in the various sectors reflects the economic structure. In 2012 the primary sector absorbed 4% of the workforce, while industry 28%. The majority of people are employed in the services (68%) (Provincia Autonoma di Trento, 2014a).

Figure 2.4 Added value for economic sector (%) in the autonomous province of Trento in 2011 (left) and structure of employment in the autonomous province of Trento in 2011 (right)

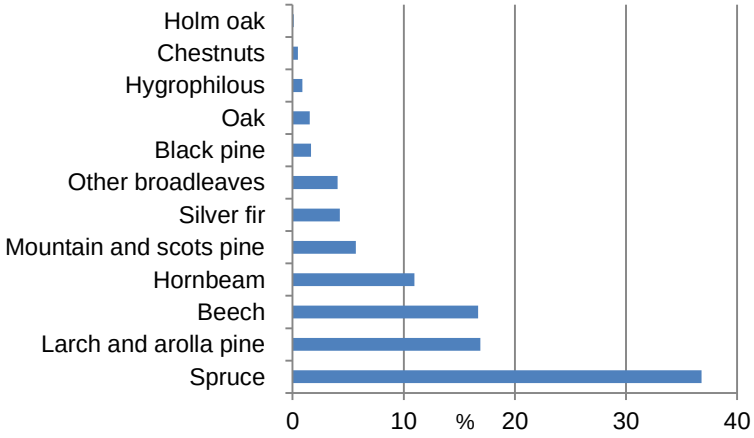


Source: Data from Provincia Autonoma di Trento (2014a)

One of the most important economic sectors is the tourism, which was performing fairly well also in the recent crisis period. Over the last decade, the trend of tourist presences in the province increased significantly: +13.3% in summer time and + 11.4% in winter (Provincia Autonoma di Trento, 2014b). The tourists choose to spend their holidays in Trentino, as well as in South Tyrol, because of its the environmental resources, the landscape, the quality of services, the possibility to play sport activities, the local culture and traditions (Provincia Autonoma di Trento, 2014b). These elements have reinforced a territorial identity strongly linked to a joint touristic and agriculture activities, with the increasing role of agri-tourisms and “green” small-scale rural tourism.
The agriculture sector in Trentino is based on three principal productions: fruits, high quality wines and livestock. The majority of the agricultural land is cultivated with permanent crops (22,267 ha), typically grape and apple (for whose production Trentino is nationally and internationally renowned), followed by the livestock (109,111 ha). In addition to these strong sectors, some niche products have also been developed, such as cultivated berries and organic horticulture.
The farm property is strongly fragmented: 63% of the farms are smaller than 2 hectares (average area of 0.7 ha) while less than 7% has 10 hectares of Utilised Agriculture Area (UAA). The great majority of the agricultural farms (97.2% in 2010) is under direct management in the province there are 177 companies covering more than 100 ha, in which is concentrated about 70% of the total UAA (Servizio statistica della Provincia Autonoma di Trento, 2014).
The average cost of a farmland in Trentino is significantly higher than the Italian average, and of the average of the northeast regions (~€110). So high land values partly explain the high fragmentation pattern: for a farmer an expansion is difficult, as well as the access for

new operators. To address this problem, in Trentino there is a strong presence of farmers producers cooperatives, which have enabled to overcome some structural problems with an increased efficiency and the effectiveness in the early stages of processing and marketing.
The forestry sector, although it occupies less than 1% of the total employed in the primary sector, plays a relevant role for the economy of the province. According to the data of the second national forest inventory (INFC, 2005), the forest cover in Trentino amounts to 375,402 ha (60.5% of the entire surface of the province), while other wooded lands are about 32,129 ha (5.2%). Forest area per inhabitant is significantly high: 0.8 ha per capita against the national value of 0.2 hectares per capita.
Almost all the wooded area (99%) is composed by semi-natural high forests. Regarding the forest types, there is a clear predominance of conifers, covering 75% of the forest area. The most widespread specie is spruce which occupies 36.8% of the area of the high forest (Figure 2.5). Among the hardwoods, most of the surface is covered with beech and hornbeam.

Figure 2.5 Distribution of forest types in the autonomous province of Trento (in %)



Source: Data from IFNC (2005)

Forest property in Trentino is mainly public (76%) and municipalities are the prevailing owners (76% of total public property) with an average forest area equal to 949 ha. 14% of forest land is managed by special forest communities: the so-called Separate Administrations for Civic Uses (ASUC), whose average size is 387 ha, while more than 26,000 ha are owned by other entities: Magnifica Comunità di Fiemme, a large common property (11,800 ha), the Provincial Forest Enterprise (7,300 ha), the Forestry Enterprise of Trento and Sopramonte (4,940 ha) and the Forest Community of Spinale and Manez (2,000 ha). 24% of the forests are private and can be divided in two categories: those regularly managed with forest management plans (12% of the area) and other, generally very small, private forests. Properties spanning more than 200 hectares are only 8, and 3 of these are collectively managed, i.e. Regola Feudale di Predazzo and two Consortele Solandre.
A peculiarity of the forests property of Trentino is the presence of forest management plans both in the public and in the large size private properties. 79% of the forest area is managed with plans. Forest planning aims at a sustainable and multifunctional use of forests, i.e. all operations and investments follow specific guidelines aiming at the improvement and maintenance of the public functions of the forest.
In the region, forest management has a fundamental role in maintaining the function of land

protection, soil erosion prevention, slope stabilization and hydro-geological protection. In addition to these two functions, forests are recognised to be fundamental for the conservation of biodiversity and for their cardinal function of characterizing the landscape, with positive impacts on tourism.

In the last fifty years, the forest area increased by 18%, due to the abandonment of meadows, fields and pastures. The reduction of human pressure on forests has led to a growth of the average biomass stocks, which is now 100 million m^3, with a growth rate of about 2.3 million m^3 per year (6.2 m^3/ha). The net annual planned removals are 515,000 m^3; the real harvested quantity is less than 60% of the planned one.

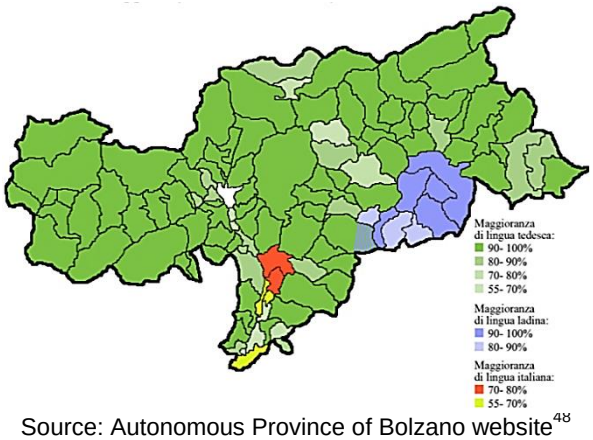
Wood harvesting now occurs to a great extent with systems of cable cranes or cableways, and there has been a process of marginalization of the areas that do not allow a sufficiently high yield. While this has allowed maintaining those properties with high timber production, it also leads to a reduction of active management, and sometimes abandonment of less productive properties, with low density of the forest road network.

Close-to-nature silviculture (*selvicoltura naturalistica*) is the only management technique, based on natural regeneration, selection systems and un-even aged stands (in some cases based on clusters of small even-aged plots), which guarantees continuous cover and greater stability of the forests. A large number of dead plants are left after harvesting operations and rare species (mainly broadleaves) are left standing.

South Tyrol (autonomous province of Bolzano)

The territory of the autonomous province of Bolzano covers an area of 7,400.43 km^2. German and Italian are the main languages of the province, together with Ladin, spoken in two eastern valleys. The great majority of the population is native German speaker (Figure 2.6).

Figure 2.6 Distribution of the language groups in South Tyrol



Source: Autonomous Province of Bolzano website[48]

The 116 municipalities of the province are grouped into 8 districts ("*comunità comprensoriali*"), administrative units located between the autonomous province and the municipalities. They manage some public services, such as roads, infrastructures and health services.

[48] http://www.provincia.bz.it

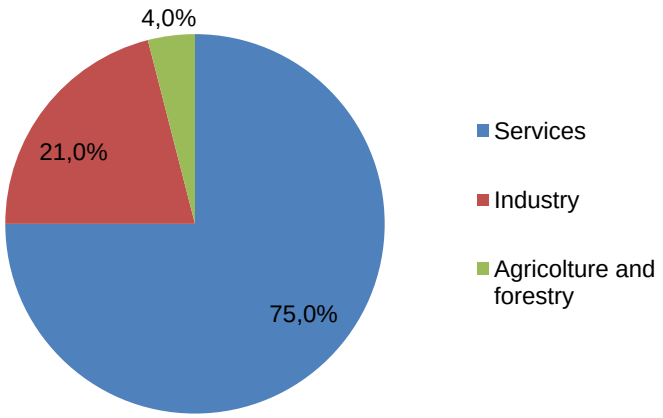
Figure 2.7 Districts in the autonomous province of Bolzano

Source: Autonomous Province of Bolzano website[48]

Similarly to Trentino, 64.4% of the province is mountainous, with 93.3% of the territory above 700 m; the rest is represented by valley floors, which have the more suited climatic and logistics condition for farming. The average density in the province is 63.4 inhabitants/km^2 and 80.5% of the municipalities are defined as rural. Most of the population is located in the valley floors.

In South Tyrol, the service sector generates 75% of the GDP (Figure 2.8). Over 30% of the added value of this sector is given by the wholesale and retail trade, transport, accommodation, services and catering, confirming the commercial and tourist vocation of the province. The industrial sector contributes up to 21% of GDP. Hydro energy and food industry are the most relevant industrial activities. Agriculture and forestry account for more the 4% to the GDP of South Tyrol, showing a positive trend (much higher than the national one).

Figure 2.8 Added value for economic sector in the autonomous province of Bolzano in 2011



Source: Data from Provincia Autonoma di Bolzano (2014a)

South Tyrol accounts for about 20,200 farms that cover more than 240,000 ha of UAA.

The census shows that average farm size is 11.9 ha, with high variation depending on the destination of the land and the land productivity. 96.1% of the properties are individually managed. South Tyrol inherited the legal institution of "*maso chiuso*" from the Bavarian domination (Mori and Hintner, 2013) (Box 2.1).

40.6% of the UAA, mostly pastures, is collectively managed. Permanent meadows and

pastures are the most diffused agricultural activities (88% of the UAA), and they are located at high altitude, where the environmental conditions do not permit other agricultural activities. The relevance of pastureland is connected to the presence of 1,733 alpine huts, established for the translocation of about 66,000 of livestock units at high altitude during the summer season. At lower elevation, mostly along the south-western valleys, the landscape is characterized by fruit orchard and vineyards (10% of the UAA). Apple orchards covers a surface of 18,540 ha (2.5 ha on average), whereas vineyards on 5,294 ha (1.1ha). South Tyrol, likely Trentino, is a famous producer of both apples and high quality wine. Crops, in particular corn for feeding cattle, are mainly located at the bottom of high Isarco valley and Val Pusteria. Agricultural activities in South Tyrol, similarly to Trentino, are often carried out by cooperatives of local producers of dairy products, apple and wine.

Box 2.1 "*Maso chiuso*" in South Tyrol

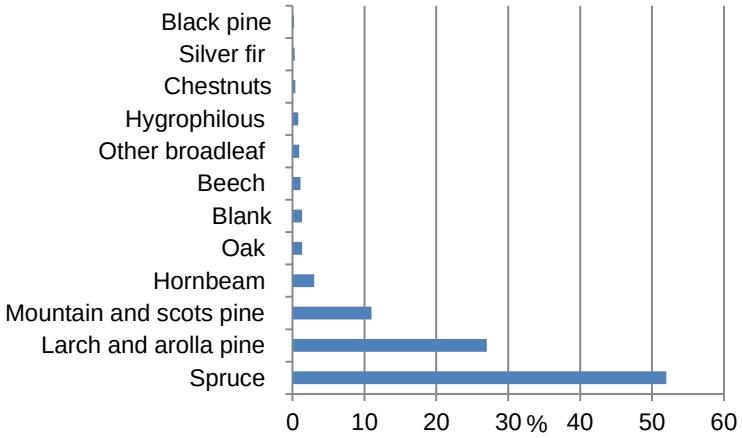
In South Tyrol, since the end of the VI Century the land ownership is conferred to the family and not to the individual property. The property rights ruling "*maso chiuso*" (enclosed farm) (*Geschlossener Hof* in German) avoid property fragmentation, typical of the Italian inheritance system. *Maso chiuso* is usually composed by the agricultural land and the pertinent buildings. During the centuries the laws governing the social unit of the *maso chiuso* have been subjected to different changes. Nowadays the maintenance of *maso chiuso* is ruled by the Provincial Law n° 17 of 2001. To establish a *maso chiuso* the land owner has to make a request to the local appointed committee and receive the approval. Furthermore, the goods included in the property have to be registered in the land law book, at Section I. The main highlights of the law are:

- principle of indivisibility: the farm is an indivisible unit;
- minimum size business: the farm annual income should guarantee an adequate revenue, able to maintain at least a family of 4 people. The income should not exceed three times that amount;
- farm conveyance: the owner has the right to assign the farm to another person through contract of sale, as gift or by will;
- legitimate inheritance: the judge decides the undertaker and the price *of maso chiuso* in case of lack of will or agreement between the heirs;
- recognition of the legitimate heirs: the legal heirs, not included in the inheritance, receive a cash payment proportional to the average annual income of the farm;
- surviving spouse right: proper economic support has to be given to the surviving spouse.

Currently in Alto Adige there are 13,410 *masi chiusi*, representing two-thirds of the total number of forest and agriculture farms in the province (20,200) (ASTAT, 2013). On average the area belonging to a *maso chiuso* is bigger than the size of other farms. About 40 new masi are instituted every year, while approximately 20 are redeemed (Mori and Hintner, 2013). Ownership distribution shows that around the 80% is owned by a single person, while the rest is organized in co-properties.

Forests cover about half of the territory of the province. Forest distribution and composition is similar to the neighbouring Trentino. About 50% of the territory is forested, 95% with high stands, mostly composed by conifers (spruce, larch, scots pine and stone pine). Forest stands are located at high elevation (mainly over 1550m a.s.l), usually on steep slopes and shallow soils. Because of the morphology, in South Tyrol 98% of the forests is submitted to hydro-geological restrictions and 17% to environmental ones (Provincia Autonoma di Bolzano, 2014b).

Figure 2.9 Distribution of forest types in the autonomous province of Bolzano (in %)



Source: Data from INFC (2005)

Differently from Trentino, the forest property in South Tyrol is mainly private. Public entities own about one-third of the forests. Even if only about 10% of the forests is provincial, the provincial forest service exercises its duties about forestry, hunting and fishing on more than 90% of the forest area. Forest holdings are distributed as shown in the Table 2.3. In Table 2.4 the estimated volume of annual increment and growing stock are shown. The value per hectare is slightly lower than Trentino. The stock is progressively increasing, while the removals are lower than the annual yield.

Table 2.3 Forest surfaces according to the property categories

Forest Property	Percentage
Single private property	52%
Public entities	28%
Co-ownership	9%
Common properties (“*Interessenze*”)	7%
Provincial property	2%
Church	2%

Source: data from Provincia Autonoma di Bolzano (2014b)

Table 2.4 Forest stock and yield

Forest	336,689 ha	
Growing stock	105,188.5 m^3*	312 m^3/ha*
N° of trees	297,734,742 n°	884 n°/ha
Annual increment	1856437 m^3*	5.5 m^3/ha*
Dead wood	4177146 m^3*	12.4 m^3/ha*
Annual yield	649,284 (in the stand wood) m^3*	37,889 (in the coppice wood) ms

ms = stere meters
*: value are referred to > = 4.5 cm DBH (1.30 m)
**: value are referred to > = 17.5 cm DBH (1.30 m)
Source: data from Provincia Autonoma di Bolzano (2014b)

2.2.2.1.1 NWFP of major economic interest in the region

As in other Italian regions, in Trentino-South Tyrol there is a long tradition of collecting and consuming a large set of NWFP. Wild mushroom, truffles, berries (especially strawberries, blueberries and raspberries), chestnuts, medicinal and aromatic plants, game and hunting licenses are economically the most important NWFP of the region (Goio et al. ,2008).

Harvesting and eating mushrooms and some wild berries are not only activities carried out by the locals but also important tourist attractions. Chestnuts are also used for promoting tourist activities, through chestnuts trails and special tourist packages based in nut picking and eating in agri-tourism farms. Aromatic and medicinal wild herbs are used for preparing some local traditional products. Both in berries and chestnut growing and marketing a special role is played by non-profit organizations (associations and cooperatives) with positive impacts in benefit sharing by local landowners. The region is a model for the advanced process of domestication of berries, and other cases of specialized management system exist, like for the extracts of *Pinus mugo*.

Despite a diversified and relative intense use of NWFP, forest management policies and practices, a part in some isolated cases, do not recognize any special role to these products, being wood production optimization the only target of the close to nature silviculture promoted by the forest authorities of the two provinces.

Hereafter a description of the main NWFP in the region is provided.

Chestnuts

The sweet chestnut (*Castanea sativa*) cultivation in the region has an ancient history. In the past, chestnuts represented an important source of livelihood for the people living in the mountain. In the statistics compiled in 1852 by Agostino Perini, the chestnut is defined as the "*fruit tree grown with more profit and greater extension in Trentino*" (Ministero delle politiche agricole, agrarie e forestali, 2010).

The chestnut is spread throughout the region between 400 and 1000 m, in the basal plane, and till an altitude of 1.500 m. Occasionally, it expands in areas located below 300 m (Adige valley; Vallagarina; Alto Garda).

The traditional management of chestnuts woodlands covers different uses: in high forest with high density, timber is produced; in less productive soils chestnuts are managed as simple coppice or coppice with standards for the production of poles and fuelwood. However, the most important use is represented by the production of chestnuts fruits [49]. Commercially, the fruit of the chestnuts is distinguished in two categories: chestnut and *marrone.* Chestnuts derive from the wild and grafted trees of *Castanea sativa,* while *marroni* derive from grafted trees of *Castanea sativa var. macrocarpa*. The main differences between chestnuts and marroni are resumed in Table 2.5.

Over the last century the chestnut cultivation in the region experienced a decline similar to what happened at national level, due to the process of urbanization and abandonment of the agricultural and forest activities. In Trentino, in the late nineteenth century there were more than 600 ha of specialised chestnut orchards, then the cultivation had a gradual, constant, reduction. In the region, in the last 20-30 years there has been an emerging interest for the sector, with the recovery of the abandoned chestnut stands. This renewed interest may be attributed to a synergic number of factors: the newfound passion of the local people for the cultivation of the chestnut trees, for their special relationship with the local traditions, an increased demand for typical products, promotional initiatives carried on by local communities.

[49] Other uses of chestnuts are the production of tannins and chestnuts honey. Tannin from the chestnut bark and wood, after a period of low prices, has become again an interesting market, but still not affecting the case study areas. Chestnut honey is one of the most appreciated honeys in the market and there are some cases of production in the region.

In Trentino, according to the inventory of chestnut orchards, the chestnut cultivation is today conducted in six valley communities: *Bassa Valsugana* and *Tesino*, *Alta Valsugana*, *Valle dell'Adige*, *Valli Giudicarie*, *Alto Garda* and *Ledro*, *Vallagarina*. According to Ministero delle politiche agricole, agrarie e forestali (2010) about 170 farmers manage land with chestnut trees.

Table 2.5 The main differences between chestnuts and marroni

Chestnuts	Marroni
Small dimension of the fruits (more than 90 fruits per kg)	Less than 90 fruits per kg
2-3 fruits per husk	Generally 1-2 fruits per husk
Uniform dark brown colour of the peel	Lighter colour with dark stripes with meridian sense
Elongated semi-spherical shape or almost conical	Broad oval shape
Thick and leathery peel with the internal film deeply inserted in the seed	Thin peel with the internal film that does not go in deep and it is simple to tear off
Seed with good organoleptic characteristics, not much resistant to cooking	Floury and compact seed, sweet, tasty and resistant to cooking
It is generally difficult to peel them	It is generally simple to peel them
Generally roundish scar	Generally rectangular scar

Source: Provincia Autonoma di Trento (2008)

The specialised chestnuts surface is about 240 ha; in addition there is a relatively huge surface of recently abandoned chestnut woodland in chestnuts eco-zone and abandoned chestnuts woodland, localized in marginal areas for the chestnuts cultivation, which together amount to 640ha (Ministero delle politiche agricole, agrarie e forestali, 2010). The chestnut cultivation is based on a great variety of local ecotypes. In Trentino, the activity is mainly based on various local ecotypes of *Castanea sativa, var. macrocarpa*, locally known with the name "*marrone trentino*". In studies conducted by the Agriculture Institute of San Michele all'Adige and the Trento province different ecotypes were described: "*marrone di Besagno*", "*marrone di Sardagna*", "*marrone di Roncegno*", "*marrone di Praso-Daone*", "*marrone di Grumes*" and "*castagna Tiona*". The genetic diversity in the province is however larger and there are other chestnut ecotypes, for which a similar work of characterization has not yet been done: "*marrone di Torcegno*", "*marrone di Telve*", "*marrone di Samone*", "*marrone di Lona*", "*marrone di Civezzano*", "*marrone di Centa San Nicolò*", "*marrone di Lodrone*", "*castagna Visentina*", "*castagna Rossara*", "*castagna Matiota*" (Provincia Autonoma di Trento, 2008).

In South Tyrol, according to Astat (2013), in 2010 the specialised chestnuts surface amounted to 123 ha (Table 2.6). In South Tyrol the three main areas are Venosta valley, *Burggraftenamt/Burgraviato* and Salto Sciliar, and Isarco valley, with 262 chestnuts farms. However, the number of chestnut farms in South Tyrol is controversial: Astat in 2002 reported about 700 chestnuts woodland owners. The differences between data are due to how the chestnuts growers declare their activity. Many of them only own spare trees and they do not consider themselves as chestnuts farmers. Probably in the more recent survey they were not included as chestnuts growers. Data on surface and chestnuts farms are resumed in Table 2.6. Differently to Trentino, in South Tyrol the literature does not report several ecotypes. However, some examples of selection in nurseries exist. The nursery Kösti, which grow three types of marroni: *Südtiroler Gelbe* (described as the best quality local ecotype and two varieties deriving from other countries.

In the region, several chestnuts associations promote the fruit production and the chestnut traditions, implementing activities that attract both local people and tourists. The example of

Törggelen in South Tyrol is illustrated in Box 2.2.

Table 2.6 Chestnuts orchard surface and number of chestnuts producers in Trentino-South Tyrol

	Specialised chestnuts orchards (ha)	Recently abandoned chestnut woodland in chestnuts eco-zone and abandoned chestnuts woodland, localized in marginal areas for the chestnuts cultivation	Number of chestnuts producers (n°)
Trentino	240	400	170*
South Tyrol	123	-	262**
Total	363		385

Source: Ministero delle politiche agricole, agrarie e forestali (2010); Astat (2013)
Note:*Chestnuts operators that declared to own chestnuts woodland, both specialised or abandoned.
** See specification in the text.

Box 2.2 *Törggelen* in South Tyrol

In South Tyrol at the end of September the traditional *Törggelen* begins. The local winegrowers gather together at this time of the year to present their young wine and young must. *Törggelen* comes from *Törggl*, which means "winepress". *Törggelen* is a feast that happens in many places in South Tyrol, either up in the hills or mountains or in the centre of towns. During the feast, both local people and tourists taste the young new wine and several South Tyrolean specialities, among which the tradition of eating roasted chestnuts stands out. In particular, in the Isarco valley, during the "Isarco valley chestnut speciality weeks" everything revolves around chestnuts. Numerous inns all along the route of the *Keschtnweg*, in the traditional chestnut growing area of the valley, offer all sorts of tasty specialities, prepared using local chestnuts. A line of chestnut orchards extends from the abbey of Novacella near Bressanone all along the slopes of Isarco valley, as far as the high plateau of the Rittner and down into the Bolzano valley. Along the trail, sellers offer regional products for sale. Another chestnut track was built in 2008 in Foiana.

Source: www.valleisarco.info

In support to the chestnuts sector, in the two provinces during years, a number of Rural Development Programme (RDP)'s measures have been activated. In addition to the RDP, both the provinces of Trento and Bolzano have their own rural programmes. Within these, some measures can favor the chestnuts sector. In particular, in Trentino the article 23bis the Provincial Law n°4/2003. "Demand for the contribution for the conservation and for the amelioration of the chestnuts orchards". The aid is paid to the owner or lessee of areas planted with chestnut trees that are committed to their recovery, maintenance and management for a period of at least five years[50].

Berries

In the region, berries have emerged over time as a source of complementary income to the ordinary mountain farming agriculture (Provincia Autonoma di Trento, 2014a; Provincia Autonoma di Bolzano, 2014a). Although several species of berries are still collected in wild by both local people and tourists (for example cranberries in South Tyrol, which are collected and used for preparing very traditional receipts) domestication is the prominent management.

[50] Eligible expenses for subsidies are: the costs incurred for the recovery of chestnut groves located in the territory of the province of Trento, such as the remediation of the ground (5€ /m^2), cleaning under the canopy (100€ per plant); the pruning of stand trees (130€ per plant) and the grafts for local variety (15€ per plant). The total sum may be granted for a minimum amount of 500€ per beneficiary and within the maximum limit of 7,500€ in three years; in compliance with these limits, the contribution that may be granted is equal to 50% of the eligible expenditure.

At the beginning, the development of berries cultivation allowed the use of marginal farmland, and today the cultivation in the region extends over about 700 hectares (500 ha in Trentino and 197 in South Tyrol), representing an important market sector.
In Trentino the cultivation of strawberry, raspberry, currant, spin, blueberry, blackberry, etc. has become the second segment of fruit production's total value (10.9%) (Table 2.7).
Sant'Orsola cooperative represents by far the major player in the market (Box 2.3). Alongside Sant'Orsola, there are also some private farms specialized in the sector.

Table 2.7 Values and quantities of berries production in Trentino in 2005 and 2010

	Strawberries	Raspberries	Currant	Gooseberries	Blueberries	Blackberries	Total
				Values (1,000 €)			
2005	10,249	2,747	1,295	0.02	2,536	1,213	18,058
2010	13,390	5,384	1,162	0.01	2,854	1,951	24,754
				Quantities (tons)			
2005	4450	485	486	8	484	327	6241
2010	4400	778	398	6	597	457	6636

Source: modified from Provincia Autonoma di Trento (2014a)

Box 2.3 A leading example for domesticated berries: Sant'Orsola cooperative

In the Early '70s, in Sant'Orsola Terme, a small municipality of the Mocheni valley, ten young producers started an innovative farm business, different from the traditional grape and apple cultivations. Taking advantage of the natural resources of the valley, they tested the domestication of cherries, strawberries and other berries. Berries production allow to exploit even small plots of farmland, located even in places not accessible for the traditional agriculture. Founded in 1972 as a voluntary association, Sant'Orsola became a producers cooperative in 1975, by extending its activities to the entire Mocheni valley and the neighbouring Pinè Plateau. In the following years, during which the members of the cooperative and the production increased, Sant'Orsola[51] exported its model in many nearby valleys of Trentino.
Sant'Orsola is today a cooperative of farmers specialized in the production and marketing of strawberries, cherries, raspberries, blackberries, blueberries, red and white currants, gooseberries and baby kiwi. It is the leading Italian cooperative in the sector and one of the largest producers in Europe. 600 small farms works part-time, together with 500 specialized part-time companies and 100 professional companies located in the valleys of Trentino, with some partners also in Veneto, Calabria and Sicily. The gradual enlargement of the cooperative to specific area of Calabria and Sicily, which have warmer climatic conditions, allowed to establish a berry production all over the year, overcoming the production's discontinuity problems that are intrinsic of many NWFP markets. Moreover, it led to the establishment of fair companies in areas once controlled by criminal organizations. This way the cooperative lost his initial strong link with Trentino, but it gained a positive image as a socially responsible organization.
The quality selection of the product is carried out already in the farm after harvesting, according to the quality criteria specified by the cooperative (size, colour, shape, texture). In the cooperative's delivery centre, a sample from the various lots of berries is subjected to rigorous scrutiny. In the warehouse the berries are then cooled with forced air systems that allow to quickly reach the ideal temperature (4-5° C) to preserve the quality and taste characteristics. From this point the "cold chain" is strictly maintained through processing, packaging, transport and placement in the stores. To secure the entire supply chain, a system of traceability of the product has been introduced, in order to be able to reconstruct at any time its history. The cooperative provides technical assistance to all the members, and it also tests news varieties of berries in experimental fields.

Source: direct interview with a technical manager of Sant'Orsola

[51] www.santorsola.it

In South Tyrol, the berries grow in Venosta valley, Isarco valley, Pusteria valley, Val D'Ultimo, San Genesio and on the Ritten plateau. The Martello valley, famous for its strawberry farms, hosts an annual strawberry festival.
Similarly to Trentino, the majority of berries in South Tyrol is marketed through the cooperative producers of the Martello valley.

Wild mushrooms

The region, and the city of Trento in specific, was defined as the richest market of mushrooms in Italy in term of species during the second half of the 20th century (Cetto and Lazzari, 1966 in Sitta and Floriani, 2008). More than 250 mushroom species were on sale, before the introduction of the national law in 1995 which limited the number of species[52] (Sitta and Floriani, 2008).
Wild mushroom picking was, and still is, a common activity in the region, conducted both by local people and tourists. Hotels and B&B managers and touristic boards support the sector with special services, e.g.: local mushroom exhibitions, lessons on mushrooms identification, mushrooms drying equipment available in the hotels, accompanying service with local guides for the pickers.
With the aim of "conserving the benefits deriving from the presence of mushrooms for the ecosystems", the two autonomous provinces were pioneers in Italy in the introduction of laws for the mushroom collection: South Tyrol introduced the law in 1972, setting a maximum harvesting quantity of 2kg per person per day, only in the areas secured for the hydrogeological risk[53] (L.P. n.12, 1972)[54]; Trentino in 1973 defined the same maximum quantity of 2kg, everywhere except for the areas where the forest owner denied the harvesting[55] (L.P. n.18,1973)[56].
At the beginning of the '90, before the definition of the national law on the collection and marketing of fresh and preserved wild mushrooms that defined that all the regions and autonomous provinces have to regulate the collection and the authorization for the collection, the two autonomous provinces set laws that introduced the payment of permits for the collection (whose maximum quantity remained 2kg/person/day). A distinction was done: resident in the Province did not pay any permit, while non-resident had to pay. This way in the region for mushrooms it was introduced a MBI that can

In the region public administrations introduced the payment for mushrooms collection. This way it was introduced a MBI that can be defined as being in between the regulatory price signal and tradable permits.

[52] Today the species allowed for trade are: *Agaricus arvensis, Agaricus bisporus, Agaricus bitorquis, Agaricus hortensis (Agaricus bisporus var. albidus), Agrocybe aegerita (Pholiota aegerita), Amanita caesarea, Armillaria mellea, Auricularia auricola judae, Boletus aereus, Boletus appendiculatus, Boletus badius (Xerocomus badius), Boletus edulis, Boletus granulatus (Suillus granulatus), Boletus impolitus, Boletus luteus (Suillus luteus), Boletus pinicola (Boletus pinophylus), Boletus regius, Boletus reticulatus (Boletus aestivalis), Boletus rufa (Leccinum aurantiacum), Boletus scabra (Leccinum scabrum), Cantharellus (*all the species except for *Subcibarius, tubaeformis var. lutescens and muscigenus), Clitocybe geotropa, Clitocybe gigantean, Craterellus cornucopiodes, Hydnum repandum, Lactarius deliciosus, Leccinum* (all the species)*, Lentinus edodes, Macrolepiota procera, Marasmius oreades, Morchella* (all the species)*, Pleurotus cornucopiae, Pleurotus eryngii, Pleurotus ostreatus - Pholiota mutabilis, Pholiota nameko mutabilis, Tricholoma columbetta, Tricholoma georgii (Calocybe gambosa), Tricholoma imbricatum, Tricholoma portentosum, Tricholoma terreum, Volvariella esculenta, Volvariella volvacea, Stropharia rugosoannulata* (D.P.R. n. 376,1995 *Regolamento concernente la disciplina della raccolta e della commercializzazione dei funghi epigei freschi e conservati*).
[53] No limitations instead for the land owner (and his relatives) in his property.
[54] Legge Provinciale 28 giugno 1972, n. 13 (*Norme per la protezione della flora alpina*)
[55] In periods with good production of mushrooms: the forest service might authorize five permits per year every 1000ha, for the collection of more than 2kg per day.
[56] Legge Provinciale 26 luglio 1973, n. 18 (*Norme per la disciplina della raccolta dei funghi*)

be defined as being in between a regulatory price signal and tradable permits.
In the autonomous province of Trento the rules are nowadays defined by the Provincial Law n.11/2007[57] and by the Decree 7-65/2011[58]. According to the laws every municipality is territorially competent and it has a certain leeway in deciding the cost of permits and the times. However, at provincial level there are general rules to be respected (Box 2.4). Municipalities can allow special permits for people that declare that the harvesting represents a source of livelihood or work. These permits, which are free of charge, can be granted only in the ration 1/100ha. Other special permits can be allowed for scientific and cultural purposes.
In the autonomous province of Bolzano the law is defined at central level (no leeway of decision for municipalities) (Box 2.4).

Box 2.4 Rules and criteria for mushroom picking in the autonomous provinces of Trento and Bolzano

The rules and criteria to follow in the autonomous province of Trento are:

- residents do not pay a permit for harvesting while non-residents have to pay. Other persons exempt from the payment are persons that were born in the province, forest owners of land inside the territory of the province, who has the right of commons and the residents in the municipalities of Magasa, Valvestino e Pedemonte;
- the payment of the permit has to be submitted to the municipality or other delegated bodies;
- restrictions for picking in natural parks and state-owned forests;
- collection only from h 07.00 to h 19.00;
- maximum of 2 kg per day;
- it is mandatory to summarily clean the mushrooms on the spot where they are collected and carry them only rigid and drilled containers (baskets and similar);
- prohibition of damaging to the mycelium of the mushrooms;
- it is forbidden to destroy or damage the mushrooms on the place of collection, as well as use collecting rakes, hooks and other similar means which could harm the soil humus;
- the forest owner (both public or private) has the right of prohibit the harvesting in his property, by placing signals at m1,5 and every 100m;

The rules and criteria to follow in the autonomous province of Bolzano are are:

- three categories of pickers exist: the landowners (can collect a daily maximum of 3 kg); the citizens in their municipality of residence (picking only on even days, up to 2 kg); the non-residents in the municipality (picking only on even days, to a maximum of 1 kg, upon payment of the fixed fee of 8 €);
- the mushroom mycelium must not be damaged (administrative penalty from 34 to 97 €);
- mushrooms must be kept in drilled containers;
- it is forbidden to collect in private land, if the boundaries can be clearly identified. The penalties for the irregular pickers outside of their municipality of residence amount to 57 €, with 34 € added for each kg of mushroom.

The sale of unpackaged wild mushrooms is subjected to municipal authorization, which is issued to the operators that passed the test after a course on the identification of mushrooms species. Moreover, there is the obligation of certification of mushrooms by the local sanitary

[57] Legge Provinciale 23 maggio 2007, n. 11 (*Governo del territorio forestale e montano, dei corsi d'acqua e delle aree protette*)
[58] Decreto del Presidente della Provincia 22 marzo 2011, n. 7-65/Leg. (*Modificazione del decreto del Presidente della Provincia 26 ottobre 2009, n. 23-25/Leg Regolamento di attuazione del titolo IV, capo II Tutela della flora, fauna, funghi e tartufi della legge provinciale 23 maggio 2007 n. 11 Legge provinciale sulle foreste e sulla protezione della natura*)

authority. In the region, the local sanitary authority makes the certification, which is for free, only in the main centres (Trento and Bolzano and other few places). According to the survey, for persons willing at selling mushrooms far from those centres, e.g. in the valleys, the cost for going to the cities is in many cases not affordable, and they are therefore obliged to pay a mycologist for the certification. The cost of the certification by a mycologist is 0.40 € per kg of mushrooms.

Medicinal and aromatic plants and other NWFP

The harvesting, the processing, and the commercialization of medicinal and aromatic herbs and plants are traditional activities in the region, which are mainly conducted at very small scale, following local customs and practices.
From 1962 norms are in place for the protection of the Alpine flora, with the list of protected species.
Today, in the autonomous province of Trento the law gives the municipalities the authority to define the maximum quantities allowed per person per day for the harvesting of mosses, lichens and flowers (non-protected species). At municipal level, also quantities and modalities of species collection are defined. The provincial frame regulation defines upper limits to the quantity that ca be collected: no more than 1 kg per day of moss and lichens and 2 kg for the other species. No limitations are set for the landowner for the harvesting or use of plants in his land. The harvesting of any species can be prohibited by the landowner, who, as for the mushrooms, has to put signs along the borders of the property (L.P. n. 11/2007)[59].
In Trentino there is an official list of operators enabled for the cultivation, harvesting and primary processing of medicinal plants for the production of food and herbal mixes.
In South Tyrol, beside the fully protected species, people can harvest the species listed in the Annex C of the law. No more than 10 floral stems can be collected. Some species can be collected for research purposes, if permitted by the nature and landscape office of the orovince (L.P. n. 6/2010)[60]. On its own land, the landowner can collect plant species without limitations.
Harvesting activity carried out for commercial purposes is allowed only for those professionals with a degree in chemistry, pharmacy, biology or natural sciences (or equivalent titles) or in possession of a special certificate issued by the province[61].
In the region there are traditional products and ancient expertise related to aromatic herbs, resins and essential oils, which have a niche market: two cases are presented in Annex II.

2.2.2.2 Regional market analysis: supply chains of chestnuts and wild mushrooms

The analysis targeted two NWFP of main economic importance in Trentino-South Tyrol, chestnuts and wild mushrooms. The research was conducted through an analysis of the chestnuts and wild mushrooms supply chains.
The supply chain study was designed following the traceability principle, which allows identifying all the actors involved in the supply chain based on the principle “from whom and

[59] Legge Provinciale 23 maggio 2007 n. 11 (*Legge provinciale sulle foreste e sulla protezione della natura*)
[60] Legge Provinciale 12 maggio 2010, n. 61 (*Legge di tutela della natura e altre disposizioni*)
[61] At least 30 days before the start of the activities, the person has to send a written communication to the provincial centre of Laimburg and to the municipality in charge, specifying the herbs which are intended to be collected. The centre can prohibit or further rule the collection.

to whom the product has been supplied"[62]. According to this, each actor should be able to provide information about its suppliers and customers. The same approach was used to develop the questionnaires for each supply chain actor asking information on "*one step back*" and "*one step forward*" its position in the supply chain together with information about its business activities related to NWFP. A theoretical supply chain based on four main actors was defined, that links forest with the end users:

i. producer: economic actor who gathers NWFP from forest for commercial purposes;
ii. processor: economic actor that purchases raw NWFP to transform them into a final or semi-finished product;
iii. wholesaler: intermediary actor that trades between two or more actors, and does not sell the products to end-users;
iv. retailer: actor that sells goods to the end user.

Only actors that commercialise the products where included, therefore excluding the collection for household consumption. For the chestnuts market analysis, since the farmers in the region are for the great majority members of chestnuts associations, all the presidents or persons in charge for the association were interviewed, asking additional questions regarding the associations' members number, the organization of the association, the main products and trade channels,

The research targeted the actors located within the administrative regional boundaries. Hence, those outside the study region were not interviewed. Forest owners were considered only if producing NWFP, while forest owners that rent the forest for harvesting or in general that sign agreements with pickers were not considered. The research of the actors in the region was conducted using Ateco[63] codes, Pagine Gialle, and also snowball sampling.

Different types of retailers were considered in the survey, such as farmers, greengrocers, supermarkets. HoReCa (hotels, restaurant and catering) were not interviewed.

The survey was designed to be conducted face-to-face, through the use of structured questionnaires, one for each category of targeted actors (producers, processors, wholesalers and retailers).

Species and products were analysed looking at both inputs and outputs: this way it was possible to verify the information provided by two different actors with a cross-validation of the data. In the questionnaires, the following qualitative and quantitative variables were included:

i. the general characteristics of the enterprise (type of enterprise, number of employees and turnover);
ii. the production inputs (type of species/product, type of suppliers and their location, source of the product or specie, quantity and price);
iii. the processing methods adopted to transform the products;
iv. the enterprise outputs (number of products, packaging, product quantity, product price, target customers).

[62] See for example Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety.

[63] From 1 January 2008, the national agency of statistics has adopted the classification of economic activities "Ateco 2007", which is the national version of the European nomenclature NACE Rev. 2.

The questionnaires are reported in Annex III. Some key actors were asked to estimate the total quantity of the given NWFP and the numbers of economic actors in the region, in order to cross validate data.

Aiming at answering at the research question "*how the chestnuts market keep alive*?", to mushrooms and chestnuts producers it was also asked whether they received funds from EU of provincial Rural Development Programme, and if the response was affirmative, to answer to the question "Do you think that EU and provincial RDP funds favoured your work?" with a five Likert scale (Yes, very much; Yes; Not influences; No; No at all).

The survey followed the sampling design presented in Table 2.8. The fieldwork took place during summer 2014 and all the questions targeted the production and trade of the year 2013. However, since for the chestnut sector the year 2013 was dramatic in terms of production, respondents replied in relation to the year 2012, or to "an average year".

Some problems were encountered during the survey. For wild mushrooms, many producers sell the products as are informal actors (that is, they are not registered as mushroom pickers in formal lists). It was therefore very difficult to find them out, and they were consequently excluded. There is also surely a part of the production which is sold through black market, which was even more difficult to trace (people are not likely to discuss about informal/illegal activities) and it was consequently excluded as well. To solve the gap for this kind of information, some targeted economic actors, individuated as "experts", were asked to give esteems.

Database preparation, data imputation and analysis were done using Microsoft Excel®. With the collected data, a description of the four categories of actors was prepared, providing quantities of product traded, products' origin, product's average prices and other descriptive characteristics. With these data, the supply chains were described.

To assess whether the direct deals application in chestnuts and wild mushrooms markets is likely to deliver sustainability aspects, we focused on the supply chains in which local products are traded. The presence of Short Food Value Chains, for their ability to contribute to social, environmental, and economic sustainability, was used as a proxy to assess whether direct deals application is likely to deliver sustainability aspects.

Table 2.8 Sampling design for chestnuts and wild mushrooms supply chains in Trentino- South Tyrol

Actors	Product	Population number	Population list	Sampling	Final Sample*	Reliability
Producers	Chestnuts	Medium-high	The great majority of chestnuts producers are members of associations and/or cooperatives. There are 9 Associations in Trentino and 3 in South Tyrol, with 90-200. There is also a chestnut cooperative	All the chestnut associations in the region were contacted. To the chestnuts president it was asked to indicate the number of memebrs and 2-4 members per association, half “small producers” and half “big producers” for the interview. Despite the great majority of producers are small producers, we interviewed both big and small producers in similar number in order to detect the greater possible number of value chains and trade channels.	19+23	Representative
	Wild mushrooms	Informal: high, Formal: low	Informal: high, unknown, many are informal producers. Formal: low, few actors in the formal registers	Ateco codes and snowball sampling, starting from few producers found in the field	3+3	Informal pickers were not targeted. The number of formal ones, who are also retailers, is very low and the sample should be close to a census..
Processors	Chestnuts	Low	Few processors. Bakeries, pastry shops and HoReCa in general were excluded.	Ateco, Pagine Gialle and snowball sampling	3+7	Representative, almost census
	Wild mushrooms	Low	3 in formal registers, only in Trentino	Ateco	3+0	Census
Wholesalers	Chestnuts	Medium	69 wholesalers of fruits and vegetable under the code Ateco 46.31. Of which 10 sell only apples and other fruits. Therefore there are potentially 59 chestnuts wholesalers	Census for the bigger wholesalers. Random sampling for the medium and small wholesalers	8+13	Representative
	Wild mushrooms	Medium	69 wholesalers of fruits and vegetable under the code Ateco 46.31. Of which 10 sell only apples and other fruits. At least 10 do not sell mushrooms, for a potential number of 49 wholesalers	Census for the bigger wholesalers. Random sampling for the medium and small wholesalers	5+8	Representative

Retailers	Chestnuts	High	Using Ateco codes, greengrocers, producers that sell at farmer markets, big retailers (such as supermarkets) located all over the region	Two-stage cluster sampling by districts: two municipalities in each "*comunità di valle*" in Trentino and "*comunità comprensoriale*" in South Tyrol, where chosen in the following way: - in each district every municipality was ordered in term of population size; - the list was divided in two, where in the first part there are the municipalities highly populated, and in the second the less populated. In each part, 1 municipality where randomly chosen; - two SME were chosen within the municipality; - once in the field, in case more activities were identified, we gave priority to shops selling fresh products. When no retailer were present, another municipality was randomly chosen from the list. - the cities of Trento, Bolzano, Merano and Rovereto where included *a priori* + 3 large retailers, interviewed at headquarter level, so that answers refer to the overall production traded in the region	21+18	Representative
	Wild mushrooms	High	Using Ateco codes, greengrocers, producers that sell at farmer markets, big retailers (such as supermarkets) located all over the region		36+24	Representative

Note: * = the first number is referred to Trentino, while the second to South Tyrol

2.2.2.3 Mushroom picking permit service in Fiemme valley

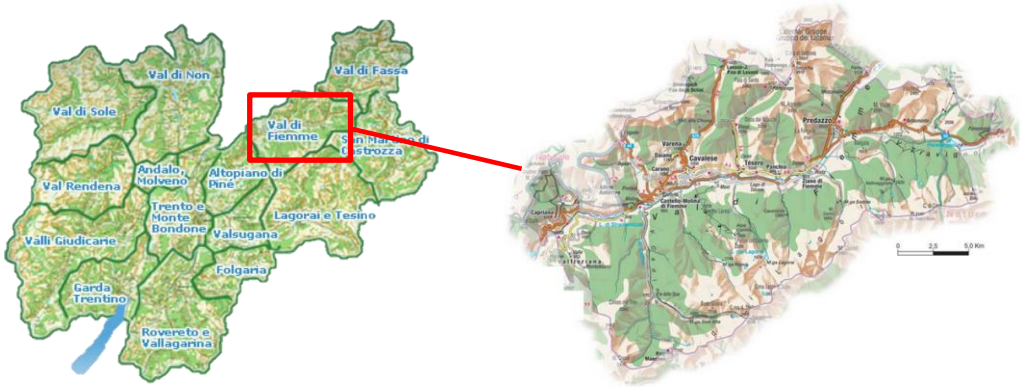
In order to answer to the research question "*Are there in the region other relevant examples of MBI applications to specific NWFP? How do they work?*", since in the region mushrooms are not only physically traded but the right to harvest them is allowed against the payment of a picking permit, an additional research was conducted targeting this mechanism.

This mechanism is implemented at regional scale, but since rules varies from municipality to municipality (refer to §2.2.2.1.1), the scale was defined to be smaller. Fiemme valley was selected. Fiemme valley is a very touristic place, and it is also renowned for being rich in mushrooms. Every year, a large number of people reach it, both for tourism and for collecting mushrooms.

The aim of the study was to understand the organization of the mushroom picking permit service and the economic and non-economic benefits that derive from. Contextually, it was investigated what local people think about the organization of the mushroom picking service and what do they think about mushroom pickers.

Fiemme valley is located in the north west of the Trento province. It is delimited by the mountainous groups of Lagorai chain, Pale di S.Martino and Latemar. The territory is in between two natural parks, Paneveggio Park and Monte Corno Park (Figure 2.10). It is characterised by forests, which span over a surface of about 25,000ha. In the valley reside 18,621 persons (ISTAT, 2011) in 12 municipalities. Of these, one (Anterivo) is under the province of Bolzano.

Figure 2.10 Location of Fiemme valley in Trentino and its territory



In Fiemme valley there is the peculiar institution of Magnifica Comunità di Fiemme (MCF). Magnifica Comunità di Fiemme is an ancient institution, which is documented already back in the 13th century. It is a "*vicinìa*", which is a customary socio-political-administrative institution in some parts of Northern Italy. A *vicinia* encompasses the assembly of persons living in the same place with interests or goods in common, i.e. forests and pastures. *Vicini* (neighbours) are the physical persons that reside in Regole, which are eleven in the valley and corresponds to the municipalities (except for the municipality located in Bolzano province). Neighbours have the right of using the collective resources. The revenues deriving by the management of the collective resources by MCF should be reinvested for community benefits, with a special focus to people in need; revenues should be used in activities that aim at improving social, cultural and

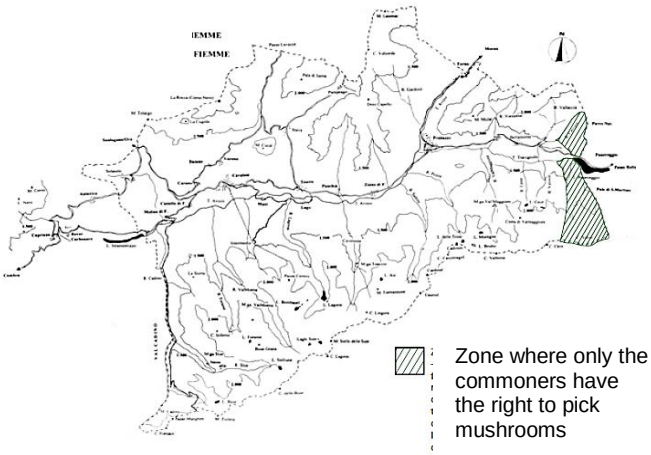
economic well-being of neighbours, and the revenues generated from natural resources must be reinvested in community benefits.

Fiemme's forests are mainly composed by conifers, with spruce coverings a surface of about 60% of the forest, followed by fir, larch and stone pine. The main broadleaves are beech, hornbeam and birch. The forest is 98% owned by MCF for collective use of vicini. It has a regular structure, and provides about 70,000 m^3/year. Technical management is regulated by assessment plans, conducted by Magnifica Comunità di Fiemme's technical forest office. It chooses the plants to harvest, and the operations are conducted by thirty wood companies of the valley. The timber is processed in the sawmill owned by MCF.

There are few private owners: the biggest are Baron Felix Longo, who owns 710ha of forest and Regola Feudale di Predazzo (1,445ha of forest); the other, few, private forest owners hold on average an area of 1-2ha each.

For the finality of mushrooms picking, Magnifica Comunità di Fiemme, together with nine Municipalities of the Vallley (Predazzo, Ziano di Fiemme, Panchià, Tesero, Cavalese, Varena, Daiano, Carano, Castello/Molina di Fiemme) and the Regola Feudale di Predazzo, set an unique and homogeneous territory (Figure 2.11). This means that the rules to follow are common and one person can encompass from one Municipality to another. Only in a limited place, which follows under a Natural Park, the harvesting is permitted only to residents who have the right of commons.

Figure 2.11 The territory in where is possible to pick mushrooms in Val di Fiemme, with a unique permit



During summer 2014, face-to face semi-structured interviews to selected stakeholders were conducted (Table 2.9), targeting:

i. the organization of the mushroom picking service (how does the service work? who is involved?)
ii. number of permits sold per year;
iii. revenues and other benefits deriving from the selling of the permits;
iv. perception of residents (and also some non-resident) toward pickers (which categories of mushroom pickers can be found? Are there differences between residents and non-resident? How the current activity impacts the resource?)

v. Perception of the residents toward the organisation of the mushroom picking service (does it work well?).

Interviews were recorded and transcribed.

Table 2.9 Interviewees in Fiemme valley

Stakeholder type	N° of interviewees	Notes	Duration (minutes)
Mushrooms guard	1		62
Town mayor	2	Phone calls, not recorded	19
MCF persons in charge (forest technicians)	2	In one joint interview	75
Forest owner	3	MCF, Regola di Predazzo; a private owner (and wife)	75+40+49
Hotel association representative	1		43
Local picker	2		20+32
Foreign pickers (tourists)	3	In a joint interview	37
Local picker (and seller) with special permit for subsistance	1		47
Restaurateur and mushrooms seller	1		16
Greengrocer	3	Not recorded	
Mycologist	1		63
Total n° of interviewees	17		

2.2.2.4 Case-study: Associazione Tutela dei Marroni di Castione

For answering to the research question "*how does the chestnuts market keeps alive*", since the chestnuts producers in the region are for the great majority member of chestnuts producer associations, one of these associations was selected for an in-depth survey.

Associazione Tutela del Marrone di Castione is a chestnut producers association, located in Brentonico Plateau, in the South Western Trentino (Figure 2.12). In the Association, since 1994 the producers have been working together in recovering the natural heritage characterized by chestnut cultivation.

The primary aim of the Association is restoring the old chestnuts stands which have not been used for many years and to promote chestnuts activity. Thanks to the work of the association, the chestnut trees are now well managed and they ensure both a profitable production and an asset from the point of view of the landscape. The Association today represents one of the main points of reference of the chestnuts sector in the region, and it has been mentioned as a national successful case by the National plan of the chestnuts sector (Ministero delle politiche agricole alimentari e forestali, 2010).

Figure 2.12 Location of the association Tutela dei Marroni di Castione in Trentino and the landscape of Castione

During summer 2014, face-to face semi-structured interviews to selected stakeholders were conducted (Table 1.1), targeting:

i. why the association was born? Where the idea came from? Which factors were of importance?
ii. how the association become so important? Which are the main products and activities delivered? Does the association work with other sectors?
iii. how is financed? How the sale of products is organised?

Interviews were recorded and transcribed.

Table 2.10 Interviewees for Associazione Tutela dei Marroni di Castione's initiatives

Name of interviewee and his role	Note	Duration (minutes)
Fulvio Viesi, president of Associazione Tutela dei Marroni di Castione		01:10
Stefano Viesi, vice-president of Associazione Tutela dei Marroni di Castione	Phone call	00:15
Rosaria Benedetti, member of the jury of experts of the gastronomic competition: "wine and chestnut: the excellent combination"		00:20
Pierpaolo Perazzolli, Founder and Artistic Director of the initiative "National Festival of Arts Graphic Humour - THE SMILE OF CHESTNUT" ®		01:09
Loredana Tranquillini, representative of the distillery Amedeo Tranquillini		00:31

2.3 Tradable permits for the carbon sequestration function of forests

The following two paragraphs illustrate the methods utilised for analysing the tradable permits application to the carbon sequestration function of forests, with reference to Italy, with the compliance (forest carbon projects within the Clean Development Mechanism) and the voluntary forest carbon markets assessments.

The MBI "tradable permits" refers to the mechanism of exchanging permits/quotas/credits among actors for the use of the resource (see §1.2.2)

2.3.1 Italian compliance forest carbon market

This study utilized the UNFCCC database[64] where official information about Clean Development Mechanism's projects are recorded, and data from the official Project Design Documents (PDD) and Monitoring Reports (MR), where project activities are described in detail (UNFCCC, 2005a). Only registered projects were considered in this study.

For the carbon financing, the BioCF database[65] was utilised, together with official BioCF and Italian Government documents.

To assess whether CDM projects contribute to the delivering of co-benefits, it was investigate *how* the projects contribute to sustainable development objectives, following the approach of UNFCCC (2012b). A text analysis of the PDDs was made, categorising the statements using a set of 10 indicators used by UNFCCC (2012b), which was built using inputs, among the others, from Alexeew et al. (2010), Olsen and Fenhann (2007), Sutter and Parreño (2007) (Table 2.11). The indicators cover the economic, environmental, and social development dimensions of sustainable development and they are based on information in the PDD, which reflects the expected contributions at the time the project is being validated.

Table 2.11 Sustainable dimensions and indicators for CDM projects

Dimension	Indicator	Description
Economic	Stimulation of the local economy including job creation and poverty alleviation	Economic improvements for the population through: direct or indirect job creation or retention of jobs, during the operation and construction phases; domestic or community cost savings; poverty reduction; financial benefits of the project for the national economy of the host country; enhancement of local investment and tourism; improvement of trade balance for the country; reinvestment of clean development mechanism proceeds into the community; creation of tax revenue for the community
	Development and diffusion of technology	Development, use, improvement and/or diffusion of a new local or international technology, international technology transfer or development of an in-house innovative technology
	Improvement to infrastructure	Creation of infrastructure (e.g. roads and bridges) and improved service availability (e.g. health centres and water availability)
Environmental	Reduction of pollution	Reducing gaseous emissions other than greenhouse gases, effluents, and odour and environmental and noise pollution; and enhancing indoor air quality

[64] https://cdm.unfccc.int/Projects/projsearch.html
[65] https://wbcarbonfinance.org/Router.cfm?Page=ProjPort&ItemID=24702

	Promotion of reliable and renewable energy	Supplying more or making less use of energy; stabilizing energy for the promotion of local enterprises; diversifying the sources of electricity generation
		Converting or adding to the country's energy capacity that is generated from renewable sources; reducing dependence on fossil fuels; helping to stimulate the growth of the renewable power industries
	Preservation of natural resources	Promoting comprehensive utilization of the local natural resources (i.e. utilizing discarded biomass for energy rather than leaving it to decay, utilizing water and solar resources); promoting efficiency (e.g. compact fluorescent lamps rather than incandescent lamps); recycling; creating positive by-products; improvement and/or protection of natural resources, including the security of non-renewable resources such as fossil fuels, or of renewable resources such as: soil and soil fertility; biodiversity (e.g. genetic diversity, species, alteration or preservation of habitats existing within the project's impact boundaries and depletion level of renewable stocks like water, forests and fisheries); water, availability of water and water quality
Social	Improvement of health and safety	Improvements to health, safety and welfare of local people through a reduction in exposure to factors impacting health and safety, and/or changes that improve their lifestyles, especially for the poorest and most vulnerable members of society; improved human rights
	Engagement of local population	Community or local/regional involvement in decision-making; respect and consideration of the rights of local/indigenous people; promotion of social harmony; education and awareness of local environmental issues; professional training of unskilled workers; reduction of urban migration
	Promotion of education	Improved accessibility of educational resources (reducing time and energy spent by children in collecting firewood for cooking, having access to electricity to study at night, and supplementing other educational opportunities); donating resources for local education
	Empowerment of women, care of children and the frail	Provision of and improvements in access to education and training for young people and women; enhancement of the position of women and children in society

Source: UNFCCC, (2012b)

For further investigate the delivering of environmental co-benefits, an assessment of the use of native and non-native species was made, utilising information contained in the PDD.
Data were analysed using Microsoft Excel.

2.3.2 Italian voluntary forest carbon market

The survey on the Italian voluntary forest carbon market took place within the project Nucleo Monitoraggio del Carbonio of INEA (now CREA). The collection of information was carried out through an online questionnaire, made available on the website of the initiative[66] open to all interested participants. The Italian organizations that operate in the sector were telephonically contacted for inviting them to fill the questionnaire; they were also invited to indicate the name of all the other operators they know.

[66] http://www.rivistasherwood.it/serviziecosistemici/

The questionnaire was prepared with Google forms, along the same lines of the one of Forest Trend's Ecosystem Marketplace, for facilitating the inclusion of the Italian data in the international report "State of the forest carbon markets" (Goldstein and Neyland, 2015).
Compilers were asked to indicate the number of projects, their geographical location, the types activities implemented; the role that the organization plays in the transactions[67] and its status (profit, non-profit, public administration); the project dimension, namely the volume of forest carbon tonnes generated and transacted; the use of forest carbon standards and methodologies
For assessing whether the projects generate of co-benefits, since it was not possible to access to PDD[68], to the project responsible it was asked whether standards for co-benefits were used. Beyond the use of standards, it was asked to provide the number of people trained and employed thanks to the projects, and to inform about the use of native and non-native species, and any generation of any other additional co-benefits.
Data were analysed using Microsoft Excel.

2.4 Voluntary price signals: NWFP certification

The MBI "voluntary price signals" works by assigning on a voluntary basis a price to environmental/socio-economic impact through the imposition of incentives/disincentives (see §1.2.2). The main example in positive is certification and use of standards

For assessing which are the certification schemes of main interests for NWFP, and which are their scope, a literature review was conducted, consulting the main scientific databases and google scholar; since certification is a business tool, and its application is not only targeted by scientific literature, also grey literature was included. The targeted certification schemes are voluntary schemes, which are in accordance to mandatory national, regional and international rules, regulations and conventions (which were not hereby matter of discussion). The work focused only on third party certifications, that is, those processes that require an independent assessment of a separate accredited third party.
The research included also a field work that was conducted contextually to the supply chain survey in Trentino-South Tyrol. It consisted in a research of certifications labels (or similar references) which are applied on products sold by greengrocers, retailers, supermarkets, etc.
For each certification scheme individuated, the standards were reviewed. By reviewing the standards, it was assessed whether they directly target NWFP and whether the standards contain ecological specifications for sustainable harvesting of NWFP (such as quantity /period/methodology of harvesting) in order to assess if the application of the standards lead to a sustainable NWFP collection.

[67] We consider "transactions" to occur at the point that offsets are contracted or suppliers otherwise agree to deliver offsets immediately or in immediate future.
[68] For many projects the PDD were not publicly available, or there was not the duty of reporting the specifications about the generation of co-benefits in the PDD.

3 Results and discussion

The *Chapter* presents the results, divided in paragraphs according to the research objectives and the issue investigated. Paragraph 3.1 is preliminary to the other results, since it indicates which are the most effective Market Based Instruments applied to Non-Wood Forest Products and to climate regulation (carbon sequestration function of forests), according to the scientific literature.

Paragraph 3.2 illustrates the results of the "direct deals" application of NWFP, focusing on the NWFP for which Italy covers a key role in the international trade (paragraph 3.2.1), and on Trentino-South Tyrol wild mushrooms and chestnuts markets (paragraph 3.2.2).

Paragraph 3.3 focuses on "tradable permits" applied to climate regulation –carbon sequestration function of forests, with paragraph 3.3.1 referring to the Italian compliance forest carbon market (afforestation and reforestation projects under the Kyoto Protocol's Clean Development Mechanism) and paragraph 3.3.2 targeting the Italian voluntary forest carbon market.

Chapter 3.4 provides the results of the "voluntary price signals" applications, namely certification, to NWFP.

Contents

3.1 How MBI application to NWFP and climate regulation (carbon sink function of forests) is reflected in the scientific literature

Results are presented according to NWFP and climate regulation that derives from the carbon sequestration function of forests.

Non-Wood Forest Products

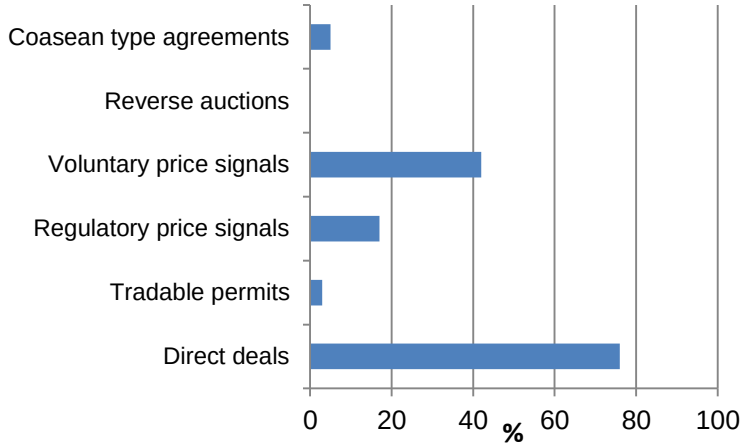
The search in Scopus Database using the terms “Non-Wood Forest Products” or “Non-Timber Forest Products” and the keywords described in the methodology, reported about 90 peer-reviewed papers.

It has to be stressed that Scopus more provides a focus on peer-reviewed scientific literature and excludes grey literature references, which surely represent a rich corpus in the case of NWFP. Moreover, Non-Wood Forest Products, so multiple and diversified, comprehend a wide range of species and ends products. For this reason, probably a specie-specific or end-product specific search would have been returned additional results. On the other side, a research only of academic journals allows to base the analysis on a strictly scientifically-validated corpus, and only on that corpus that precisely target Non Wood Forest Products as a category, rather than single species. Moreover, the study aims at emphasising representativeness more than exhaustiveness.

The search revealed that, among the six categories of MBI investigated, the great majority of the papers focused on “**direct deals**” (Figure 3.1). This is an expected result, since NWFP are physical products and a simple way to exchange them is in direct, physical markets, at different scales, from the local to the global. The reviewed researches stress that NWFP commercialization, by increasing the economic value of the forests, can both conserve forest ecosystems and contribute to the livelihoods of people that depend on forests.

For example, supply chain analysis were used in south-west Ethiopia to explore how a spice, korerima, can be developed to increase forest value and enhance sustainable forest livelihoods (Meaton et. al, 2015).

Figure 3.1 NWFP: Distribution (%) of scientific articles targeting MBI, according to the categories



Source: own elaboration on Scopus database data

Saastamoinen et al. (1998) report that in many parts of Finland, picking for sale is very

important. Since 1977, is recorded that in most years, the value of wild berries has been greater than that of cropped berries. Estimates indicate that the combination of professional sale, direct sale and market sale of wild berries amounted to Fmk 105.5 million in 1998, which is a very high value.

In Lithuania, income from the market sale of NWFP, especially mushrooms, made up 13% of the total amount earned from forest activities (Olmos, 1999).

In Roztochya (Ukraine), people sell berries and mushrooms in markets and along the main roads in the region, earning per day more than the mean daily labour payment in rural areas (Stryamets et al., 2012).

In Europe, studies have explored NWFP market and the structure of the market. Examples are Saastamoinen, 1999; Kangas and Markkanen, 2001; De Romàn and Boa, 2006; Croitoru, 2007, Pettenella et al. 2007; Secco et al., 2009; Turtiainen and Nuutinen, 2011; Cai et al., 2011; Voces et al., 2011; Weiss et al., 2011; Keča et al., 2013.

The literature also reports that in some cases the harvesting for commercialization can deplete the NWFP resources, due to overuses. This is for example, the case of Batshireet district, in Mongolia, where the transition and integration into the global market economy led to an increasing degradation of its natural environment. Due to the decline of income alternatives, the population increasingly collect NWFP, up to one third of house-hold incomes, leading to overexploitation (Hartwig, 2008).

The reviewed literature does not report the application to NWFP of MBI “reverse auctions”.

Few papers refer to the mechanisms of application of “**tradable permits**”, and in particular of quotas for the commercialization of a given NWFP. For example, Stewart (2003), report the case of bark extract of *Prunus Africana* produced in Cameroon, Madagascar, Equatorial Guinea and Kenya. Because of concerns regarding the sustainability of the trade, the species was included on the IUCN Red List of Threatened Species, listed as ‘‘vulnerable,’’ and it was included in Appendix II of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES is allowed to assign quota for export. This kind of measure belongs to the tradable permits mechanism. Stewart affirms that the free commerce led to a decade of exploitation, while the quota assignment appears to have spurred efforts to establish scientifically based annual quotas.

Another case of tradable permits is reported by Kalliola and Flores (2011). In Peru, the Brazil nut trees are owned by the state, which provides concessions to individuals with the exclusive right to harvest the nuts in a given area. Currently, there are about 1,200,000 hectares of concessions in Peru, including 60,000 hectares entitled to indigenous people territories. This activity sustains locally important economies. Concessionaires are requested to make annual operating plans and present a management plan every fice year, including information about the production process and forest quality. Such assurance provides “*a strong predictability element that can be considered as an incentive to invest in and maintain the sustainability of the nut production. The obligation to regularly update the operation and management plans also promotes bidirectional interaction with the national authorities that are in charge of this natural resource*. *This linkage reinforces the implementation of sound environmental practices in the country”.*

Even if the scientific literature does not highly target the tradable permits mechanism for NWFP, it has to be stressed that the use of concessions for harvesting right is a wide used practice in

many countries of the world. For example, in the Asia and Pacific area, as reported by FAO's studies (Warner, 1995) the collection of many NWFP (such as resin or rattan) typically occur under concession rights. Concessions mostly are of long terms in response to the prevailing theory that if long-term benefits could be obtained there would be better management of the resource.

There are some examples that report the effectiveness of "**Cosean types agreements**", namely Payments for Ecosystem Services. For example, Diemer and Borner (2013) state that to address overexploitation in tropical forestry, a number of market-based approaches were developed. The rationale is that tropical forests can only be maintained in the long term if economic returns of sustainable activities are equivalent to unsustainable forest uses. The article underlined that an important prerequisite for the successful application are robust land use rights.

Gios and Rizio (2013) state that the purpose of such a payment system is to promote the sustainable development and management of forests, as well as the income of the community whose economy is based directly on forest resources.

Almost 20% of the papers target "**regulatory price signals**", namely the use of policies, policy instruments and laws for the assignation of a price to environmental impacts. Many kinds of incentive have been used to increase the profitability of forestry in general and also for NWFP, including grants, cheap loans, favourable tax treatment, the provision of below-cost or free materials and/or ad-vice, the provision of public goods, and supportive policy measures (Witheman, 2003).

For example, in Finland, you may sell berries tax-free on a market place, as long as you only do it occasionally on an amateur basis. In addition, you may sell berries tax-free directly to restaurants or wholesale buyers.

In Serbia, Nedeljković et al. (2013) stress that in the application of policy instruments is needed the inclusion of representatives of regional and local authorities, NWFP based enterprises, and local residents, to ensure the presence of all stakeholders during the preparation of planning documents, rules and regulations, as well as possible strategies for sustainable use of NWFP.

Almost 50% of the papers state the importance of "**voluntary price signals"**, and specifically certification, for development of NWFP sector (e.g. Pierce et al., 2008; Guedes Pinto et al., 2012; Schmitt et al., 2012; Yadav and Dugaya, 2012). Refer to § 1.3.1.3 for a more detailed description. The effectiveness of the mechanism is also confirmed by a substantial non-academic journal literature, such as publication of CIFOR, FAO etc.

The present research will therefore target, for NWFP, the application of "direct market" and "voluntary price signals".

Climate regulation derived from the carbon sequestration function of forests

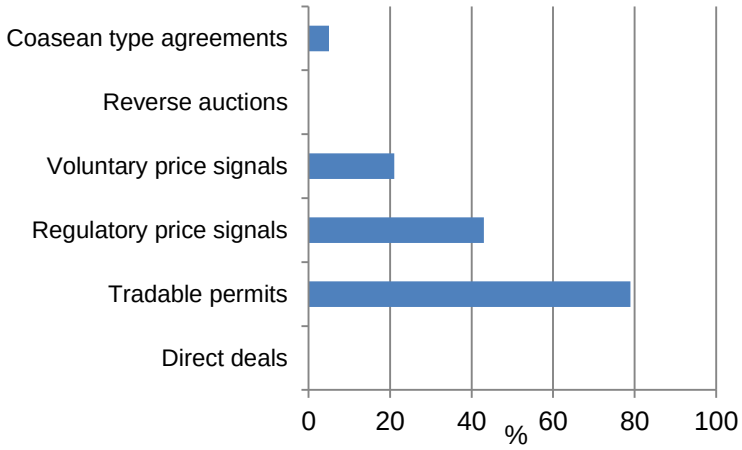
The search in Scopus Database using the keywords described in the methodology, reported 197 peer-reviewed papers. A sample of 100 was analysed by reading the abstracts.

The first thing that can be observed that in several cases there are misunderstanding regarding the terms linked to the MBI types analysed. For example, there are papers naming the PES mechanism. However, almost all refer to the mechanism of providing money for the ecosystem service of carbon sequestration by forest, against the acquisition of carbon credits that originate

from the forest carbon projects. Therefore, this is more ascribable to the tradable permit mechanism. Other papers name “policy mechanisms”, which may be included in the “regulatory price signal” mechanism”. However, they actually target the Clean Development Mechanism, which is based on the exchange of carbon tones against a payment, and again ascribable to the tradable permit mechanism.

From the literature analysis emerged that the mostly targeted MBI is, as expected, “**tradable permits**”, with reference to the carbon markets created with the exchange of the carbon credits generated by forest carbon projects (Figure 3.2).

Figure 3.2 Forest carbon: distribution (%) of scientific articles targeting MBI, according to the categories



Source: own elaboration on Scopus database data

Forest carbon markets are described by scholars with respect to the forest activities implemented (stressing that especially avoided deforestation activities, especially in the tropics, provides enormous opportunities to reduce GHG emissions), the climate benefits derived, the location of the projects, the actors involved, the other co-benefits obtained. Forestry projects are reported to offer considerable market opportunities for carbon offsets and they have the potential to reward landowners for improved forest management and forest conservation.

Both the markets generated by the application of the tradable permits mechanism, the compliance and the voluntary, are cited by the papers. Refer to §1.3.2 for the description of the forest carbon markets.

Among the compliance markets, not only the Kyoto based market is targeted, but also other compliance markets. Kerchner and Keeton (2015) for example, while stating that to date, the voluntary market in U.S. represents the greatest opportunity for forest landowners to participate in carbon transactions, affirm that lack of a consistent carbon price signals and sporadic demand has prevented widespread participation. They suggest the adoption of a U.S. based cap-and-trade program to reduce price risk and provide incentives for sustainable forest management across large areas.

Some articles also report that in the forest carbon markets there are also drawbacks (e.g. Gorte and Ramseur, 2008). Criticisms exist toward the commodification of forests for the carbon sequestration purpose. Bäckstrand and Lövbrand (2006) write that a critical civic

environmentalism discourse contested forest carbon projects depicting them as unjust and environmentally unsound strategies to mitigate climate change. The article examines the articulation of these discourses in the climate negotiation process as well as the wider implications for environmental governance.

Boucher (2015) also suggests resizing the importance of the market. The author states that both proponents and opponents of using forest carbon markets to pay for Reductions in Emissions from Deforestation and forest Degradation have exaggerated their importance. Indeed, if we look at the main drivers of deforestation, that are livestock, soy, palm oil, and wood products, funding for forest carbon markets and for REDD+ mechanism are very “small potatoes”.

Many papers also target the use of **regulatory price signals** MBI. Within this mechanism, there are carbon taxes and fiscal policies.

For example, Hsueh (2013) report that in Taiwan, the Forestry and Agriculture Bureaus currently subsidize with a 20 years plan the transformation of fallow or inactive farmland into forests that sequester carbon. These policies simultaneously reduce atmospheric carbon concentrations and increase the income of farmers.

Caurla et al. (2013) explored the impacts of a combination of a carbon tax and a fuelwood policy, and a combination of a carbon tax and a sequestration policy on the economy of the forest sector in France.

Weng (2013) suggest a public policy to develop forest carbon sink in the coal industry, using also carbon taxes.

Sjølie et al (2013) in Norway explored the effects of albedo when incorporated in a carbon tax/subsidy scheme in the Norwegian forest sector.

Nepal et al. (2013) describe the benefits of a hypothetical future carbon reserve scenarios, where U.S. forest landowners would be paid to sequester carbon on their timberland and forego timber harvests for 100 years.

However, by far the main role within the regulatory price signal mechanism is played by the REDD and REDD+ mechanism. A distinction has to be done: REDD both refers to a forest carbon project activity[69] and to an institutional mechanism. This second, firstly put in place by the United Nations, is a mechanism that offers incentives for developing countries to reduce emissions from forested lands and invest in low-carbon paths to sustainable development. "REDD+" goes beyond deforestation and forest degradation, and includes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks. While the project activity leads to reducing emission at project level and to creating and commercialising credits, being ascribable to the tradable permit mechanism, the institutional mechanism typically falls into the regulatory price signals mechanism. With this second mechanism, public sector (mostly) has committed $2.8B to finance REDD+ readiness initiatives in developing countries. Moneys go to developing countries with tropical forests for preparing their forest institutions, their laws, for consulting and engaging stakeholders and for setting pilot

[69] Reduced Emissions from Deforestation and forest Degradation (REDD and REDD+) project type activity consist in conserving existing forest areas with demonstrable risk of land-use change or reduced carbon storage, resulting in the avoidance of a business-as-usual scenario that would have produced higher emissions. Emissions reductions occur primarily through avoided emissions. With the negotiations in Cancun in 2010 it was defined the “plus” as encompassing reduced emissions from deforestation and forest degradation, as well as additional efforts to sustainably manage forests, and conserve and enhance carbon stocks

activities and strategic plans for REDD+. Italy is not involved in this institutional mechanism.
In Scopus, if we change the keywords of the research and instead of using “fiscal policy” or “tax” or “incentive” we use “REDD”, the database returns an enormous amount of records, 2,157 results. The papers both target the project level activity and the institutional mechanism and a further investigation to distinguish the two things would be needed. The great number of results reveals that this is both the project activity that is recognised as being the most effective in conserving natural tropical forests (including conserving biodiversity and local communities benefits) and a powerful financial mechanism that connect industrialised and developing countries in the effort of reducing the degradation of tropical forests.
Some papers also refer to the Payment for Ecosystem Service, but, as stated before, it is mainly referred to the payment for receiving back carbon credits, therefore being more ascribable to tradable permit mechanism. No papers refer to the mechanism of direct deals. No papers target the use of revers auction.
Many papers also target the **“voluntary price signal”** mechanisms, referring to the use of certification and forest carbon standards. This especially happens within the voluntary carbon market. As Merger and Pistorius (2011) state, as the voluntary carbon market is not regulated (or less regulated), voluntary standards have been created to secure the social and environmental integrity of the projects and thus to ensure the quality of the resulting carbon credits. The study of Merger and Pistorius identifies and analyses the characteristics that determine the efficiency and organisational legitimacy of standards for forest carbon projects.
Merger et al. (2011) compared and evaluated the applicability of ten forest management, social, environmental and carbon standards to the Reducing Emission from Deforestation and Degradation Projects concluding that the voluntary certification provides useful experience that should also fit within the international REDD+ regime. As Goldsteon and Neyland (2015) report, 91% of forest carbon credits transacted in 2014 were developed under a third party certified standard.
The present research will target, for the climate regulation derived from the carbon sequestration function of forests, the application of “tradable permits”.

3.2 "Direct deals" of NWFP

Results are presented in two main paragraphs. Paragraph 3.2.1 illustrates the results of the analysis of the international trade conducted using UN Comtrade database for determining which are the NWFP for which Italy covers a key role in the international trade.
Paragraph 3.2.2 shows the results of the survey conducted for analysing the markets of wild mushrooms and chestnuts in Trentino-South Tyrol.

3.2.1 NWFP for which Italy covers a key role in the international trade

The analysis of the international trade conducted using UN Comtrade database shows that **Italy covers a key role in the international trade of tannins, cork stoppers, chestnuts and wild mushrooms**, where it has held a top position within the five largest global traders in the last decade. Results are presented according to the four NWFP. Annex IV reports an overview of all data.

3.2.1.1 Tannins

Vegetable tannins (as opposed to synthetic tannins) are plant polyphenolic compound that bind to and precipitate proteins and other organic compounds. Tannins are extracted from wood and wood bark of different trees and they are used in the food industry and, especially, in the process of tanning leather. The production of vegetable tannins was prominent until '50-'60 of the last century, thereafter natural tannins were hugely substituted by synthetic tannins.
Recently there has been a rediscovery of natural tannins, and the sector may be particularly fostered in the light of the introduction of some regulations with environmental focus. This is the case of Dir.2000/60/EC, which was introduced in the European Union for enhancing the quality of freshwater streams and rivers. One of the main targets is the reduction of hazardous substances[70] used in leather industry, which could be partially substituted with natural tannins.
Under Harmonised System (HS), tannins are commercialised under four commodity codes. The trade analysis shows that Argentina, Brazil and South Africa are today the three major tannin exporters (Table 3.1). This is the result of the geographical shift that occurred in the last decades in the vegetable tannins production, from Europe to other countries. In Europe they were, and still are, mainly obtained from oaks and chestnuts trees. However, the production has almost completely substituted by quebracho[71] and wattle[72], which mainly grow in southern hemisphere countries.

Figure 3.3 shows that the HS code for tannins deriving from chestnuts and oaks ceased to exist, arguably for the decreased economic importance of the products, in favour of quebracho, wattle, and other tannins. If we look at the traded quantity, we can see that tannin market is a market with a quite stable trend, which become negative in the last decade. This arguably pushed the

[70] http://ec.europa.eu/environment/water/water-framework/priority_substances.htm
[71] *Quebracho* is the Spanish term that describes very hard wood tree species. Quebracho produces tannins that are extracted from the heartwood. The quebracho species from where tannins are extracted are mainly red quebracho (*Schinopsis lorentzii*) and white quebracho (*Aspidosperma quebracho-blanco*).
[72] Wattle is mainly derived from the bark of *Acacia mearnsii*.

price and the total traded value up (Figure 3.4 and Figure 3.5).

Table 3.1 Top 5 global importer and exporter of quebracho and wattle tannins, in terms of values

Exports (million USD)							
2000		**2005**		**2010**		**2011**	
Argentina	49	Argentina	46	Argentina	68	Argentina	69
Brazil	25	South Africa	34	South Africa	50	Brazil	57
South Africa	20	Brazil	31	Brazil	49	South Africa	53
Hong Kong	6	USA	8	USA	5	USA	6
Kenya	3	Zimbabwe	4	Zimbabwe	4	Zimbabwe	5
Imports (million USD)							
2000		**2005**		**2010**		**2011**	
Italy	25	Italy	22	India	28	India	29
Mexico	12	India	18	China	27	Italy	28
India	10	Mexico	16	Italy	23	China	26
China	9	China	12	Mexico	18	Mexico	22
USA	6	USA	6	USA	8	USA	8

Figure 3.3 Global trade of tannins by commodity from 1988 to 2012 (metric tons)

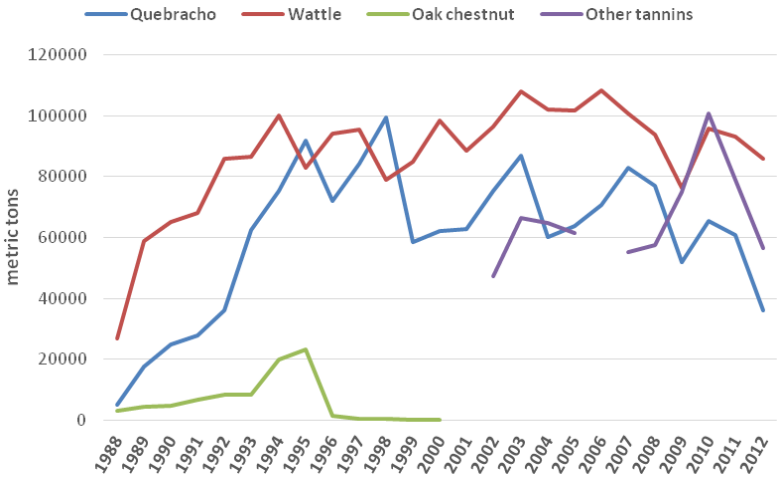


Figure 3.4 Global tannins trade flows by commodity from 1988 to 2012 (millions of dollars)

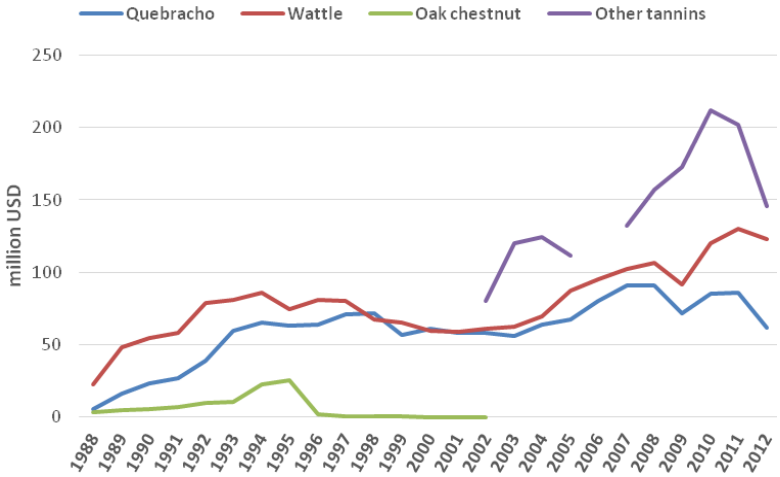
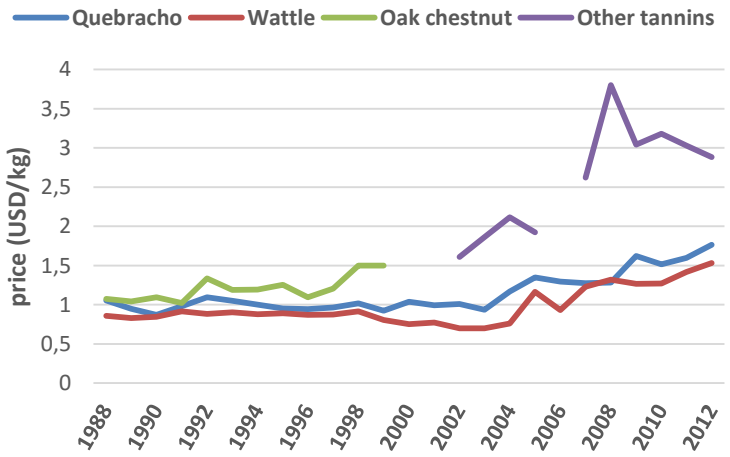


Figure 3.5 Global trade of tannins by commodity from 1988 to 2012 (prices)

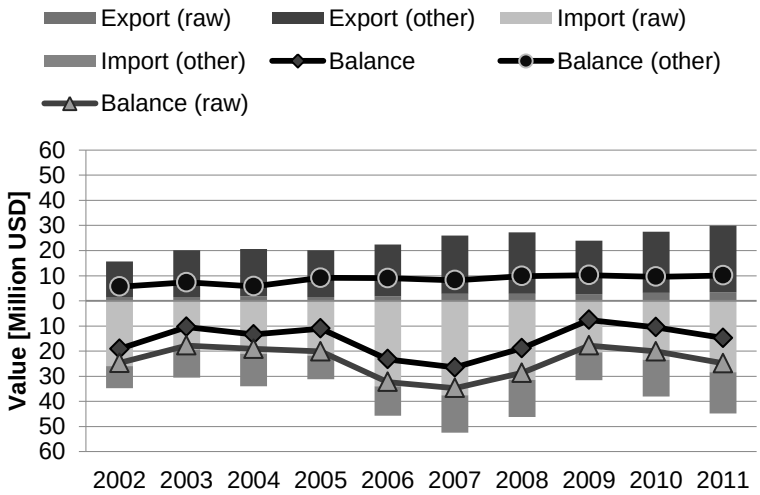


Note: prices on large quantities, greater than 50 tons

At present, in Europe only Italy has maintained a core role in the global vegetable tannin market. However, Italy is not a top producer, but rather it covers an important role in the tannin processing. As shown in Table 3.1, Italy is among the top five global importers.

Italy purchases raw tannins from 25 countries, it refines them, and it exports the production to more than 85 countries (in 2011). Italy doubled the export value between the 2001 and 2011, resulting as a net exporter in 2011 (Figure 3.6).

Figure 3.6 Italian import, exports and balance of trade for quebracho and wattle tannins in 2011



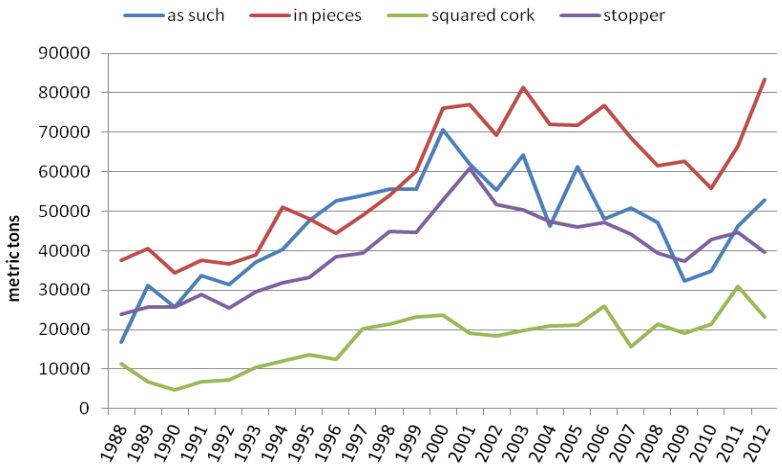
With the introduction of the EU regulation that disfavours synthetic tannins, and whether the current trend of price increment will be maintained, this might allow to create a profitability of national tannin production, re-establishing the role of chestnut and oak forests in producing these compounds.

3.2.1.2 Cork

Cork is a product derived from the outer bark the cork oak tree and it is a renewable and sustainable product during the life of the tree. Its use supports a biologically rich system and an important economy in Mediterranean countries. Cork production in western Mediterranean countries is part of the history and the culture (Pereira, 2011). Commodification and commercialization has been occurred since historical time.

Data on international cork trade can be found in seven HS commodities groups. Among these categories, in the analysis three categories related to rough materials (cork as harvested, pieces of cork and squared cork) and cork stoppers as final product were considered. In 2012, the global traded raw cork accounted for 0.159 M tons (Figure 3.7). The increase in the latest years in terms of traded quantity may be understood as a new re-launch of the sector. The economic value of raw cork represents only the 28.5% of the total traded value, while the higher added value is generated from the trade of cork stoppers. Cork stopper is among the most valuable NWFP-by product exported from EU28. The EU28 production accounts for the 94.7% of the global export of the cork in which 55% is traded within EU (Figure 3.9).

Figure 3.7 Global trade of cork by commodity from 1988 to 2012, in quantity (metric tons)



However, cork stoppers trade value is showing a decrease (Figure 3.8). This negative trend is most likely related to the high competition of plastic stoppers for wine bottles, which are more frequently used because of their lower cost.

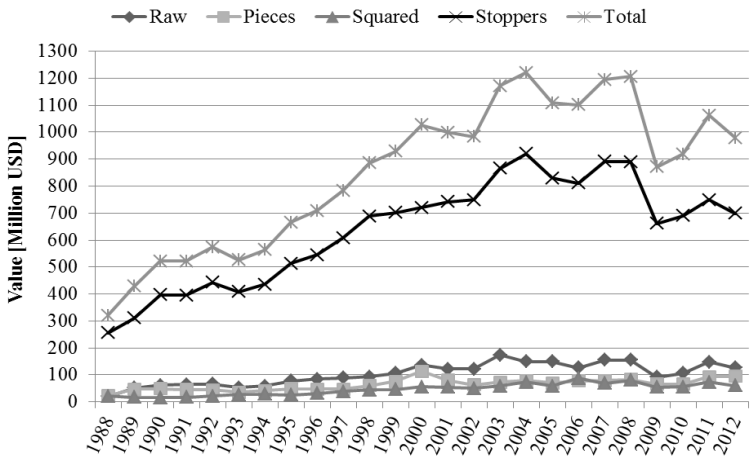
Portugal is the main cork producer in the world, exporting to 97 country partners and covering also a relevant role as processor (Table 3.2). Portugal is indeed the main global exporter of cork stoppers. It was followed by Spain, France and Italy. This is in line with data that confirm that the 60-70% of the Italian cork production in 2005, almost totally located in Sardinia, was for cork stoppers[73] (Pereira, 2011).

However, Italy recently disappeared from the top 5 exporters. This is probably due to the high demand on the internal market, arguably for the use of cork stoppers in the wine industry. This actually resulted in a growing position of Italy as global importer. This is confirmed by the balance of trade analysis (Figure 3.10). Despite the role of Italy as cork producer, the trade

[73] The remainder is for green buildings (16%), footwear industry (9%) and 3% for handcrafts.

balance has been negative since data were recorded: it reached almost the equality between 1998 and 2003, while from 2004 the balance oscillated between 20 and 30 M US$ of deficit (Figure 3.10). This is reasonably due to the flourishing of another sector in which Italy is the global leader exporter, the wine, which probably absorbed a great part of the internal production and also required an additional import.

Figure 3.8 Global cork trade by commodity, in value (million US$)



Even with the decrease in the trade, which is hopefully a temporary dynamic, the cork stopper sector may represents for Italy a good business also in the future. According to a recent survey, almost 60% of Italians say they are willing to spend more money for a bottle of wine sealed with a cork stopper, because of their perceived higher value, quality and for the better image (Cork information bureau, 2011).

Cork stoppers, as well as innovative products such as cork panels, composites, high performance insulators and tissues could continue to support Mediterranean forestry.

Figure 3.9 EU28 imports and exports' partners for cork stoppers in 2011 with respect to global trade (percentage based on value in US$)

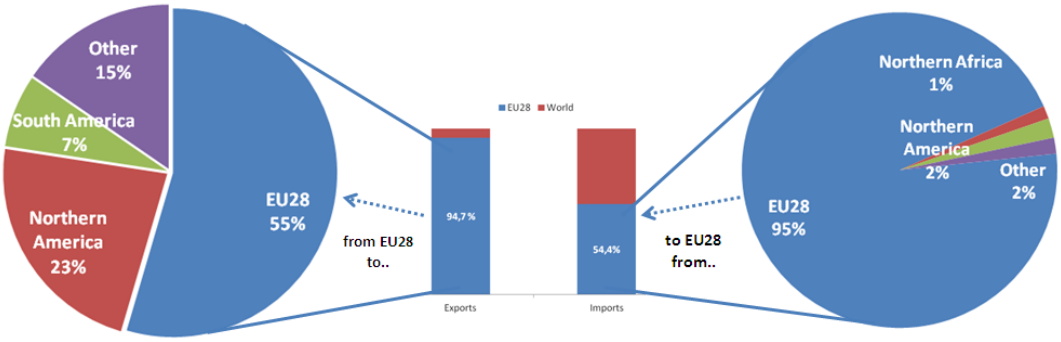
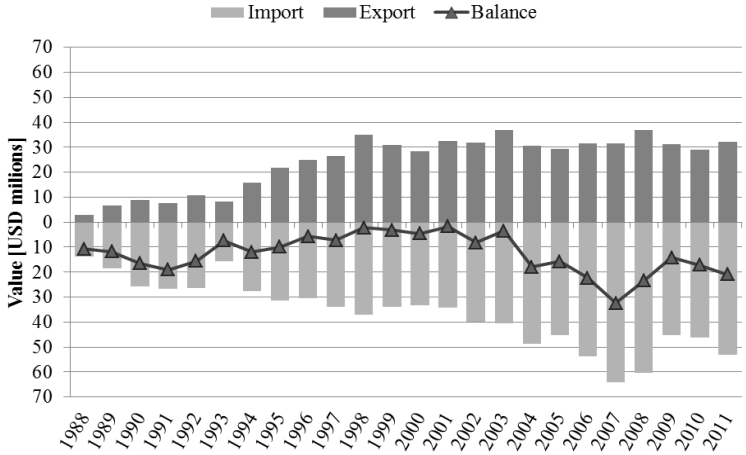


Table 3.2 Top 5 global importer and exporter of cork stoppers (economic value)

Exports (million USD)							
2000		**2005**		**2010**		**2012**	
Portugal	502	Portugal	592,1	Portugal	483,1	Portugal	524,0
Spain	58,6	Spain	79	Spain	81,6	Spain	87,7
France	53,7	France	38	France	33,2	France	27,9
Italy	28,5	Italy	29,3	Italy	29,1	USA	17,5
Germany	16,2	Germany	18,9	USA	13,5	Germany	9,4
Imports (million USD)							
2000		**2005**		**2010**		**2012**	
France	192,7	France	205,3	France	189,5	France	181,3
USA	115,6	USA	146,1	USA	137,4	USA	150,1
Australia	58,8	Spain	73,1	Spain	49,7	Spain	47,0
Spain	55,4	Australia	55,5	Italy	46,3	Italy	44,8
Germany	52,1	Italy	45,1	Chile	30	Portugal	38,0

Figure 3.10 Italian balance of trade of cork



3.2.1.3 Chestnuts

According to HS code, nuts are divided into two commodity families: the first considers coconuts, Brazilian nuts and cashew nuts, while the second gather all the other nuts. The research looked at some nuts within the second group, namely hazelnuts, walnuts, chestnuts and pistachios, while unfortunately pine nuts were excluded because the correspondent HS commodity code reported mainly tropical nuts, and it was therefore not possible to extrapolate them.

Within the group we targeted, according to the trade analysis, the most important traded nuts in terms of quantities and values are almonds which accounted for 1.1 million tons and 4.7 billion US$ in 2011, on a total quantity of 2.5 million tons and value of 12.9 billion US$ of traded nuts (Figure 3.11 and Figure 3.12).

Since 2001, the trade of hazelnuts, walnuts, chestnuts and pistachios has quite constantly increased.

Figure 3.11 Global nuts trade by commodity from 1998 to 2012: quantity

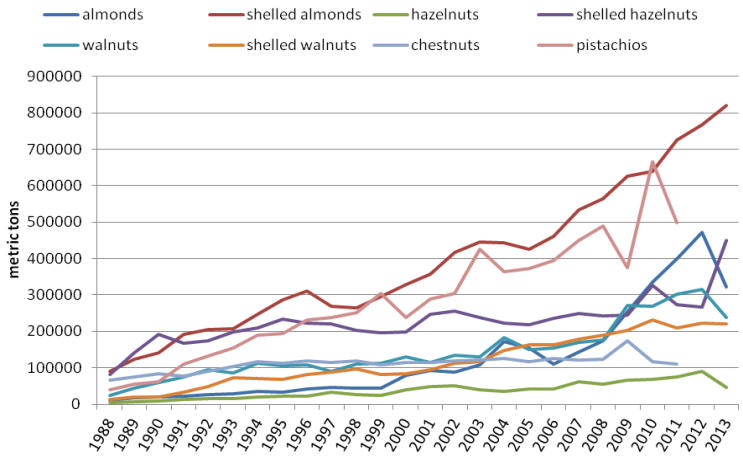
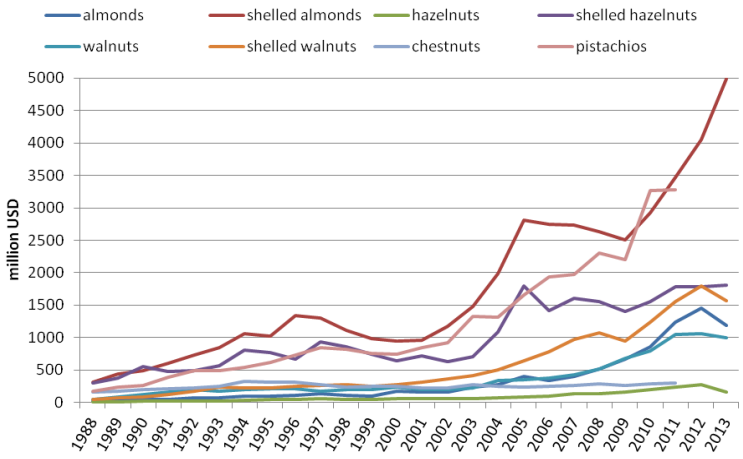


Figure 3.12 Global nuts trade by commodity from 1988 to 2012: economic value

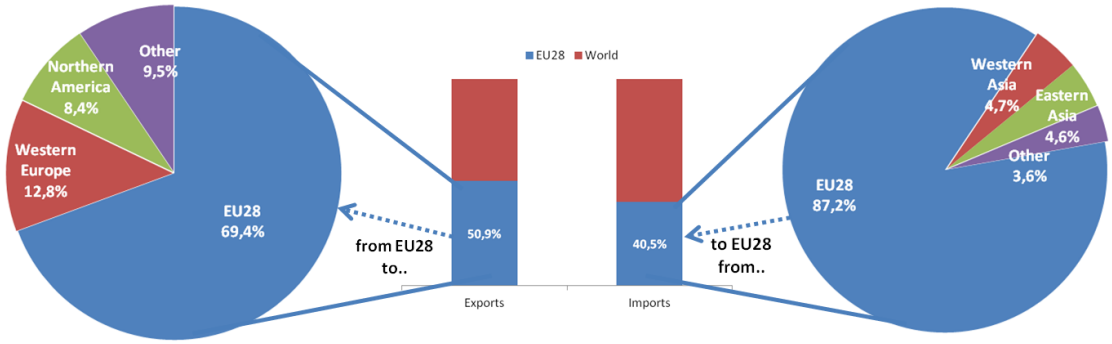


The target of the present research are products that come from forests and other wooded land. Among the traded nuts, only a minor part comes from these ecosystems, like chestnuts and part of traded almonds and pistachios. In particular, chestnuts trade requires a specific focus since it is the most forest-dependent production, and still a key NWFP in the South European countries like Italy.

Despite the constant position of China as the main global chestnut exporter, European countries were able to erode positions to China and Korea in terms of economic value (Table 3.3), which have decreased their export share from the 67% in 2000 to 42% in 2011 (total trade value 0.28 billion US$). In the same period, Italy, Portugal and Spain have increased their share of the export value from the 25% to 42%, probably as a combined effect of the EU Common Agriculture Policy implementation that support the sector, together with the consolidated traditional know-how in chestnut production, processing and marketing.

The EU28 trade balance has been positive since 1988, remaining around $30 M in the last three years. EU28 was covering 40.5% of global import in 2011, mainly generated within the European Union and it supplied over 50% of the global export value, though almost 70% does not leave EU28 countries (Figure 3.13).

Figure 3.13 EU28 imports and exports' partners for chestnuts in 2011 with respect to global trade (percentage based on USD dollars).



Despite the increasing export trend, there is also an increasing import from the international partners, since the trade balance has been quite stable in the last decade (Figure 3.14). An explanation of this stable trend is surely the static low dimensions of the chestnut forests combined with several pests that have limited the chestnut production (i.e. "chestnut gall wasp" and chestnut blight).

In 2011, Italy was the leader exporter in terms of value, accounting for $79.7M[74] (Table 3.3) and exporting chestnuts to 51 countries.

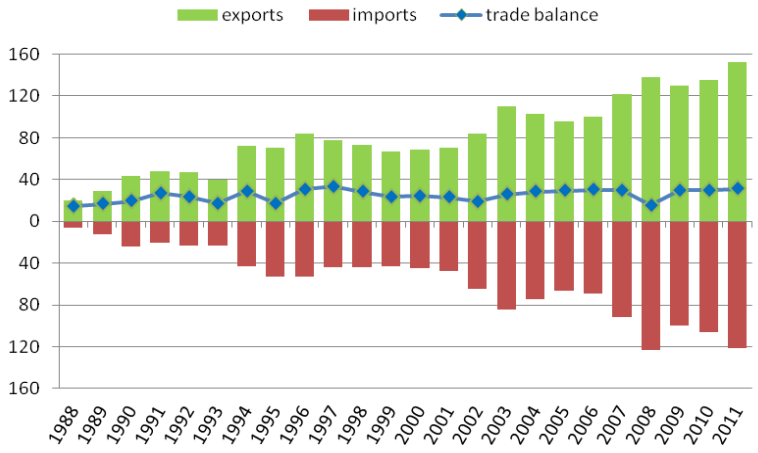
Table 3.3 Top 5 global importer and exporters of chestnuts (economic value)

Exports (million USD)							
2000		**2005**		**2010**		**2011**	
China	85,4	China	66,5	Italy	73,2	Italy	79,7
R. of Korea	84,3	Italy	64,1	China	70,1	China	78,4
Italy	40,2	R. of Korea	53,0	R. of Korea	45,4	R. of Korea	48,1
Portugal	13,1	Portugal	11,8	Portugal	22,5	Portugal	25,8
Spain	9,0	Turkey	9,4	Spain	16,6	Spain	20,0
Imports (million USD)							
2000		**2005**		**2010**		**2011**	
Japan	149,6	Japan	72,5	Japan	54,4	Japan	59,0
France	13,8	China	21,9	China	23,1	France	28,6
USA	11,5	USA	16,0	France	21,7	Italy	24,2
Asia, nes	9,8	France	13,9	USA	19,9	Switzerland	19,5
Switzerland	6,8	Switzerland	10,9	Germany	17,8	China	19,1

The Italian trade was also affected by the same problems affecting EU, and recently some Italian regions were particularly hit by the chestnuts gall wasp. The scarcity in the domestic production leaded to import from the international market (Figure 3.15). For this reason in 2011 Italy has become also the third largest importer (Table 3.3), importing from 26 countries (Figure 3.15).

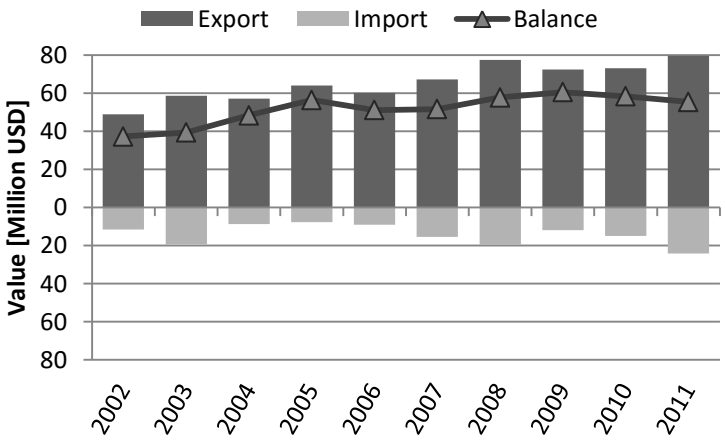
[74] Results found with this analysis show a greater value than the one reported the Chestnuts National Plan of the Sector for that year ($63.55M) (Ministero delle politiche agricole alimentari e forestali, 2010).

Figure 3.14 EU28 total imports, exports and trade balance for chestnuts (million dollars) in 2011



As reported by the main organization of farmers at national and European level (Coldiretti, 2015[75]) it is likely that, in the moment of low production, a considerable amount of chestnuts that circulate within the national boundaries originate from other countries, such as Spain, Portugal and Turkey. However, there are positive signals: the fight of the chestnuts gall wasp with the natural antagonist *Torymus sinensis* Kamijo is producing good results, at the point that from 2014 to 2015 it has been noticed a 20% increase of the national chestnuts production (Coldiretti, 2015[75]).

Figure 3.15 Italian imports, exports and balance of trade for chestnuts in 2011 (million dollars)



3.2.1.4 Wild mushrooms

The global mushroom trade shows a continuous increase in the trade volume and value (Figure 3.16 and Figure 3.17). According to the results, excluding all the species that are cultivated, wild mushrooms cover the 26.4% of the total traded volume (that is 0.47Mt over 1.79 Mt) and 45.6% of the total value (that is $2.27B over $4.98 B in 2011) of mushrooms. The proportion of quantity and economic value was also confirmed in 2012, despite the global trade decreased to $4.52 B.

[75] http://www.coldiretti.it/news/Pagine/738-%E2%80%93-17-Ottobre-2015.aspx

Among all wild mushrooms categories, fresh and frozen mushrooms show a relatively stable increment rate of $37.6 M per year since 2002, accounting nine years later for $0.8 B, a value that was confirmed also in 2012 ($0.77 B).

Figure 3.16 Global mushrooms trade by commodity form 1988 to 2012: quantity

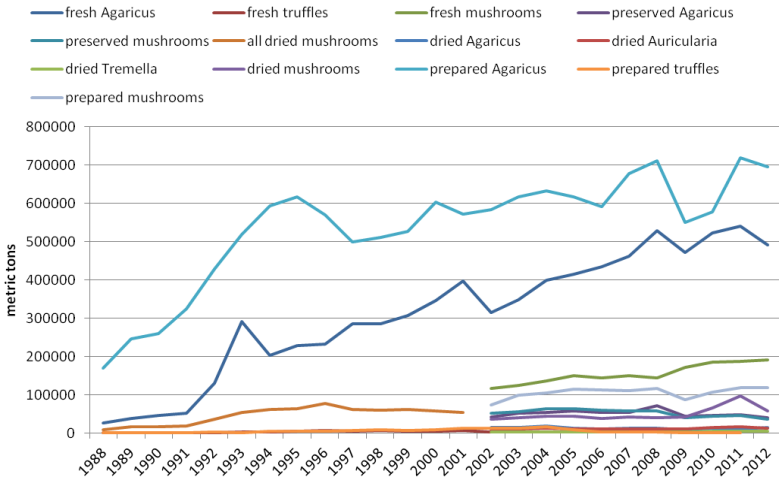
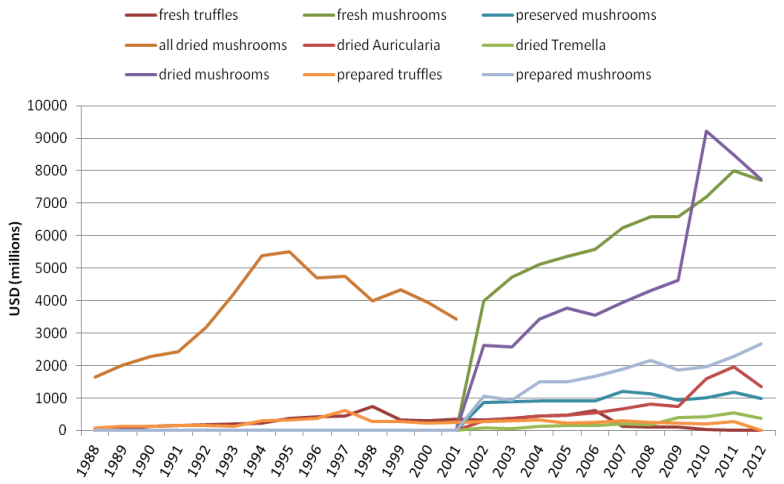


Figure 3.17 Global mushrooms trade by commodity form 1988 to 2012: economic value



Dry mushrooms had a slower increment than preserved mushrooms, accounting respectively for 28.4 M US$ of average annual growth from 2002 till 2009 and 14.6 M US$ from 2002 till 2012.
On the global context, China is undoubtedly the largest fresh wild mushrooms exporter, both in terms of quantity and economic value (Table 3.4). Alone, it accounted for the 21.2% of the global export value of fresh mushrooms in 2012. The Netherlands and Poland cover an important role in the wild mushrooms trade as main suppliers of the European market; the two countries represent also the main gates of EU28's market. Also Italy is ranked among the top five wild mushrooms exporters. Although it was not possible to specifically track truffles, because the truffle code in HS was removed in 2006 and aggregated with the ones of other mushrooms, the role of Italy is surely done by the trade of this valuable product. Truffles are renowned specialties

of some Italian regions and their value reach very high peaks.[76]

For fresh mushrooms, on the import side, the top 4 importers in terms of economic value have been the same from 2005, with a predominant role of Germany and Japan followed by France and Italy.

From

Table 3.5 it is possible to see that China is also the leader exporter for dry mushrooms.

Table 3.4 Top 5 global importer and exporters of fresh wild mushrooms (economic value)

Exports (million USD)					
2005		**2010**		**2012**	
China	139,1	China	145,1	China	163,7
Netherlands	48,0	Netherlands	77,5	Poland	93,8
Poland	44,5	Poland	75,5	Netherlands	69,4
Romania	25,0	Italy	49,6	Italy	54,4
Russian Fed.	24,3	R. of Korea	44,7	R. of Korea	37,9
Imports (million USD)					
2005		**2010**		**2012**	
Japan	152,9	Japan	99,1	Germany	100,1
Germany	75,4	Germany	95,4	Japan	97,8
Italy	61,8	France	83,8	France	90,9
France	51,7	Italy	61,2	Italy	51,9
UK	34,5	UK	58,7	USA	51,1

Table 3.5 Global export and import top 5 countries of dried mushrooms in million USD.

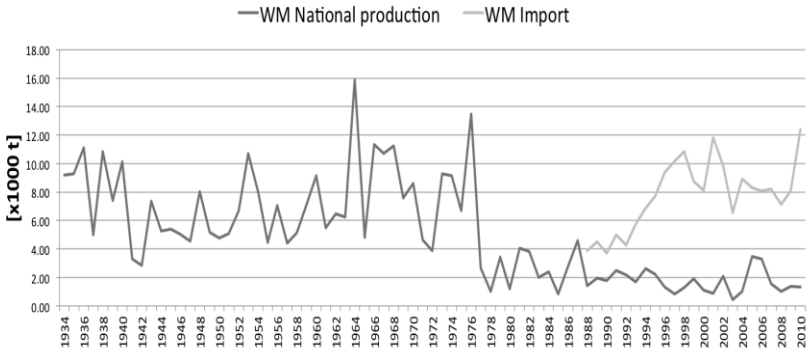
Exports (million USD)					
2005		**2010**		**2012**	
China	231,1	China	751,6	China	585,8
Hong Kong	13,4	Hong Kong	19,4	Hong Kong	27,3
Bulgaria	12,6	Germany	17,3	Pakistan	18,7
Italy	11,8	Italy	15,5	Germany	16,6
Germany	11,5	Chile	11,9	Italy	14,2
Imports (million USD)					
2005		**2010**		**2012**	
Hong Kong	66,2	Viet Nam	210,2	Hong Kong	120,0
Japan	63,5	Hong Kong	129,7	Viet Nam	117,6
Italy	53,9	Japan	103,3	Thailand	77,6
France	28,7	Thailand	65,7	Japan	76,8
Thailand	19,2	Malaysia	54,3	Malaysia	76,5

Italy has a strong tradition of producing and consuming mushrooms, and it has been defined a "mycophillic" country (Peintner et al., 2013). The demand for mushroom was, and still is, very high. Italy began importing fresh *Boletus* from neighbouring countries, especially Yugoslavia, during the early 20th century, reaching significant levels in 1930 (Bellini 1933 in Sitta e Floriani, 2008). From the '70, the import of dried and preserved mushrooms from non-European countries (South Africa, China, Russia, South America) began. This surely happened because the costs of production in these countries made them more competitive. However, this date also coincides with the introduction, in some Italian regions, of the regulations that limited the harvesting quantities, usually at 2kg per person per day (refer to §1.3.1.1). Wild mushrooms, considered before that moment *res nullius*, became effectively semi-private goods and the reduced

[76] Established in 1996 by the Chamber of Commerce of Asti, the national truffle stock exchange provides from October to December the truffle prices updated weekly.

harvestable quantities surely limited the creation of businesses. In fact, looking at the data reported by ISTAT[77] regarding the Italian mushrooms production, it is visible that after 1975, national production experienced a sharp reduction. ISTAT only recorded import data from the '80s, but from that moment a massive increase in wild mushrooms imports especially from Eastern European Countries and Asia has been recorded. By contrast, internal production remained quite limited.

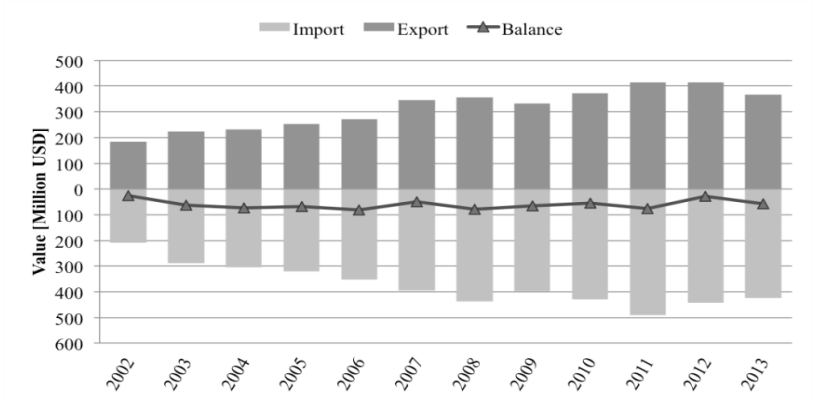
Figure 3.18 Wild mushrooms Italian production and import



Source: own elaboration on ISTAT data

Today Italy is a top importer and a top exporter of wild mushrooms (Table 3.4 and Figure 3.19). If the import is indeed justified by the high internal demand, for the export we may assume that, a part for truffles, mushroom export derives from the processing activities that Italian companies do. That is, Italian processors buy mushrooms from other countries, they process and re-sell them processed and packaged to other countries (and also domestically, but this is not recorded by the international trade). Sometimes the sale of dried foreign mushrooms has been noted to happen under the Italian name "porcini," even identifying the dried mushrooms as "Italian porcini" or as a "Product of Italy"(Sitta and Floriani, 2008).

Figure 3.19 Italy: total imports, exports and trade balance for wild mushrooms (million dollars) in 2011



[77] ISTAT ceased to report data on NWFP in 2011.

3.2.2 Wild mushrooms and chestnuts markets in Trentino-South Tyrol

The results of the survey conducted in Trentino-South Tyrol are presented according to the two products, wild mushrooms and chestnuts.

3.2.2.1 Wild mushrooms

Results concerning wild mushrooms are divided in three paragraphs. The first targets the supply chain analysis in the region. The second paragraph presents the results of the interviews targeting the picking service's organization in Fiemme valley and the perception of the residents toward the organization of the service and over mushroom picking activities. The third summarizes the different supply chains in the region and illustrates the presence of sustainability aspects.

3.2.2.1.1 Product supply chain analysis

Results are presented according to the supply chains actors targeted during the survey: producers, processors, wholesalers and retailers.

Producers

In Trentino-South Tyrol very few producers are professional "mushroom producers and sellers". These producers are those that sell, in majority, local mushrooms.

We found a big difference between the two provinces: in South Tyrol mushroom producers and sellers sell small quantities of mushrooms (37kg on average/year), that they mostly pick up in their own properties (*maso chiuso*). They also sell other products, such as berries and agricultural products.

In Trentino mushroom producers and sellers are bigger, they are specialised in mushrooms and they own the special authorization for collecting and selling more than 2kg per day for commercial purposes (see §2.2.2.1.1). These formal producers are small enterprises with less than 3 seasonal employees with a gross turnover, as stated by the interviewees, on average between 10 and 50 thousands €, sometimes 100 thousands €. Producers of Trentino are both pickers themselves and purvey from other local pickers. These second are single privates that reside in the region, and most of them collect mushrooms only in the spare time. The law does not require that this last kind of pickers is registered in the chamber of commerce for the work they carry on, while every transaction should be recorded. For this reason they can be considered "informal", and therefore not easy to detect. They do not operate in the black market. However, as stated by the interviewees, also a black market exists. Since it was difficult to find these kind of actors, as well as obtaining information from them, because of a logical non propensity in revealing sensitive data, they were not interviewed. On the other side we interviewed professional producers and sellers: they trade on average 6.6 tons each/year.

Despite the survey focused on the two main species of mushrooms traded, interviewees underlined that several species are collected and commercialised: *Boletus* (and especially *Boletus edulis)* and *Cantharellus cibarius* are the main ones, but there are also *Armillaria mellea*, russula, *Rozites caperata* (gypsy mushrooms), *Cantharellus lutescens*, honey mushrooms, *Macrolepiota procera*, *Craterellus cornucopioides,* and many many others. The interviewees underlined that the region is very rich in term of number of species, confirming the data that

indicated Trento as one of the main market of mushrooms in terms of species traded (Sitta and Floriani, 2008).

According to the survey and to the estimates done by the key "mushrooms producers and sellers" interviewed, **the regional wild mushroom production sold through the trade channel of professional mushrooms producers can be assessed around 25 tons/year**, in a normal year[78]. To the interviewees it was also asked whether they could estimate the total quantity traded in the region. The key actors answered that it is reasonable to think that many informal pickers directly supply restaurants and hotels in the region, for a quantity of around 30 tons/year, with a **total estimated quantity of local mushrooms traded in Trentino-South Tyrol of 55 tons/year**.

All producers collect mushrooms in the wild. 33% of them pick in forests that they own (9 hectares on average), but this refers only to the producers that live in South Tyrol, while in Trentino pickers collect in other forests, usually publicly owned. Forests are in general close to producers' premises: no more than 20 Km. The picking time requires on average 38 days per year (but for the informal pickers that supply them mushrooms the period is longer, from June to October).

Producers sell mushrooms as raw, cleaned and sorted based mainly on aesthetic, shape, maturity and size. They do not pack mushrooms neither use their own brand in selling them.

When these producers buy mushrooms from other pickers, the purchasing price for Chanterelles is on average 11 €/kg for first quality chanterelles and 10 €/kg for second quality chanterelles; *Boletus edulis* are instead bought at 14€/kg first quality and 8€/kg second quality. Chanterelles are then sold at 14 €/kg first quality and 11€/kg second quality; boletus are sold at 19.9€/kg first quality and 13,5€/kg second quality (Table 3.6).

Only 1 producer on 6 processes part of the collected mushrooms, by drying them at home, at the sun. Dried boletus are sold at 150€/Kg mainly to local (95%) private individuals.

Table 3.6 Average purchasing and selling price of local fresh *Chantarellus cibarius* and *Boletus edulis*

	Average purchasing price (€/kg)		**Average selling price (€/kg)**	
	1st quality	2nd quality	1st quality	2nd quality
Chantarellus cibarius	11	10	13,5	11
Boletus edulis	14	8	19.9	14

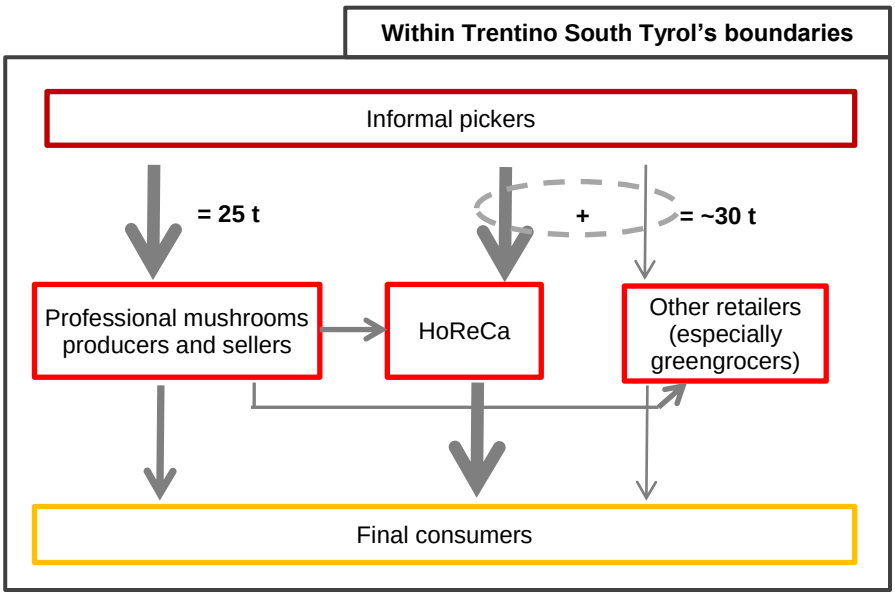
The only market for regional mushrooms is indeed regional, mainly local. The bigger producers sell mushrooms daily, in a square in Trento, where mushrooms are controlled by the local sanitary authority. 54.8% of the mushrooms are sold to private individuals , 35.2% is sold to HoReCa and 10% to other retailers. Producers stressed the fact that, a part from some tourists, people that buy their mushrooms know them, know their experience in mushroom production (the SME of some of the producers is more than 70 years old), and strongly appreciate the quality of their products.

According to the survey, the supply chains of local mushrooms can be described as follow (and

[78] According to the survey about 20 tons are traded; however, the key actors estimated that, totally in the region, professional mushrooms producers trade about 25 tons yearly.

summarised in Figure 3.20): many local informal non professional pickers, whose number cannot be estimated, pick up the mushrooms during the mushroom season. A part of these pickers sell the mushrooms to professional mushrooms producers and sellers, who also collect for themselves, reaching an average quantities of around 25 t per year, depending on the climatic conditions. Another part sells mushrooms to HoReCa and small retailers and greengrocers, for a total estimated average quantity (done by professional producers) of 35 tons per year.

Figure 3.20 Supply chains of local mushrooms in Trentino-South Tyrol



Aiming at answering at the research question "*how does the wild mushroom market keep alive*?", mushrooms producers where asked whether they asked for and received funds for their activities from EU of provincial Rural Development Programme. No one received funds.

Processors

There are very few (3) mushroom processors in the region, all located in Trentino, the southern part of the case study[79]. One is a small family based company. The other two are bigger companies, with 9-10 permanent employees, with a gross turnover bigger than 2 million € per year, mainly generated by mushrooms (90% on average).

They process, and then trade a huge amount of mushrooms, that account for a total of more than 1,610 tons. The main traded species are *Boletus edulis and Chanterelles cibarius, but there is also Boletus pinophilus, Chanterelles cibarius, Morchella esculenta, Morchella conica* and shiitake. **None of the processor supply from regional producers**. **The totality of mushrooms production originates from abroad[80]**. Mushrooms are bought, processed and

[79] There are other persons that domestically dry, at the sun or with domestic driers, mushrooms, such as one of the processors. However, since the quantities are minimal, they were therefore not considered as processors.

[80] Although a little part is "nationalised", which means that it originates from foreign countries, it arrives in Italian harbours, it is bought from other Italian SME that then sold to the given SME in Trentino-South Tyrol.

then sold through the following trade channels:

i. fresh mushrooms are bought from Eastern Europe producers. They are cleaned, sorted, packed and sold with the company label, to big Italian and regional retailers;
ii. dried mushrooms are bought from Eastern Europe producers and processors. Mushrooms are then manually selected, packed in categories (1st [Extra], 2nd [Speciali], 3rd [Commerciali], 4th [Briciole], 5th [Polvere] according to the Ministerial Decree n° 249/1998) and sold to Italian (70%) and regional, but also Spanish large retailers with the company label, or already with the label of the big retailers that are buying dry mushrooms[81]. Only one processor gave information about the purchasing and selling prices. Data are reported in Table 3.7;
iii. in brine from China (at 6.5€/Kg). Mushrooms are desalinated and then processed (many times with milk) and then sold in cans to large processor, mainly multinational food corporations that use the mushrooms for preparing other products. Cans are sold at 4,5€/l[82].
iv. in brine from Eastern European producers or wholesalers (especially Macedonia and Bulgaria). Mushrooms are desalinated and then processed (most of the times with milk) and then sold in cans, following the process described above; or they are desalinated and sold in small glass jars, mainly to specialised, niche retailers, at 13 €/jar of 200g (which contain a big part of oil).

Table 3.7 Costs and prices of dry boletus, as reporter by one processor

Category	Purchasing price (€/Kg)	Waste (%/Kg)	Labour cost €/hour	Selling price (€/Kg)	Example
1st	60	7-10	18-20	100	
2nd	50	7-10	18-20	83	Dry boletus 20 g packs are sold at 1.60€
3rd	32	7-10	18-20	52	
4th	28	7-10	18-20	45	

When asked why they do not supply from regional producers, processors listed the following factors:

- production limit: in the region there is not a sufficient production able to cover their needs; moreover it is discontinuous, in the region mushrooms grows only from June to October;
- quantity limit: even if the quantity would be sufficient, there is a quantity limit of 2kg/person/ day that restrict the business;
- manufacturing cost: cost of labour and raw material is lower abroad so for them is convenient to buy mushrooms from other countries;

The processors in the region are few in number, but very powerful in terms of market and market share. They have dozen of buyers, among which the most important large retailers in the region,

[81] Among the labels under which are commercialised the dry mushrooms processed by Trentino's companies there are: Auchan, Carrefour and Carrefour Selection, Caber, Cerreto, Club Premium, Coop and Fior Fiore Coop, Dico, Ecor Eurospin, Sigma, Sisa.
[82] The can contain a large part of liquid, this is the reason why the final price is lower than the purchasing cost.

in Italy, and also abroad. Some of the processors declared also to having recently done processes of horizontal integration, acquiring similar SME that were located out of the region, enlarging their firm for the same part of the production process. Some also makes trainings for their international suppliers, by teaching techniques of mushrooms storing and selection, aiming at receiving better raw material from them.

Wholesalers

During the survey we interviewed 13 wholesalers that trade, among the other products, mushrooms[83].

These wholesalers are SME with on average 24 permanent employees and 3 seasonal ones, but the biggest wholesalers have till 120 employers. Mushrooms are definitely not the main source of income for more than 90% of the regional wholesalers. Mushrooms are not the only traded NWFP: all wholesalers trade also nuts, 90% of them trade berries, 56% aromatic plants, 44% truffles and 11% foliage. Except for very few respondents, NWFP generate on average the 2.5% of their annual gross turnover, which is for the medium-big wholesalers is higher than 500 thousands €.

Wholesalers can be divided in three groups according to the quantities of mushrooms they trade: big wholesalers (6 in the region, with an average quantity of 29.6 tons each), medium wholesalers (12 in the region, with an average quantity of 2.6 tons each) and small wholesalers (30 in the region, with an average quantity of 185kg each).

Totally, we can estimate that in the Region about 208 tons of mushrooms pass through the wholesaler's channel. However, we must underline that many small-medium wholesalers buy mushrooms from the big wholesalers located in the region. So about 8% of the overall quantity is probably double counted.

Only a very small quantity of chanterelles is bought from local producers (3%): **the majority of the production comes from other wholesalers (97%). They are located mainly in Europe (66.8%), above all in the neighbouring Austria (and this is the channel preferred by the South Tyrolean wholesalers), Romania and Lithuania, but also in Italy (24.9%), and in particular in Verona, Padova, Bologna, and within Trentino Alto Adige, in Trento and Brunico (7.5%).** It is interesting to discover that also the Italian suppliers buy mushrooms abroad, and the main exporters Countries are Romania, Lithuania, Austria, Slovenia, Bulgaria and Russia. The price of chanterelles depends on the quality category: first category chanterelles are bought at 7.4€/Kg, second category at 6.4€/Kg.

Boletus are bought in minimal part from local producers (5.6%). **The majority of the production comes from other wholesalers. These suppliers are located mainly in Europe (77.6%), in Austria and Romania**, and the remaining in Italy (8.5%, from Verona, Brunico and Trento). As for chanterelles, these Italian suppliers buy boletus abroad, from Romania, Lithuania, Bulgaria, Austria and Slovenia. Raw unsorted boletus are bought at 12€/Kg, first quality boletus at 13.1€/Kg, and second quality ones at 10.1€/Kg on average.

The main customers for chanterelles are HoReCa (58.5%), large retailers (24.4%), small

[83]Over an overall number estimated of maximum 49 mushroom wholesalers. However, the population could be low, since not all the wholesalers that trade vegetable also trade mushrooms. Note that the wholesalers that also process have been treated as processors and not as wholesalers.

retailers (16.2%) and only in minimal part private individuals. The market is local and regional. First quality chanterelles are sold on average at 8.7€/Kg, second choice ones at 7.7€/Kg.
Wholesalers sell also boletus only within the regional boundaries: the main customers are large retailers (45.2%), HorReCa (35%), small retailers (14.5) and few private individuals. Raw unsorted boletus are sold at 12.5€/Kg, first quality boletus at 14.3€/Kg, and second quality ones at 11.2€/Kg on average.
Only few wholesalers trade also a small amount of processed mushrooms. There are several traded products, for instance: chanterelles in brine in vase, mixed mushrooms "*trifolati*" (cooked in olive oil, parsley and garlic), boletus "*trifolati*", dry boletus, frozen boletus, frozen boletus in cubes, boletus in cans, *etc.* On these products wholesalers don't apply their own brad.
Dried boletus 3rd category are bought at 55€/Kg from regional processors, and sold at 68€/Kg to regional HoReCa. Boletus "*trifolati*" (that means cooked in olive oil, parsley and garlic) are bought at 10€/Kg from national wholesalers, and sold at 12.5€/Kg to regional HoReCa. Mixed mushrooms "*trifolati*" in brine are bought from national (Padova) wholesalers, and sold at 3€/Kg to regional HoReCa. Chanterelles in brine are bought from national (Verona) wholesalers, and sold at 13.6€/Kg to regional HoReCa.

Retailers

In Trentino South Tyrol mushrooms can be purchased in several types of final retailers: big supermarkets, greengrocers, cooperatives, seasonal market stands and peddlers.
The majority of retailers are greengrocers, they have small dimensions, with 3 employees on average, a gross turnover lower than 50 thousands €, only in minimal part generated by NWFP (4.3% on average). More than 60% of retailers trade also berries and nuts, while very few of them sell truffles, aromatic and medicinal plants. Big retailers (i.e supermarkets) instead have a huge number of employees, a gross turnover higher than 2 million €, made up by NWFP for less than 0.3%.
Except of the few specialised producers and retailers mentioned in the paragraph "Producers", no other retailers base their activity only on mushrooms trade.
Small retailers trade on average 117 kg, medium retailers 690kg and supermarkets 11 tons[84]**. In total, the estimated quantity of mushrooms traded by retailers is about 86 tons.**
The main species traded are *Boletus* and *Cantharellus cibarius*, but few retailers trade also *Cantharellus lutescens* and *Armillaria* spp. The number of species sold by retailers is definitely lower than the one sold by professional producers.
By considering all retailers, the main suppliers for chanterelles are big wholesalers (81.1%), processors (16.6%)[85] producers (2%).
The majority of suppliers are or local (29.2%) and regional (8%) or foreign (39,6%), mainly from Eastern Europe (Polonia, Romania, Lithuania, Russia) and Austria; 14,7 % comes from national wholesalers, mainly located in Veneto. However, even if suppliers are local or regional, chanterelles are for the great majority non local**. We can assess that at least 95% of the**

[84] We interviewed the headquarters that answered with reference to the sum of all the branches in the region.
[85] Processors are the suppliers when we refer to dry mushrooms). Processors are also the suppliers of the big supermarkets: supermarkets and large retailers, which cannot sell raw unpackaged mushrooms: processors make this process of selecting and packing mushrooms in plastic boxes.

chanterelles traded by retailers are not regional. Of these, at least 72% are not national.
Prices depend on the grading scheme: first quality chanterelles are bought at 9.3€/Kg (within a range of 6.5-15€/Kg) and second quality ones at 8.7€/Kg.
The buying system is **similar for boletus:** the main suppliers are big wholesalers (66.7%), some are producers (12.3%) and processors (21%). The majority of suppliers are or foreign (52.5%), mainly from Eastern Europe (Polonia, Romania, Russia) and Austria, or local (36.6%), or national, mainly in Veneto (10,9%). Also in this case we can assess that **at least 66.6% of boletus that reach the retailers in Trentino-South Tyrol comes from foreign countries.**
Purchasing prices depend on the grading scheme: raw unsorted boletus are bought at 11.2€/Kg, first quality ones at 13.4€/Kg (within a range of 11-22€/Kg, according to the amount of traded Kg) and second quality ones at 8.2€/Kg.
Instead very few retailers buy *Cantharellus lutescens*, only from local non-commercial pickers, at 8€/Kg.
Retailers mainly sell mushrooms to local population (81.5%) and to national tourists.
Boletus first quality are sold at 19€/Kg, second quality ones at 14.1€/Kg on average. First quality Chanterelles are sold at 12.5€/Kg, second quality ones at 9.9€/Kg on average. Big supermarkets sell huge quantities of mushrooms as packed branded at 6.8€/Kg. Finally, retailers sell *Cantharellus lutescens* at 12€/Kg.
In general, the majority of retailers (70%) trade also a huge array of processed products[86].

[86] The main ones are: dried boletus, organic dried boletus, frozen boletus, boletus corn cream, boletus in oil, boletus risotto, boletus soup, dried chanterelles, dried mixed mushrooms, frozen mixed mushrooms and mixed mushrooms in oil.
Dried boletus: on average each retailer buys 67 Kg (from 1 to 300 Kg) of dried boletus at 75.4€/Kg (confidence interval 59.4-91.4€/Kg); the main suppliers are processors (56.8%) and wholesalers (40.5%), located within Trentino-South Tyrol (59%) or in Italy; the product is sold at 132.6€/Kg (confidence interval 111.3-153.8€/Kg) mainly to tourists (73.6%), both Italian and foreign ones (above all from Germany, Austria and Switzerland). However, we have seen that boletus traded by TST processors are totally deriving from other countries.
Few retailers trade organic dried boletus, which are bought at 160€/Kg from national wholesalers, and sold at 206€/Kg. Frozen boletus: few retailers trade frozen boletus, which are bought from national processors, and sold at 23€/Kg mainly to local population (90%). Boletus corn cream: on average retailers buy this product at 5.9€/Kg (confidence interval 2.3-9.5€/Kg) from regional wholesalers; the product is sold at 10.6€/Kg (confidence interval 4.4-16.8€/Kg) mainly to tourists (73.686.7%), both Italian and foreign ones (above all from Germany and Austria). Boletus in oil: on average retailers buy this product at 30€/Kg from national wholesalers; the product is sold at 60€/Kg only to tourists (above all from Germany and The Netherlands). Boletus risotto: on average retailers buy this product at 8€/Kg from both regional and national wholesalers; the product is sold at 12.8€/Kg mainly to tourists (above all from Italy, Germany, Austria and Belgium). Dried chanterelles: on average retailers buy this product at 75€/Kg (confidence interval 62.8-87.2€/Kg) from national (67%) and local wholesalers; the product is sold at 149.5€/Kg (confidence interval 120.1-178.9€/Kg) to tourists, both Italian and foreign ones (above all from Germany and Switzerland). Dried mixed mushrooms: on average each retailer buys 7.5Kg (from 1 to 17Kg) of dried boletus at 45€/Kg; the main suppliers are both processors and wholesalers, located within Trentino Alto Adige (80%) or in Italy; the product is sold at 100.3€/Kg (confidence interval 49.2-151.5€/Kg) both to tourists and to local population. Frozen mixed mushrooms: few retailers trade frozen mixed mushrooms, which are bought from national processors at 6€/Kg, and sold at 9€/Kg mainly to local population (60%).
Mixed mushrooms in oil: few retailers trade mixed mushrooms in oil, which are bought from national processors (67%) and wholesalers at 5.5€/Kg, and sold at 14.7€/Kg (confidence interval 7.4-22.1€/Kg) mainly to tourists (67%).

Table 3.8 reports the average purchasing and selling price for mushrooms in TST. In the table is underlined where the suppliers are located and where the mushrooms mainly come from.

Table 3.8 Average purchasing and selling prices for traded products in TST region at each step of the supply chain

	Professional producers and sellers(€/Kg)		Processors (€/Kg)		Wholesalers (€/Kg)		Retailers (€/Kg)	
	In	out	In	out	In	out	In	out
RAW FRESH								
Boletus 1st quality	14 L	19.9 L			13.1 F	14.3 F	13.4 F	19 F
Boletus 2nd quality	8 L	14 L			10.1 F	11.2 F	8.2 F	14.1 F
Cantharellus c. 1st quality	11 L	13,5 L			7.4 F	8.7 F	9.3 F	12,5 F
Cantharellus c. 2nd quality	10 L	11 L			6.4 F	7.7 F	8.7 F	9.9 F
Gypsy mush.		5 L						
Russula		5 L						
Cantharellus lutescens							8 L	12 L
PROCESSED								
Dried boletus 1st quality		150 L	60 F	100 F	55 F	68 F	75.4 F	132.6 F
Dried boletus 2nd quality			50 F	83 F				
Dried boletus 3rd quality			32 F	52 F				
Dried boletus 4th quality			28 F	45 F				
Dried boletus (organic)							160 N	206 N
Dried Cantharellus							75 N	149.5 N
Dried mixed mushrooms							45 F	100.3 F
Mushrooms in brine			6.5 F					
Frozen boletus								23 F
Frozen mixed mushrooms							6 F	9 F
Chanterelles in brine						13.6 F		
Boletus “trifolati”					10 F	12.5 F		
Mushrooms “trifolati”						3 F		
Boletus in oil							30 F	60 F
Mixed mushrooms in oil							5.5 F	14.7 F
Boletus corn cream							5.9 F	10.6 F
Boletus risotto							8 F	12.8 F

Notes: L= local mushrooms; F= mainly foreign mushrooms N=mainly national mushrooms
Green: mainly within the region; Red = mainly from-to other Countries / Blue = mainly from-to the country

3.2.2.1.2 In depth case study in Fiemme valley

The results are presented in two paragraphs: in the first the mushroom picking service in the valley is illustrated, with the organization of the service, the revenues and the benefit sharing. In the second paragraph the perception of the interviewees towards mushroom pickers and the organization of the mushroom picking service are reported.

Mushroom picking service in Fiemme valley: organisation, revenues and benefit sharing

The mushroom picking service in Fiemme valley has been managed since the year of introduction of the permits at provincial level (Provincial Law 16/91)[87] by Magnifica Comunità di Fiemme. From that year, a Convention (*Convenzione per la disciplina della raccolta dei funghi*

[87] Legge Provinciale 6 agosto 1991, n. 16 (*Disciplina della raccolta dei funghi*)

nell'ambito territoriale di Fiemme[88]) is periodically signed (yearly at the beginning, now every three years) to regulate the relationships between the parties. The contents of the Convention have changed three times (1991, 1997, 2011). The latest version is in compliance with Provincial Law 11/2007, which introduced further criteria. According to the law and The Convention, persons living in the municipalities of Fiemme valley and the MCF, persons living in the province of Trento, non-resident owners of a forest of at least one hectare wishing to pick mushrooms in their property, persons born in the province of Trento but not residing there, are exempt to pay the permit for collecting (refer to § 2.2.2.1.1).

The main purposes of the Convention are to ensure a rational exploitation of ecosystems and to preserve the benefits of the presence of wild mushrooms, as well as avoiding the negative effects resulting from an excessive human impact.

Parties of the Convention are the MCF, acting as administrator of the service, nine Municipalities of the valley[89] and forest owners with more than 100ha of forests, that is Regola Feudale di Predazzo[90]. Municipalities are connected by the geographical, environmental, historical and traditional contiguity.

Other parties may join, upon presentation of a request, which will be assessed within the Conference of the parties. The Conference is a meeting attended by the heads of all the organizations involved in the management of mushroom picking service. During the meetings, issues and possible changes and solutions are evaluated.

The Convention set picking rules, costs of permits and the sanctions in case of violation (Box 3.1 and Table 3.9).

The permits are payable as bank deposits, as postal bulletins, as payments at the Touristic Board (Azienda di Promozione Turistica, APT), or with operations at the ATM of the Rural Bank of Fiemme. The receipt of payment must be retained by the collector for the duration of the collection so that it can be shown to employees of the security service, together with a valid identification document.

From the beginning, the Convention declared the need to patrol the territory and the mushroom collection activity. For this reason, **with the annual revenues deriving from the payment of the permits, are hired 4 mushrooms guards**. Mushrooms guards are seasonally employed by MCF, from mid-June to mid-October. Mushroom guards work in synergy with the Head of the Technical Forestry MCF that coordinates them week by week. The mushrooms guards carry out their activities for 40 hours per week, and they work in two teams, each one equipped with a car. They patrol the territory together with forest police, local police and the guardians of the forest area.

What remains after paying expenses is shared between the parties of the Convention. Today, parties that receive a share of the revenue are MCF, municipalities and owners of forest land with extending more than 100 ha, that is only Regola Feudale di Predazzo[91]. Criteria have been changing during time, as underlined in Table 3.9.

[88] The Convention is in compliance with the articles 28, 105 e 109 of the Provincial Law 23 May 2007 n. 11, art. 16 of D.P.P. 26 October 2009 nr. 23-25/Leg., and G.P. of Trento n. 3287 of 30 December 2009

[89] Municipality of Capriana ceased the agreement.

[90] Regola Feudale di Predazzo is a communion ruled by private law.

[91] Baron Felix Longo, who owns 710ha of forest, decided that in his property is not allowed to collect mushrooms, and therefore renounced to the benefit sharing.

Box 3.1 Sanctions to be applied in case of violation of the norm

In Fiemme valley, the following sanctions are applied:

- in presence of a quantity exceeding the 2kg: the payment of an amount from 20 to 120€ per kilogram, or fraction of kilogram of mushrooms collected over the daily amount allowed per person or over time allowed;
- in absence of notification of the payment of the permit: the payment of an amount from 25 to 150€ per kilogram, or fraction of kilogram of mushrooms collected;
- in areas restricted by the regulation: the payment of an amount from 30 to 180€ per kilogram, or fraction of kilogram of mushrooms collected;
- the payment of an amount from 10 to 60€ for the pickers who does not respect the rules of collection and transportation;
- the payment of an amount from 10 to 60€ for anyone damaging or destroying the mushrooms on the ground;
- the payment of an amount from 30 to 180€ for violations of provisions not expressly provided for by this article.

In addition to the fine there is the confiscation of the entire quantity collected. The confiscated mushrooms are delivered to charitable institutions and hospices. In case of doubtful edibility, mushrooms are destroyed. In case the picker refuses to deliver the product to the authorities, the pecuniary administrative sanction is doubled. The sanctions double if the fact is committed again.

Source: Data from Magnifica Comunità di Fiemme

Table 3.9 Criteria contained in the three mushroom collection Conventions in Fiemme valley

Text of the Convention	Permits	Cost	Payment due to Touristic board (APT)	Share to MCF for the organization of the service	Entities with benefit sharing	Criteria for benefits sharing
1991	6 days 15 days	£3 0.000 £50.000	£2.000 for each permit	10% of the total	Municipalities	20% according to the Municipality surface; 40% according to the number of tourists from 1 June to 30 September); 40% according to the number of permits issued by the Municipality.
1997	1 day 3 days 1 week 2 weeks 1 month	£ 15,000 £ 28,000 £ 40,000 £70,000 £100,000	None	10% of the total sum	Municipalities	50% according to the Municipality surface; 50% according to the number of tourists from 1 June to 30 September;
2011	1 day 3 days 1weeks 2 weeks 1 month	€12 €18 €24 €36 € 55	None	5% of the total sum	Municipalities, MCF, private forest owners with more than 100ha of forests	50% according to the forest surface of the Municipality; 50% according to the number of tourists from 1 June to 30 September.

Source: own elaboration from data of Magnifica Comunità di Fiemme

From the first version of the Convention, there have been improvements in the sharing criteria. Firstly, it has been removed the duty due to the Touristic Board (APT). From 2009 forest owners with more than 100ha of forests have the right to receive sharing, stating this way that also private forest owners have the right to share benefits derived from the sale of a recreational service that affect their properties.

From the first version the fix revenues for MCF has decreased from 10% to 5%. A criterium that was considered not anymore necessary is the percentage of 40% of revenues due to the municipalities for the fact that permits were issued on their territory[92]. Criteria are today the number of tourists that are recorded to stay during the period from 1st of June to 30th of September in the Municipality, and the forest surface of the Municipality: this last criterium has been changed from the first version that accounted for the entire surface of the Municipality.

Number of permits issued varies from season to season. In the decade 2003-2013, 9,421 permits were issued on average, but with very high variation, from 2,759 permits issued in 2003, to 14,614 issued in 2007 (Figure 3.21). According to the interviewees, this is mainly due to weather conditions, which affect both the touristic presence in the valley and the availability of mushrooms. The majority (54%on average) of permits are issued with one day of validity. These are relatively less convenient for buyers, but since mushroom availability strictly depends on weather, which may change very quickly, they allow more flexibility.

The sale of permits allows every year gross earnings on average of about €200,000, and, after paying the salaries for mushroom guards and other expenses, net earnings of more than €114,000 on average, as shown in Revenues are than shared between the participants, as illustrated in Table 3.11.

The Convention rules that that the revenues, after expenses, have to be used in: i) information and dissemination concerning the legislation and behaviour to follow in mushroom picking; ii) environmental education; iii) improvement of the ecosystems and the agro-forestry-pastoral heritage. **Revenues are therefore invested in activities that directly and indirectly sustain the ecosystems and the territory**. According to Official data of MCF and Municipalities, in the latest years, revenues were mainly used for:

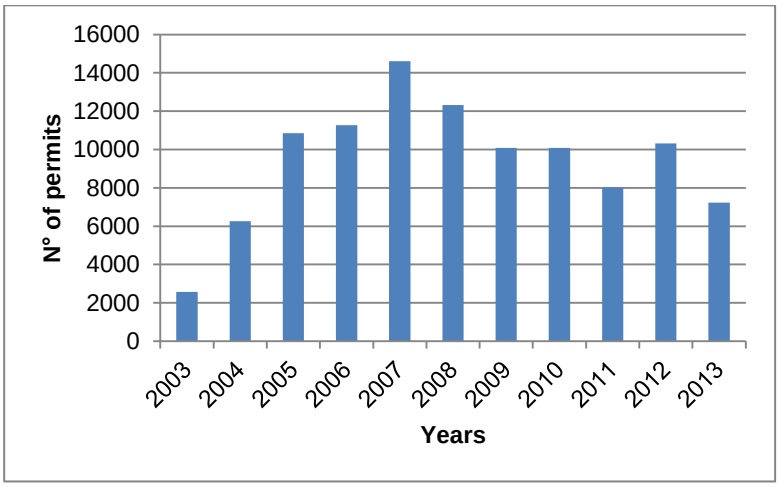
i. maintenance of forest roads;
ii. management of grazing areas;
iii. infrastructures against landslides;
iv. moreover, during the summer period, in the APT offices, a mycologist offers the service of mushroom identification for free three days per week.

However, nothing goes directly for the improvement of forest ecosystems for the specific purpose of mushroom production and no silvicultural activities for improving availability of mushrooms or any other NWFP is in place.

Table 3.10.

[92] Since now it is possible to pay the permit everywhere.

Figure 3.21 Number of picking permits issued in Fiemme valley (2003-2013)



Source: data from Magnifica Comunità di Fiemme

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Table 3.10 Gross and net earnings deriving from the sale of permits (2088-2010)

Year	Gross earnings from mushrooms permits (€)	Fixed sum due to MCF (5%) + VAT (€)	Expenses for mushrooms guards (€)	Bank and postal expenses(€)	Net earnings (€)
2008	215,532.57	25,863.90	58,863.37	3,184.30	127,621.00
2009	187,226.61	22,467.20	63,215.99	3,100.88	98,442.54
2010	194,620.38	11,682.00	63,532.86	3,140.22	116,265.30

Source: data from Magnifica Comunità di Fiemme

Table 3.11 Net earnings deriving from the sale of mushroom permits, per Municipality in 2012

Municipalities	Forest surface (ha)	Touristic presence(n°)	Share 50% forest surface	Share 50% touristic presences	Net earnings (€)

Predazzo	709	388757	2067,46	13558,88	15626,34
Ziano	593	158914	1729,20	5542,53	7271,73
Panchià	349	50549	1017,69	1763,02	2780,71
Tesero	1725	180763	5030,13	6304,57	11334,70
Cavalese	1231	388860	3589,62	13562,48	17152,10
Varena	963	83814	2808,13	2923,23	5731,36
Daiano	578	51467	1685,46	1795,04	3480,5
Carano	570	218237	1662,13	7611,57	9273,70
Castello/Molina di Fiemme	787	124367	2294,91	4337,61	6632,52
MCF	10734	-	31300,55		31300,55
Regola Feudale di Predazzo	1445	-	4213,65		4213,65
Total					**114,797.86**

Source: data from Magnifica Comunità di Fiemme

In Annex V the main characteristic of the mushroom picking service in Fiemme valley are summarised.

Beside the direct revenues deriving from the picking permits, indirect revenues derive by the presence of "mushrooms tourists", and their families, in the valley. The quantification of these indirect revenues was not targeted by the present research; however, if we consider that every year 9,500 "mushroom tourists" reach the valley, and that they and presumably their families sojourn, have a meal, and in general take advantage of the valley facilities, we can affirm that there are indirect revenues. This was confirmed by the interviewes. The interviewees related to touristic facilities suggested encouraging this flux of persons. In their opinion, given that "mushroom tourists" stay for a certain period in the hotels and apartments, providing an income for the owners and the community, they should be exempted by the payment of the permit. They suggest annulling the duty of payment for those sojourning at least 3 days/one week. Some already autonomously provided for this: a group of hotel managers included in the hotel rent fee the permit, already paid by the hotel.

Perceptions towards pickers and the organization of the mushrooms picking service

Residents refer that the great majority of locals collect mushrooms[93], occasionally, to consume the fresh product or to conserve it for a couple of month. [Local picker, major, touristic association representative]: *Most of the locals pick mushrooms, at least sometimes. Someone make gifts with these mushrooms, some others conserve them, but not in great quantity, a quantity enough to arrive to the Christmas holidays*)[94]. Mushrooms are considered a good side dish, and they are part of the culinary tradition of the area. In the touristic menus mushrooms, and especially porcini, are always included.

[93] According to the interviewees, the main species picked up by them, and by all the people who collect in the valley, are *Boletus edulis* and *Boletus pinicola*, *Cantarellus cibarius* and *Chantarellus lutescens*. Most of the interviewees refer that Val di Fiemme is famous for porcini, and people like porcini, much more than finferli and finferle. Someone collects also other species, and in particular *Amanita caesarea, Lepiota procera*, *Armillaria mellea*, *Coprinus comatus*. Some respondents coming from a specific locality, also like very much *Pleorotus eryngii* - called mushroom of Bellamonte (from Bellamonte, the locality).

[94] "*La maggior parte delle persone raccoglie, ogni tanto. Qualcuno regala i funghi, qualcuno li mette via, ma non grandi quantità, quel che basta per farli arrivare alle feste di Natale.";*

Interviewees tended to categorise mushroom pickers in three groups: i) people of Fiemme, ii) people resident in Trento province, and iii) people from outside.
According to the interviewees, the majority of people of Fiemme goes, at least from time to time to pick mushrooms. The frequency can vary, that is more or less often, but during a good mushroom season a person of Fiemme goes at least some times, with no differences of ages, gender, occupation, although older persons can have more time and more possibility to go (and also more experience). Similar pattern can be said for tourist that pick mushrooms, which are very heterogeneous. People resident in the province and people coming from outside, which are not tourists but exclusively mushrooms pickers, can be mostly defined "specialists", because they reach the valley only for mushroom purpose.
Interviewees refer that during a good season there are all the typologies of pickers, both from Fiemme, from the province and from outside. When there are no mushrooms there are no pickers around, except someone, usually from the valley, who can be defined "explorer". It has always been like this. When the summer ends, tourists usually come back home, and in proportion there are more local around in the forest, joint to the "specialists" coming from the province and outside.
In order to understand the belief of residents toward recreational pickers, it was asked to categorise pickers according to their behaviour. Results are summarised in Table 3.12.
All the interviewees revealed to have a general good opinion about tourists coming from outside and picking mushrooms with permits. **They also think that the majority of locals have the same belief. According to the interviews, there is a perceived relative abundance of mushrooms, when remaining in the limit of 2kg per person/day, and there is no perception that tourists "steal" mushrooms.** Even the pickers that collect mushrooms for selling them, do not have any complain regarding tourists. [Informal commercial picker 1] "*There are no problems with tourists, those well-mannered I mean, because when there are mushrooms there is something for everyone. I have many mushrooms pickers friends that come from outside the region and we meet during the evening at the bar, to talk about mushrooms. And then, not irrelevant, they also bring money into the coffers of the municipalities, and this is a good thing!*)"[95].
[Commercial picker for subsistence] "*Ah, I don't have anything to say against tourists. They come here, they sleep in the hotels and pay a permit. There are mushrooms for everyone, so why not? Even I, although sometimes some locals look badly at me for this*[96]*, I bring tourists around, in the places where there are mushrooms. We walk even for 6-7 hours, in the mountains and then in the woods, and they collect mushrooms. Always with the permit, of course. I ask some money for the tour and we all go home happy, after having spent a beautiful day)"*[97].

[95] *Non c'è nessun problema con i turisti, quelli educati intendo, perchè quando ci sono funghi ce ne sono per tutti. Ho tanti amici fungaioli che provengono da fuori regione e ci incontriamo anche la sera al bar, a parlare di funghi. E poi, cosa non da poco, portano anche dei soldi nelle casse dei comuni, e questo non può che far piacere*"
[96] This could imply that some locals are in conflict with foreigners. But this sounds logical: locals don't want to share secrets with unknowns
[97] "*Ah, io proprio non ho nulla da ridire nei confronti dei turisti. Vengono qui, dormono negli alberghi e pagano un permesso. Funghi ce n'è per tutti, quindi perché no? Addirittura io, anche se a volte qualcuno di qui mi guarda storto per questo, li porto in giro per i posti dove ci sono i funghi. Gli faccio fare dei giri anche di 8-9 ore, in montagna e poi nei boschi, dove si raccolgono un po' di funghi. Sempre con il permesso, sia ben chiaro. Mi faccio magari dare qualche soldo per la visita e torniamo a casa tutti contenti, dopo aver passato una bella giornata*".

Some of the interviewees (34%) say that the exemption of paying the permit, which is both for people of the valley and people resident in the province, should be only for people resident of the valley. People living in Trentino already have a place near house where to go to collect mushrooms. In the opinion of the interviewees, people living in Trentino should pay a permit when they decide to go in another valley. **It is in this sense is possible to say that, according to some of the locals, tourists are better considered than people resident outside the valley but in the province**, **because the first leave revenues in the valley, the second no**.

"Bad pickers" are those persons that pick up, frequently, much more than the quantity allowed. They are considered greedy. According to the interviewees these persons probably also sell the product, sometime in the valley, sometime outside.

Other bad pickers are impolite persons. They can be from the Valley, the province and from outside and they sometimes destroy mushrooms (those ones that they do not know), or other times they pick up all the mushrooms they find, also if they do not know if they are edible. In this way they destroy the production. Sometime bad pickers leave trashes in the forest. They are considered ignorant and careless.

With both the typologies, most of the interviewees [picker with special permit, touristic pickers, mycologist, representative of touristic association, restaurateur] suggest that the law should be more severe. The mushroom guard has the same opinion and he underlines that a stronger fee is expected for recidivists, but according to the law every case is than examined at provincial level, with a long bureaucratic process. This, in his opinion, should be simplified.

Regarding the organization of the service, **100% the interviewed state that they are satisfied by the *status quo*: the law and the organization is considered well-functioning** and the cost of permit is fair (both from resident side, that is, they are happy that some money arrive, and from the non-resident side, they find just to pay that amount of money to pick up the mushrooms).

Table 3.12 Definition of good and bad pickers in Fiemme valley, according to the interviewees

Definition according to the interviewees	Characteristics according to the interviewees	Additional benefits/ losses
Good pickers	Persons living **in Fiemme** valley which go to pick up the mushrooms for its own consumption or for giving the products to relatives and friends. They respect the limits and the law and they respect the forest. They may rarely exceed the prescribed quantity (and for a limited quantity). Some of them sometimes sell mushrooms to greengrocers, HoReCa ad privates.	
	Persons living **in Trentino** valley which go to pick up the mushrooms for its own consumption or for giving the products to relatives and friends. They respect the limits and the law and they respect the forest. They may rarely exceed the prescribed quantity (and for a limited quantity).	
	Persons living out of Trento province (**tourists**). They pay a permit and during its duration they collect mushrooms for its own consumption or for giving the products to relatives and friends. They respect the limits and the law and they respect the forest. Moreover, they give an economic contribute to the MCF and the Municipalities. They may rarely exceed the prescribed quantity (and for a limited quantity).	Revenues deriving from the permits
	Persons from Fiemme valley, province or outside who ask for a special for-free permit for scientific reasons or for subsistence. They collect more than 2kg per day	

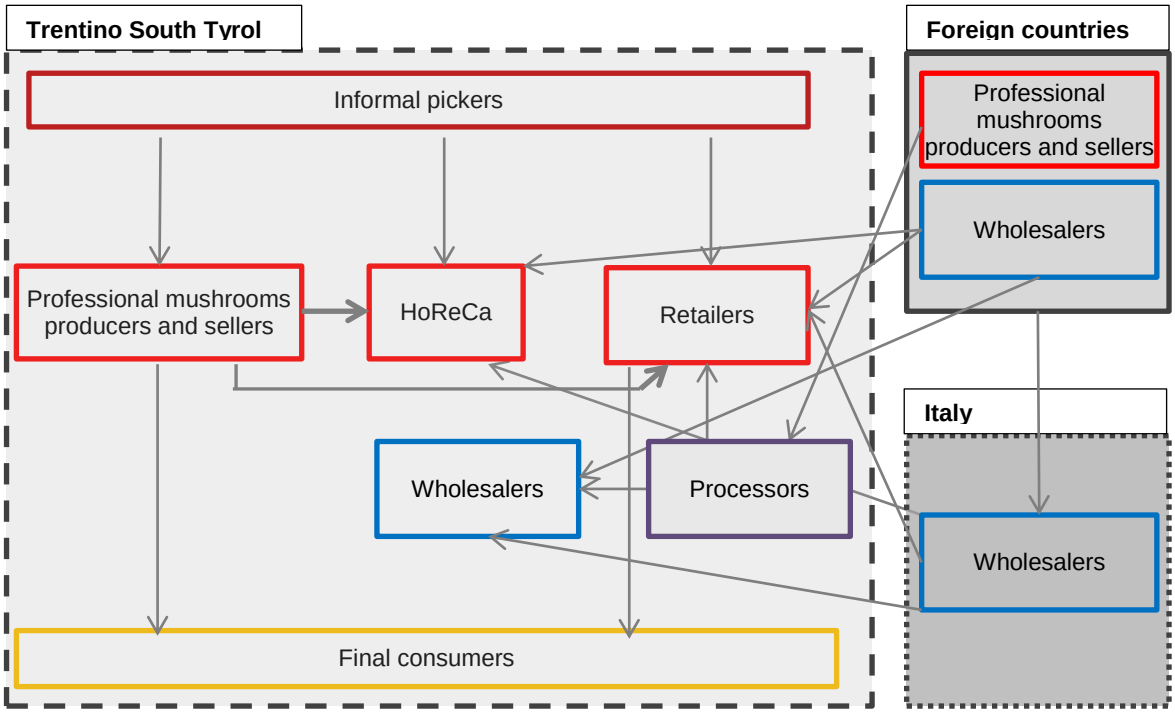
	and they use the mushrooms for exhibitions and research or for commercial purpose.	
Bad pickers	Persons from **Fiemme valley** who pick up, frequently, much more than the quantity allowed. Some also sell the product, mostly informally, to greengrocers, private persons and HoReCa, in the zone	
	Persons from the **province** who pick up, frequently, much more than the quantity allowed. Considered greedy. Some probably also sell the product, mostly out of the valley	
	Persons from **outside of the province** who pick up, frequently, much more than the quantity allowed. Considered greedy. They probably also sell the product, mostly out of the Valley and the province. They sometimes pay the permit and sometimes do not pay at all.	Loss for the missed payment of the permit
	Persons ill-mannered (from the valley, the province and from outside): they sometimes destroy mushrooms (those ones that they do not know), or other times they pick up all the mushrooms they find, also if they do not know if they are edible. They are sometimes ignorant and careless.	

100% of the interviewees believe that 2kg per day is a fair quantity for the housed consumption. **They also believe that with this quantity the collection is sustainable (although 3 interviewees underlined that when is a good mushroom season there would be surely a more quantity available for everyone, so more than 2kg/person)**. According to all the interviewees, the mushrooms guards work well, they are everyday on the place and some of the interviewees say that they encounter them frequently around.

3.2.2.1.3 Summary of supply chains in the region and provision of sustainability aspects

According to the survey, in the region there are different markets and different supply chains for wild mushrooms. A distinction can be done with respect to the origin of the mushrooms, local or not local.

Figure 3.22 Supply chains of mushrooms that are traded in Trentino-South Tyrol



i. **Local mushrooms:**

a. **Physical trade of the fresh raw product**[98, 99]. Local mushrooms are picked by "informal pickers" in many places, but always within the regional boundaries, and sold to "professional mushrooms producers and sellers" or to HoReCa (another smaller part goes also to retailers and to privates). Professional mushroom producers (which also collect a certain amount of mushrooms by themselves) sell the mushrooms to privates, small retailers and sometimes to HoReCa, mainly at the market square in the biggest centres of the region, where mushrooms are controlled by the local sanitary authority. The quality of the mushrooms is declared by the retailers and also by the customers to be "high" (or at least is perceived as "high", also in comparison with most of the foreign mushrooms that are considered insipid); the traded quantities are relatively low, about 25tons per year. High qualities and low quantities allow categorising this type of market as a "niche market".

Mushrooms are sold through Short Food Supply Chain, and in particular face-to face SFSC, that is, when consumers buy a product directly from the producers. In this type of trade, components such as trust for the retailer, trust in the quality of the product, and local nature of the product are of great importance. Mushrooms producers stress that they mostly have loyal customers, which appreciate locality and quality of the product.

Regarding the provision of sustainability aspects, for the social sustainability, this

[98] Only minimal quantities processed.
[99] Only legal trade was targeted.

type of supply chain makes easier to establish fairness because it facilitates consumers' willingness to pay for products that they know and trust, and they implicate the recognition of producer's work. For the economic sustainability, this type of supply chain allows these small-medium producers to find out a target market in which they can avoid the competition with bigger wholesalers and large retailers. These producers, who are actually family based enterprises, thanks to SFSC are able to base their entire business on local mushrooms (no other retailer base its entire business on foreign mushrooms). Their business is based on many pickers' work, that mainly complement their income with this activity.

Professional mushrooms producers and sellers are able this way to receive fair prices. They earn on average 6€/Kg for boletus 1st quality and 2€/Kg for chanterelles 1st quality when buying from other pickers, letting these pickers earning 14€/Kg for boletus 1st quality and 11€/Kg for chanterelles 1st quality. Obviously, when they collect for themselves and directly sell the product, they earn much more, 19.9€/Kg for boletus and 13.5€/Kg for chanterelles.

For environmental sustainability, face-to face SFCS allows consumers to receive information about the method of production, which is generally expected to be sustainable. In this example we are in front of a trade that respect natural seasonal processes (from June to October) and that gives value to local mushrooms varieties (not only Boletus and Chanterelles are traded, but dozens of other mushrooms). Since the collection of mushrooms is strictly regulated by the provincial laws that limit the quantity and indicate methods of collection, the collection can be assessed as being sustainable by definition. In the case of the autonomous province of Trento, professional mushroom producers are those that have received the special permits by the provincial authority for collecting more than 2kg per day. These permits are accurately granted on the basis of the ecological sustainability. Therefore, the ecological sustainability is met[100]. Mushrooms are daily controlled by the sanitary authority so also the quality and healthy issue is met.

b. Permits for harvesting. Municipalities sell permits of collection to non-resident, according to a MBI that can be classified as being in between the tradable permits mechanism and the regulatory price signals' one.

In the case of Fiemme valley, a horizontal geographic-specific alliance has been set for the purpose of mushroom picking. Magnifica Comunità di Fiemme, municipalities and owners with more than 100ha made an agreement for sharing expenses and incomes deriving from the sale of mushroom picking permits, and for offering an improved service to the customers. Every year, more than 9,400 mushroom picking permits are sold.

For the provision of sustainability aspects, economically, 200,000€/year derive

[100] Even if some doubts may arise toward informal pickers. These persons, who reside in the provinces, are allowed to collect without paying a permit, but they must collect max 2kg per day. To check the quantity is not a task of the professional mushroom producer that buy the mushrooms from them. Therefore, there could be cases of overharvesting.

from the sale of the permits. This, without the introduction of payment for permits for harvesting that began in early '90, would have meant a loss of income for the valley. However, a question that one might ask is whether the introduction of the limit of collection has strongly discouraged the business of the sale of physical mushrooms. If so, we should compare the revenue for permits with the lost revenue for the direct sale of mushrooms, probably resulting in an economic loss. Nevertheless, the harvestable limit of 2kg is a regulation that comes from public administration, both at Provincial and National level, and it was set for the purpose of ecological sustainability. Therefore, given the legislative *status quo,* we can assess that the presence of the permits bring direct revenues to the valley. The revenues are used for paying expenses of advertisement and of the service in general, and for hiring four mushrooms guards, that patrol the forest.

Regarding the environmental sustainability, the strict rules for the quantity and for the methods of collection should be able to guarantee ecological sustainability. This is enforced by the presence of the mushroom guards, which are specifically hired. The sustainability of the collection was also confirmed during the survey in Fiemme valley by the interviewees to the residents. According to the interviews, a part of some persons that are ill-mannered, the business as usual level of collection is sustainable. There is a perceived relative abundance of mushrooms, when remaining in the limit of 2kg per person/day, and there is no perception that non-residents "steal" mushrooms.

Another aspect of environmental sustainability is done by the fact that a part of the earning deriving from the permits goes for maintenance of forest roads, for the management of grazing areas, for infrastructures against landslide and for the service of mushroom recognition by a mycologist. However, nothing goes directly for the improvement of forest ecosystems for the specific purpose of mushroom production and no silvicultural activities for improving availability of mushrooms or any other NWFP is in place. This could be improved in the future.

ii. **Non local mushrooms.** A much bigger quantity, with respect to local mushrooms, is not local. Non local mushrooms, for the vast majority foreign mushrooms, are traded in the region by wholesalers, processors and retailers.Mushrooms are generally sold with low level of differentiation, both in quality and in prices, in high quantities and they aim at reach a high number of consumers. They can be defined mass products.

To illustrate, we take the example of the processors. Mushrooms are bought, processed and then re-sold in mass quantities (more than 1,610 tons) through long food supply chains that connect producers based foreign countries, generally Eastern Europe countries and China, to the processors in the region. No one mushroom originates from the region. Sometimes, the foreign producers rely on many other small producers and sometimes concessions for the harvesting in a specific area are set; however, these are only assumptions since no information about the collection where given by the interviewee. Similarly, these are not embedded information that reaches the consumer with the product.

For these types of markets and supply chains it is not possible to make assumptions

about the presence of sustainable aspects. Economically, about 50 persons are employed in the sector as workmen in the factories and the most important company interviewed has a turnover of more than $7M. However, the first part of the supply chains is totally developed outside the region, and therefore the added value remain outside. Different would be the situation where at least a part of the raw material would originate from the region. The cheaper manufacturing cost, together with the limited harvestable quantity and maybe also ecological constraints, made the business focusing on other markets.

For the environmental sustainibility it was not possible to assess the presence of positive or negative impacts. Since the collection occurs very far away, whith methods that do not reach the consumers as information on product, it cannot be said that the mushroom harvesting is sustainable. The use of a certification that contains ecological specification regarding the harvesting would be valuable in this regard.

However, the quality and healty assessment of the traded mushrooms always occur in presence of mycologists and experts, and all processes are regulated by very strict quality control procedures.Some of the companies also take advantage of the use of certification, such as ISO 9001 and also BRC, a food safety certification.

3.2.2.2 Chestnuts

Results concerning chestnuts market in the region are divided in three paragraphs. The first targets the supply chain analysis. Since the chestnuts farmers in the region are for the great majority members of chestnut producer associations, the second paragraph targets the case study of Associazione Tutela dei Marroni di Castione. The third paragraph summarizes the different supply chains in the region and illustrates the presence of sustainability aspects.

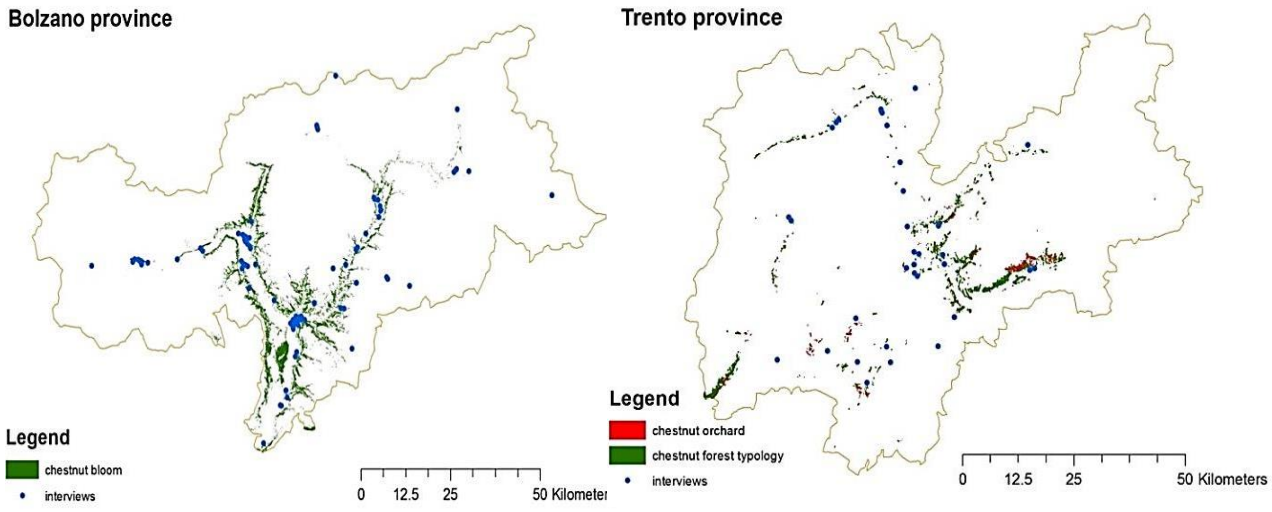
3.2.2.2.1 Supply chain analysis

Producers

23 producers in South Tyrol and 19 in Trentino have been interviewed, including 4 professional farmers that do not belong to any association or cooperative. Figure 3.23 reports the physical location of the interviews, obtained with QGIS software by using the interviewee addresses.

According to the survey, the majority of chestnuts farms are small, 0.94 ha on average. However, the respondents were indicated by the presidents of the association as those having such a production that can be sold. Since within the associations there are many (sometimes the majority) chestnuts growers that do not sell the production at all, and they usually have very small properties, the size of 0.94ha on average is an overestimation. The average farm is more likely to span 0.50ha on average, as affirmed by many presidents of the associations and confirmed by a similar study simultaneously conducted in South Tyrol (Bossi Fedrigotti and Fisher, 2013).

Figure 3.23 Localization of the interviewed chestnuts producers in Bolzano and Trento provinces



The great majority of the chestnuts stands are old traditional stands, recovered and maintained by chestnuts farmers. Sometimes the properties are fragmented and chestnuts trees are scattered. On average chestnuts producers collect 780Kg/ha of chestnuts per year. This is in line with official data (Ministero delle politiche agricole alimentari e forestali, 2010) that report that in the Province of Trento, when in presence of old chestnuts orchards, the production is about 800kg/ha (12-14 kg per tree)[101, 102].

Our survey showed that the individual amount of chestnuts changes a lot producer by producer, from few kg per year (the minimum is 10kg) to some tons (the maximum is 6 thousands kg).

The harvesting activity in TST mostly takes place in chestnuts woodlands that producers own. Only the bigger producers also manage other forests. In these cases the forests reach a surface of about 9 ha, and they are located farer from farmer's premises. Producers collect chestnuts and "marroni", the local ecotypes of *Castanea sativa*, var. macrocarpa. In Trentino, the cultivation is mainly based on various local ecotypes of *marrone,* locally known with the name "marrone Trentino".

According to the interviewees, on average the harvesting period lasts around 37 days per year, plus days dedicated to sorting and cleaning activities, in particular the traditional activity of "novena", which is a water treatment for the chestnut conservation; the chestnuts are kept under fresh water for nine days and are then sold in the market or stored for months in dry and cold environment. The collection is manually conducted (only one producer stated to use mechanichal means). This is due to the small size of the farms that do not allow affording costs of the machineries, but also to the steep slopes where orchards are located. This surely affects the cost of production.

Chestnut farming is a labour intensive activity, if considering that there is also a consistent work

[101] When in presence of new orchards, with around 100 tree/ha, the production can reach 2400 kg/ha.

[102] Many interviewees reported that 2013 was a dramatic year for chestnuts production in the region, due to the attack of the chestnuts gall wasp Dryocosmus kuriphilus. Production dramatically declined. Therefore, in answering, many interviewees reported the average typical year, instead of 2013.

of cleaning and pruning of the orchard. For the great majority of chestnuts farmers, chestnut growing is a secondary activity. The results highlighted that the majority of the producers (53%) have an annual income between 10 and 50 thousands euros, but only a very small proportion of the income is generated by chestnut production; only producers with an annual gross income lower than 10,000€ consider chestnut an important income, accounting on average to one-third of the total turnover. The main professional activity for 70% of the chestnuts farmers is the production of other crops or fruits, or they are retired. Interviewees report that chestnuts activity is rather a complement of their income, a tradition and a true passion. [Chestnut farmer of Albiano, Trentino]: " *Ah, if it would be for profit, I would rather not do it..it's very strenuous, cleaning, pruning..moreover these years, with all these diseases..chestnuts is an unlucky trees, it attracts all the diseases. I do it for passion. It's our tradition, and all the chestnuts farmers I know do the same..it's something magical for me. I would stay here every day, in the chestnuts woodland, like this, nursing the trees, looking at the mountains..what in the world is more beautiful*?"[103]

In the region chestnuts producers are in most of the cases members of chestnuts associations[104]. Chestnuts associations gather chestnuts producers, as well as sympathizer and volunteers, who join together under the passion of the chestnuts growing and the chestnuts traditions.

South Tyrol has three main productive areas for chestnut, Val Venosta, Burgraviato and Salto-Scilliar and the eastern side Valle Isarco. Each area has one association or group of interest that constitutes a point of reference for the chestnut producers of the valley. The first association, "Kastanienverein Vinschgau" was founded in Val Venosta in the year 2001, followed by "Ketschnriggl" in 2003 in the area of Burgraviato , and the "Eisacktaler Kastanienverein" in 2011 in the Isarco valley (Box 3.2).

Box 3.2 Chestnuts associations in South Tyrol

The "**Kastanienverein Vinschgauer**" was founded in 2001 in Val Venosta with the aim of showing and teaching the chestnut culture to the population and tourists of Val Venosta. Consulting, in coordination with the forest offices of the valley, is one of the primary services supplied by the association, and concerns different topics such as chestnuts orchards establishment or re-establishment, grafting, cultivation techniques, harvesting, treatment of diseases and pests and nonetheless consulting on how the public subsidies for chestnuts are assigned. On the other hand the association aims at improving the marketing of chestnuts. "Kastanienverein Vinschgau" association counts about 150 members, who have different production dimension that varies from larger producers to several members with only few trees, or just chestnut passionate. Each year two free educational sessions related to grafting techniques, nursery and chestnut forest pruning take place. Usually the activities are carried out by an associated member; nevertheless the annual agenda includes instructive trips and exchanges with other associations and contact relationship maintenance at local, national or European level. One important appointment is the congress of chestnut

[103] " *Ah, se fosse per guadagnarci solo io mica lo farei..è tanta fatica sai, pulire, potare..poi in questi anni, con tutte queste malattie della pianta..el castagno l'è proprio sfortunà eh, le ga tute. Ma io lo faccio per passione. E' una nostra tradizione, e quelli che conosco fanno tutti così..è un po' una cosa magica per me. Io starei qui ogni giorno nel castagneto, così, a curare i miei alberi, a guardare le mie montagne..cosa c'è di più bello*?"

[104] Interviews were done to members of each association, plus some other external (rare) chestnuts producers.

producers, held in Italy, but with an international audience. The educational part is partially sponsored with the founds of the association that derive from revenues of association fee (10€/year per member), subsidies from the region (about 1500€/ha), the local Communities and banks. A future investment will address to the construction of a warehouses to store the production of the member, in order to enhance sale activity. In fact a proper conservation is the main step to extent the chestnut availability over time.

The second association, "**Ketschnriggl**", counts about 200 members and has a similar structure of the previous one, but in addition it provides also a guide to define the chestnut prices according to the quality and size category. The association suggests a price range that the members are recommended to address. At the moment there is no control system by the association board, but the respect of the guidelines is based on trust. Three different prices are set up according the following categorical parameters: i)I category: <50 pieces/kg; ii) II category: 50-70 pieces/kg; iii) III category : >70 pieces/kg.
The association aims at trading high quality products, which justify the low number of nuts per kilogram. The area is favourable to the cultivation of marroni, which represents the larger part of the production, due to the higher customer appreciation. The association is a main actor in the traditional chestnut local fair held in Lana. The local fair was designed to let the customer meet the chestnut producers or other interlinked economic activities of the area, like wine and local food served together with roasted chestnuts. In fact, in this occasion there is a direct contact between producers and the customers, both locals and tourists, and a great quantity of chestnuts is consumed.

The third association, "**Eisacktaler Kastanienverein**", funded in 2011, includes about 90 members. The president of the association was the initiator of the "Ketschnweg", a trail that links chestnut growers along the valley. Furthermore the District Community of Valle Isarco was the promoter of the project "Wirtschaftskreisläufe am Keschtnweg" (literally "economic circuits along the chestnut trail") that aimed to enhance the chestnut production in the valley through a bottom-up approach. In November 2011, during the last workshop of the project, the working group "Castagne della Val d'Isarco" was created. The new project was the consequence of the idea of a follow-up project to qualify service providers, especially the farmers, in terms of the professionalization of the offer along the chestnut trail and to develop concrete initiatives and products. The purpose of the project was to take up chestnut tradition in modern, complex and professional way, focusing in particular on the small-scale agriculture in Isarco Valley. The intention was to restore the antique use of chestnuts, as new branch of agriculture and alternative source of income. Secondarily, the project provided also a sustainable diversification of agriculture and agricultural products and, furthermore, contributed to the preservation of the characteristic landscape of the valley through a working group ("Circolo di lavoro Castagne della Val d'Isarco"). The Working Group offers to farmers the possibility to meet in a discussion table, guided by experts; in this context, the project represented a strategic mix of theory and practical actions. At the moment the project is financially supported by the European Union, under the European Agricultural Fund for Rural Development (EC Regulation n° 1698/2005). The association, Eisacktaler Kastanienverein, holds 90 members and it carries out mainly formation activities on grafting course. The association is also in constant relationship with the local forest office, because they believe that the link among different institutions is one of the prerequisites for good governance.

Source: direct interviewees with the persons in charge of the associations

In **Trentino**, the chestnut cultivation is located in six zones: Bassa Valsugana e Tesino, Alta Valsugana, Valle dell'Adige, Valli Giudicarie, Alto Garda and Ledro, Vallagarina. Nine chestnuts associations operate in the respective productive areas, and in many cases communicate and cooperate with the other associations (Table 3.14). One of the most successful examples is

represented by Associazione Tutela dei Marroni di Castione (see §3.2.2.2.2).
In addition to the associations, there is a chestnuts cooperative that operates at Regional level (although the great majority of the members are from the Province of Trento), with about 70 members (
Box 3.3).
According to the survey, in the region there are 940 members of the chestnuts associations (440 is South Tyrol and 500 in Trentino). To this have to be added at least the 4 professional producers that we interviewed who do not belong to any association and the 65 members of the chestnuts cooperative (who, however, in some cases are also members of the associations), reaching a number of more than 1000 persons. This number is considerably greater that the one reported for chestnuts farmers by official data of Ministero delle politiche agricole alimentari e forestali (2010) and by Astat (2013) (Table 3.13). However, not all the members of the associations actually grow chestnuts; a certain number is made up by volunteers and "friend of the chestnuts associations". It is also worthy to consider that many members only own a couple of chestnuts trees and produce for self-consumption (for example two associations, for a total of 48 persons, do not sell the chestnuts at all**). Anyway, the great number of people involved in these associations represents an indicator of the interest that is growing in the region for this traditional, rediscovered, activity. It also shows that in this sector there is a strong prevalence of horizontal integrations among actors and tendency at sharing knowledge and experiences through these forms of associations.**

Table 3.13 Numbers of chestnuts farmers according to official data and to our survey

	Ministero delle politiche agricole alimentari e forestali (2010) and Astat (2013)	**Our survey**
Chestnuts farmers (n°)	432	
Members of chestnuts associations (n°)		940
Members of the chestnuts cooperative (n°)		65
Other professional producers (n°)		At least 4

Source: data from Ministero delle politiche agricole alimentari e forestali (2010) and Astat (2013) and our survey

Due to the sample characteristics, with the survey it was not possible to define the total production of the region. Our interviewees produce in total 43.42 tons per year. However, estimates done during the interviewees by some of the presidents of the more active associations say that in Trentino the total produciton should be around 500 tons/year, in a normal/good year (that is, not in the latest, very dramatic years). In South Tyrol some estimates define 400 tons as the maximum production in the Province (Scartezzini, 2002, in Bossi Fedrigotti and Fisher, 2013), which is probably overestimated, because it corresponds to something more than 3 tons/ha. Adjusting the values to the ones found by our survey and the one of Bossi Fedrigotti and Fisher (2013) **the total estimated quantity could be around 620 tons/year produced in the region**.
From the survey emerged that **chestnuts market in Trentino-South Tyrol has a local**

dimension: **96.6% of the local production is sold within the regional boundaries**[105]. Only a minimal part of the production is sold abroad, mainly in Austria, which is very close to South Tyrol, and in Germany (one producer also in other Italian regions). Producers state that the regional demand for the local chestnuts is very high, and often they are not able to satisfy it, especially during the years of low production, such as the last ones, where there was a dramatic decline as a consequence of the attack of the *Dryocosmus kuriphilus* Yasumatsu.

The supply chains of local chestnuts in the region are for the vast majority Short Food Supply Chains.

In **South Tyrol** a great part of the raw production is sold by producers directly to the end consumers (48%), and this happens or at the farm, both to people that go there for buying or to hosts that overnight in the farms and at farmer market. To this it is added another 6% which is sold to private consumers during events, such as chestnuts festivals. 9% of the production that is absorbed by HoReCa, mainly restaurants, for traditional reason linked to *Törggelen* tradition (see Box 2.2). The remainders are sold to small retailers (23%), to wholesalers (9%) and to processors (5%). Data are similar to those found by Bossi Fedrigotti and Fischer (2013), that, even with some discrepancies (e.g 77% of the production is sold through direct sale to end consumer) found that the majority of the production follows a short and local supply chain "producer-consumer", and that is strong the role of direct sale, farmer markets, seasonal events, chestnuts festivals and *Törggelen*.

In **Trentino**, the production is mainly sold to the chestnuts associations and cooperative (66%) to whom the producers take part, which then sold the overall production to end consumer during chestnuts festival, and to processors for producing products with the association/cooperative label; to retailers (greengrocers and shops, but also large retailers such as supermarkets) (18%), 12% to private consumers, which include also organizations such as hospices, and 5% to wholesalers (which are in some cases cooperatives). **The role of chestnuts associations and chestnuts cooperative is definitely relevant**. Especially in 2013, where the local production was dramatically scarce, the associations, together with the Cooperativa Castanicoltori Trentino Alto Adige, absorbed the majority of the local production. Representatives of the associations explained that, in the years of crisis and scarce production, at least the chestnut festival and the tradition must be maintained.

Figure 3.26 and Figure 3.27 show the percentage of the production that is commercialised in the different trade channels in the two provinces.

In general the survey found two different realities: small producers are mostly linked to associations and the cooperative to trade their production, while larger producers showed to have independent channel of trade.

The very large part of chestnuts production (94%) is sold as raw. Producers sell chestnuts with a grading scheme based on size and aesthetics, that is defined "category", that sometimes differ area from area but that can generally can be summarised as follows: i) I category: <50 pieces/kg, ii) II category: 50-70 pieces/kg, iii) III category : >70 pieces/kg). In 2013, year of very poor production first category chestnuts were sold at 4.9€/Kg, second category at 3.6€/Kg, and

[105] During the survey we targeted only the production that is successively commercialised. However we consider relevant to report that the majority of producers state that a certain part of their production, that could be assessed around 10-20%, is set aside and self-consumed, or donate to relatives and friends.

third category at 1.1€/Kg; while first category marroni were sold at 9€/Kg, second category at 7€/Kg, and third category at 2.8 €/Kg.

In the context of the association and chestnuts festivals, associations sold chestnuts both as raw and as “caldarroste” (roast chestnuts), or in form of sweets (see next paragraph, on processors). A part from the preparation of roast chestnuts and chestnuts sweets, producers usually do not process their products.

Table 3.14 Chestnuts associations in Trentino and Cooperativa castanicoltori del Trentino Alto Adige

Association	Place	N° of members	Date of birth	Brief description	Products and trade channels
Associazione tutela dei marroni di Castione	Brentonico plateau	About 100	1994	See 3.2.2.2.2	Raw products are sold to private persons (sometimes small retailers, rarely large retailers). Chestnuts are sold in nets with label of the Association. Roast chestnuts and sweets (*zirele di marroni*) made with chestnuts during the traditional local feast. Marroncino di Castione (a liquor), chestnuts honey, chestnut cream.
Associazione castanicoltori della Valle del Centa	Centa S. Nicolò	40	1985	It was born as consortium of land improvement. Today it is a medium association, that gathers many persons during the Autumn and especially during the chestnuts festival.	Raw products to private persons (sometimes small retailers, rarely large retailers). Roast chestnuts during the traditional local feast.
Associazione castanicoltori Roncegno	Roncegno	35	1980	It is an active association, the centre of the production of chestnuts in Valsugana	Raw products to private persons (sometimes small retailers, rarely large retailers). Roast chestnuts and sweets made with chestnuts during the traditional local feast.
Consorzio di miglioramento fondiario di Albiano	Albiano	50	1999	It was born as consortium of land improvement	Raw products to private persons (sometimes small retailers, rarely large retailers). Roasted chestnuts and sweets made with chestnuts during the traditional local feast.
Associazione affidatari castanicoltori Sardagna	Sardagna	47		The Municipality gives to the residents that are interested the possibility to manage some chestnuts trees, in the Municipality’s territory, as a right of commons. The foster persons can manage and produce chestnuts, but they are not allowed to sell them as privates. They use the production for self-consumption and they bestow chestnuts to the association, which sell them during the traditional local feast.	All the products (raw, roast chestnuts and sweets made with chestnuts) sold during the traditional local feast.
Associazione castanicoltori Val Rendena	Rendena valley	28		The association is brand new. Chestnuts are not already in production	No production until now, they have just started in the recovering of the stands

Associazione marrone del Chiese	Chiese valley	115	2012	It is an active association in the valley. There is also an experimental tree nursery for local varieties of chestnuts.	Raw products to private persons (sometimes small retailers, rarely large retailers). Roasted chestnuts and sweets made with chestnuts during the traditional local feast.
Associazione marroni di Campi	Campi	65	2004		Every member deliver his production to a cooperative that acts as a wholesalers as well. This purchaser is trading only chestnut coming from the surroundings.
Associazione affidatari castanicoltori Nago-Torbole	Nago-Torbole	20		The Municipality gives to the residents that are interested the possibility to manage some chestnuts trees, in the Municipality's territory, as a right of commons. The foster persons can manage and produce chestnuts, but they are not allowed to sell them as privates. They use the production for self-consumption and they bestow chestnuts to the association, which sell them during the traditional local feast.	Chestnuts not for sale
Cooperativa castanicoltori del Trentino-Alto Adige	Whole region	65	1990	The cooperative receives the fruits from producers located in different valleys, that usually are registered also in other associations. The cooperative is more trade oriented than the other associations, and furthermore establishes high and quite strict quality standards.In this optic the cooperative trades also a superior grade called "fioroni" which is sold up to 12€/kg.	Raw products to private persons. Chesnuts are sold in net with the label of the Cooperative. Syruped Marroni, chestnut beer, Marroni cream, Marroni cream with vanilla, rhum and cacao, Marroni cream with vanilla, candied Marroni and with Gewürztraminer and with Grappa ala Nosiola

Box 3.3 Chestnuts cooperative "Cooperativa Castanicoltori Trentino-Alto Adige"

The chestnuts cooperative "Cooperativa castanicoltori Trentino - Alto Adige" was born fifteen years ago. The Cooperative constitutes a cross body among the different producers and associations established in the region. It is one of the points of reference for the chestnut sector in the region, it provides guidance on prices of products and it directly and indirectly promotes the marketing of products. The Cooperative is present in many events and festivals all around the region to sell the products and to promote chestnuts activity. The Cooperative also established transregional cooperation with other chestnuts associations. It also organises trainings and courses for growers and technicians

At the beginning the Cooperative counted 125 members that were progressively reduced on the basis of the compliance of the procedure guideline provided by the cooperative, with the aim to keep a high quality standard on products and production techniques. Nevertheless the number of associates in now increasing, always keeping the quality oriented membership criteria. It commercialize about 150tons/year.

Members of the Cooperative have to pack chestnuts in the nets (3, 5 and 10kg) provided by the Cooperative, which bear its logo. The Cooperative also indicate the chestnuts calibres:

- I category extra: less than 50 per Kg
- I category: 51/70 pieces per Kg
- II category: 71/90 pieces per Kg
- III category: 91/100 pieces per Kg
- IV category: more than 100 pieces per Kg.

Nets must be sold with a certificate of traceability that include data of the company.

Figure 3.24 Logo of Cooperativa Castanicoltori Trentino-Alto Adige

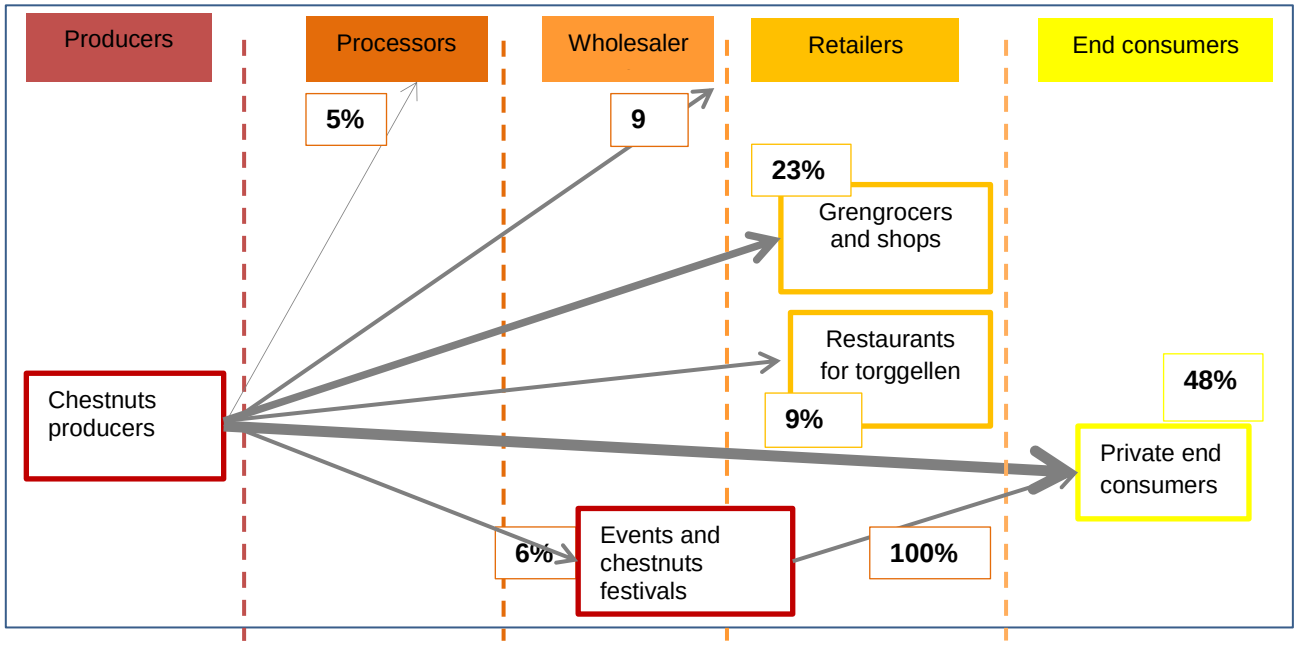
The Cooperative also sell processed products with the label of the Cooperative. It collects raw chestnuts from the members and send to a SME in Marradi (FI) where they peel, freeze, and make them candied. 1kg of peeled chestnuts can reach a price up to 17€/kg. With peeled chestnuts are produced chestnuts cream, candied chestnuts in syrup, flavored syrup to Trentino grappa and chestnut beer "Castanea". These products are mainly sold in specialty food stores in the region and during chestnuts markets all around the region.

Figure 3.25 Processed chestnuts products of Cooperativa castanicoltori Trentino Alto-Adige

Source: interview with Stefano Pradi, president of the Cooperative

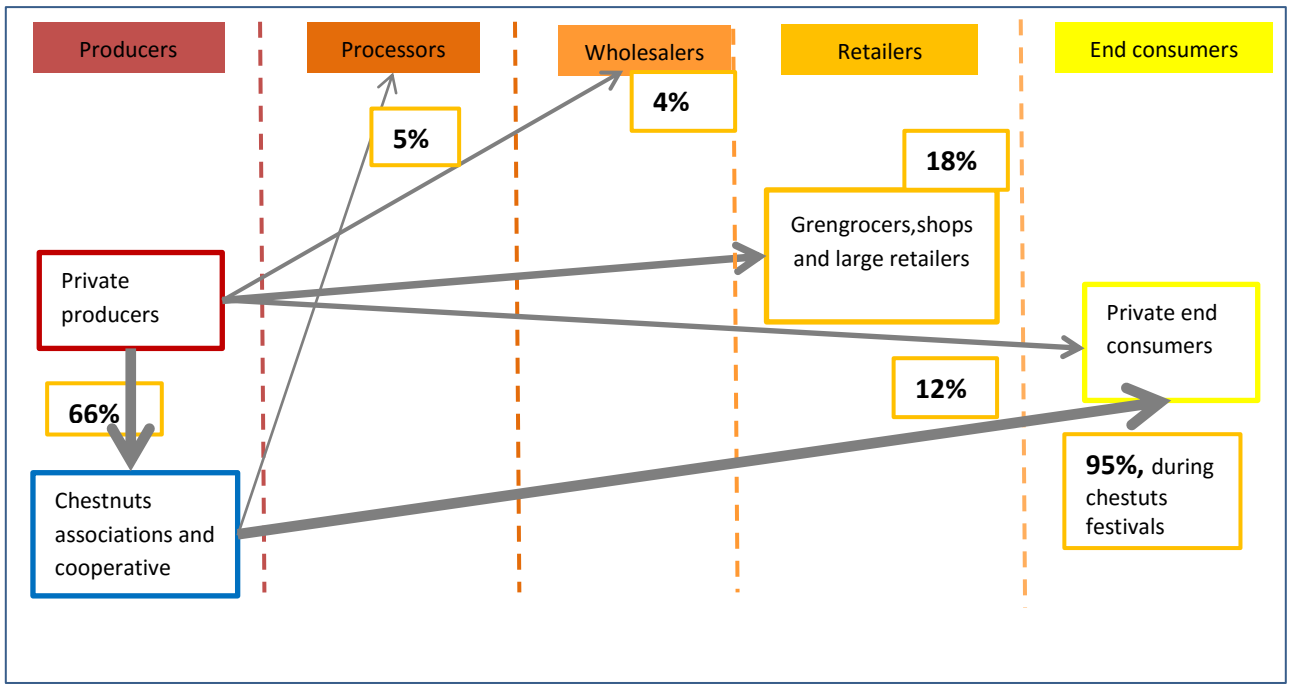
In the region, only Associazione Tutela dei Marroni di Castione and the chestnut cooperative sell with the label of the organization. No other certifications, with the exception of the origin, which is written on the price tag, are present on the product. According to the survey, in Trentino farmers within all the chestnuts association grow precise ecotypes, most of the times ecotypes of marroni. In Trentino chestnuts farmers also refer that their customers appreciate the quality of the product (this was also reported by some of the retailers that referred to supply chestnuts from a place with respect to another, because they "*always eat those chestnuts and they like them*"). On the contrary, in South Tyrol, this happens less. The farmers seem to be less conscious about the precise ecotype they grow. This is also confirmed by the study of Bossi Fedrigotti and Fisher (2013) that attested that in South Tyrol only 20% of the respondents consciously grow a precise cultivar and chestnuts are less differentiated.

Figure 3.26 Trade channels of local chestnuts in South Tyrol



Note: numbers refer to the percentage, on the total production detected with the survey, which are sold through the different trade channels.

Figure 3.27 Trade channels of local chestnuts in Trentino



Note: numbers refer to the percentages, on the total production detected with the survey, which are sold through the different trade channels

In order to respond to the research question "*how does the chestnuts production keep alive*?" to the chestnuts producers it was also asked whether they received funds in the last two years for the sustenance of the chestnuts orchards. According to the survey (43 respondents), the great

majority of chestnuts producers interviewed (71%) asked and received funds from Rural Development Programmes, for the restoration, the clearing and the pruning of the chestnuts orchards. However, it was difficult to understand if these funds came from the EU RDP or from the Rural Development Programme of the Provinces. In fact, since both the financings pass from the Province administration, most of the respondents were confused and not able to say to what programme the funds belonged to. For this reason, and because the typologies of funding can be consider analogous, data was aggregated. Among the respondents, many persons in charge of the chestnuts associations claimed that they received funds from LEADER, and from measure 111, "vocational trainings" for educational training, seminars and courses.
The financial incentives given by both the EU and the provinces, are typically ascribable to the Pigouvian "regulatory price signals" market based mechanism. Funds are utilised for rewarding those that make activities with positive associated externalities.
All the respondents that received funds stated that these favoured their works. 12% of them indicated that the funds helped them "very much" and most of them (88%) declared that these funds helped them "for a certain extent", specifying that the amount of money that they received "*it is not a sum that can change the life, but a contribution for better working*". Many stated that unfortunately the bureaucratic process for getting funds takes too long.

Processors

During the survey, 12 processors have been interviewed (2 bakeries, 4 factories that are also jam producers, 2 breweries, 3 distilleries and 1 street seller of roasted chestnuts). To this number have to be added the interviews done to the chestnuts associations, which sold "*caldarroste"* during the chestnuts festivals (during the festivals, chestnuts are roasted and chestnuts sweets are prepared and then sold by the association members and by many volunteers). The most common processed product sold in the region is indeed "*caldarroste*", which are sold by chestnuts associations, at 12-18€/Kg on average, mainly indeed during chestnuts festivals. Buyers of caldarroste are 100% private individuals, both local population and tourists from other regions of Italy, Germany, Austria and Switzerland. During these festivals are also sold traditional chestnuts sweets and cakes.
Sweets are also prepared by bakeries and pastry shops, mainly in South Tyrol. Chestnuts "hearts" (typical local sweet) are sold to local population (85%), and in minimal part to small retailers. Chestnuts "panforte" (typical local cake) is sold at 20€/Kg to local population (85%), and in minimal part to small retailers.
A part for the preparation of roast chestnuts, which is a very simple processed product, actors that make more processed products are rare. According to the interviewee, **in the region the processors represent the weakest link of the supply chain**. In fact, producers willing at creating chestnuts-by products (other than the simple "caldarroste" and perishable chestnuts sweets) mostly rely on powerful SME outside the region. This is indeed the process that follows the chestnuts Cooperative of Trentino Alto Adige (
Box 3.3).
On the contrary, *Associazione Tutela dei Marroni di Castione* produces a product entirely made in the Trento Province. It relies on a distillery of Trentino, for producing an innovative chestnut spirit creamy drink (see § 3.2.2.2.2). Other processors are two distilleries in South Tyrol. They

buy “category V chestnuts”, those with a minimum size, as long as they do not have damages at 0.8 €/kg, and, after a labour intensive process of distillation, they are able to sell the distillate at an average price of 58 €/l[106]. Distillates are niche products mainly bought by tourists. Half of the bottles in 2013 was sold to private individuals, a quarter was given to restaurants and the remaining part to retail stores, in particular wine shops. The local market absorbs 80% of the production; a 5% is sold in wine shops spread throughout the country and the 15% of the bottles will be delivered to foreign countries such as Germany and Austria. The other few local actors who make a processing activity on chestnuts, usually process also other products, such as other NWFP and other agricultural products, for preparing jellies and jams. Chestnuts products cover only a minimal part of their turnover. The processors are mainly small and medium enterprises, with few employees. There is also a farmer cooperatives, that usually deal with berries and other fruits, that buys chestnuts flour outside the region.

These few regional processors buy chestnuts from regional commercial pickers (62.3%) and regional wholesalers (22.3%), while the remaining part is self-picked (in the case of those that process chestnuts and makes caldarroste). First quality chestnuts are bought at 3€/Kg. Few processors-retailers buy directly chestnuts flour at 3.2€/Kg from local producers.

Marroni cream is sold at 15.9€/Kg on average, mainly to regional supermarket (46.7%), private individuals (26.7%), both local population and tourists from Germany, and to small retailers (26.7%). Alcoholic chestnuts cream is sold to regional small retailers (80%), and in minimal part to local population. Chestnuts beer is sold at 18€/l to local population and tourists. Chestnuts spirit is sold at 58€/l on average, mainly to private individuals (50%), above all foreign tourists, and to HoReCa (25%) and small retailers. The market is mainly local, but a small part of the production (15%) is sold to Austria and Germany. Marroni into spirit are sold at 12.5€/Kg, mainly to large retailers (80%), and in minimal part to small retailers and private individuals.

The products processed by the interviewed companies are usually sold in small quantities, at a relative high price, to small retailers in the region, and the customers are mainly (90%) tourists. They can be defined niche products.

Wholesalers

During the survey we interviewed 21 wholesalers.

As for mushrooms, chestnuts retailers can be divided in three categories: big wholesalers (11, with sell on average 17.7tons), medium wholesalers (12 that sell 2.5 tons on average) and small wholesalers (37 with 415 kg on average). In addition there is a very big wholesaler that trade 350tons. **The total estimated quantity traded through wholesalers in the region is about 570tons**.

Medium-big regional wholesalers are SME (with few exceptions, who are cooperatives), with 23 permanent workers on average, and 3 seasonal ones. Their gross turnover is higher than 500 thousands euro, but only a minimal part (2%) generated by chestnuts.

Wholesalers supply for the 94.3% from other wholesalers, and for 5.7% from producers. The other wholesalers from where they supply from are for the great majority located in Italy,

[106] Each stage of the process, which passes from cooking to the distillation, is carried out carefully to obtain a final high quality product. As an indication for each litre of distillate, about 12 kg of chestnuts are required. The final average price reaches about at 57€/l kg on which 10 €/litre are paid for excise duty.

above all in Veneto (Verona and Padova), Emilia Romagna (Bologna), Piedmont (Cuneo) and Tuscany. **The traded chestnuts comes 99% from Italian big producers located in Cuneo (Piedmont), zone of Monte Amiata (Tuscany) and Avellino (Campania)**. These are indeed the main chestnuts production zones in Italy, where chestnuts growing is intensive, specialised and similar to an industrial production. Some of the wholesalers stated also that in periods of very low production also these big producers rely on foreign chestnuts.

The 5,7% on the total that come from producers derive both from national producers (the same zones aforementioned) and only 38% of this (corresponding to ~10.7tons) from local producers, both single farmers or associations of chestnuts growers.

Wholesalers stated that their buyers appreciate local production, but it is very small and it cannot cover the demand. Moreover it is discontinuous while they need to have large and programmed quantities during the autumn. Chestnuts, and in most of the cases marroni, are also more expensive. Therefore, their core activity is based on chestnuts coming from other regions.

Prices at wholesalers place change a lot according to the grading scheme: first quality chestnuts are bought at 4.7€/Kg, second quality at 4.2€/Kg, third quality at 2.5€/Kg, fourth quality at 1.5€/Kg, and packed unbranded chestnuts at 2.3€/Kg on average.

Wholesalers sell first quality marroni at 6€/Kg, second quality ones at 4.2€/Kg, and third quality ones at 3.5€/Kg. Almost all the production is sold within the regional boundaries. The main customers are small retailers (41.1%), other wholesalers (29.2%), HoReCa (25.5%), private individuals, hospices and processors.

Chestnuts price depends on the grading scheme: first quality chestnuts are sold at 5.9€/Kg, second quality at 5.2€/Kg, third quality at 3€/Kg, fourth quality at 1.8€/Kg, and packed unbranded chestnuts at 2.5€/Kg.

Chestnuts remain within the regional boundaries in Trentino, while in South Tyrol the biggest amount of chestnuts is sold to European (German and Austrian) large retailers (64.9%); the remaining quantity is sold to regional wholesaler (14.6%), small retailers (7.9%), HoReCa (5.9%), private individuals and associations or street sellers.

Retailers

The majority of the interviewee for the retailer category are small and medium greengrocers, but there are also big supermarkets and individual farmers selling directly to the final consumers (mainly in South Tyrol).

Small and medium retailers have on average 2-3 permanent employees and 3 seasonal ones. Their gross turnover is very variable, among 10 and 100 thousands year, a minimal amount of which (1.5% on average) is generated by NWFP, which include mushrooms (86% of retailers), berries (72%), other nuts (55%) and aromatic plants (48%). Some retailers also sell truffles, medicinal plants and foliage. Small retailers commercialise on average 190kg of chestnuts, while medium retailers 2.7 tons.

Supermarkets have on average 1,430 permanent employees, and a gross turnover higher than 2 million euro per year, of which NWFP form less than 1%. They commercialise each 88.7tons on average.

Overall, through retailer pass an estimated quantity of about 565tons of chestnuts.

Overall, regional retailers supply from wholesalers (65.6%), half of which are located in Italy

(in Padova, Verona, Cuneo, Tuscany, Avellino) and half within the region. **As for the wholesalers, the chestnuts come from the aforementioned zones of production of Piedmont, Tuscany and Campania. Other suppliers are local producers (privates, associations, cooperatives) (34.1%)**, a share higher than what happens for wholesalers. According to the retailers, they and their customers strongly appreciate local chestnuts and marroni. Retailers were always able to specify the village and/or the chestnut association where the products come from. [Retailer in Pergine Valsugana]: "*If I can I purchase always from Roncegno, marroni are the best. Customers always purchase all those marroni eh..usually I make like this: at the beginning of the season I buy marroni from those of the association. Then when they are finished, for the rest of the season I buy from wholesalers*"[107]

For greengrocers the main customers are local population (also because chestnuts are sold in a low touristic season), and a small percentage is also sold to tourists, Italians, Germans and Austrians. Different is the situation that happens to chestnuts farmers that directly sell their product at the farms, or at the farmer market, or during chestnuts festival.. In this case many tourists are attracted by the chestnuts festival, Törggelen and chestnuts trails.

Prices depend on the grading scheme. First quality chestnuts are sold at 5.2€/Kg, second quality ones at 4€/Kg. First quality marroni are sold at 7.4€/Kg, second quality ones at 5€/Kg, and third quality at 4.3€/Kg.

35% of retailers sell also products based on chestnuts processing. The most common are: marroni cream, alcoholic chestnuts cream, caldarroste, chestnuts spirit, blood vessel gel. First quality marroni are bought at 4.9€/Kg, second quality ones at 3.3€/Kg, and third quality at 2.9€/Kg.

Marroni cream is bought at 8.5€/Kg (330gr jars) from regional processors and wholesalers, and is sold at 14.1€/Kg to tourists and local population. Blood vessel gel is bought at 40€/l from local wholesalers, and is sold at 56.4€/l.

3.2.2.2.2 Case-study: Associazione Tutela dei Marroni di Castione

In Castione village, the idea of restoring the chestnut orchards and the traditional landscape rose in 1994 from the passion of some chestnuts growers, among which the present president of the Association Fulvio Viesi. However, they only re-start a process, they did not invent it. According to the interviewees, the restoration has been possible because the memory of the management techniques and the traditions has never been lost.

There are many other places in Trentino, as well as in Italy, where in the past the chestnuts were cultivated. But in some of them the chestnuts orchards were totally abandoned and forgotten, in favour of other economic activities. On the contrary, in some places, the memory remained. This is the case of Castione. According to Fulvio Viesi, Castione can be considered lucky from the point of view of the "memory". "*In the past, in Castione there were some important marble sculptors. They were considered artists, and their work was appreciated all around Europe. They*

[107] *"Io se posso mi rifornisco sempre da quelli di Roncegno, i marroni sono i migliori. Mi vanno via sempre tutti eh..di solito faccio che la prima partita la compro da loro, da quelli dell'associazione. Poi per il resto della stagione compro da grossisti*".

travelled in many places in Italy, and also in Austria, Germany, France. During their journeys they brought with them one of the most important fruits of their land: the chestnut. This way they let people outside Castione knowing about the high quality of the fruit. And once a product overcomes the limit of the little place where it is cultivated, it can be defined "famous". For this reason, from other places, a demand for the "marrone di Castione" remained during time, and the chestnuts cultivation was never totally abandoned".

Thanks to a group of farmers from 1994 the process of rediscovering made a positive turning point. And it was only possible thanks to the voluntarism. "*Only with the efforts of the persons which work for the satisfaction of making something good for the territory, with small or null revenues, this became reality*". The initiative grew through the years, and every year, new persons join the Association.

A multitude of initiatives rose up from the idea of some of the members, often Viesi himself. These initiatives often spring from the discussion with people coming from other sectors, e.g. the wine and the educational sector. For this reason the network also outside the Association is considered fundamental. Then the initiatives are discussed within the Association and shaped on the basis of the real possibilities. According to Viesi, the engagement of persons is necessary for the success of an initiative. Therefore, factors of importance for the creation and maintenance of the Association and its initiatives were listed by the interviewees as being: tradition, culture, territory, memory, local product, voluntarism, persons, dedication, passion, engagement, networking.

Today the Association counts about a hundred of members (both chestnuts growers and supporters). The chestnut trees are now well managed and they ensure both a profitable production and an asset from the point of view of the landscape. The Association promotes the chestnuts cultivation, teaches how to manage chestnuts orchards, gives standard for the conservation, defines prices. All these elements guarantee a high quality of the product.

The Association yearly defines and suggests the prices of the chestnuts to the farmers. It also suggests to sell the chestnuts in nets with the logo of the Association (Figure 3.28). Producers can decide to whom sell the products (the Association itself for the chestnuts festival, private individuals, retailers, wholesalers etc.).

Omitting the year 2013, which led to a total production of 10 quintals, usually the production in Castione is about 500-2000 quintals per year. Of this amount, a part is sold fresh, another is transformed in products and another, usually the main part, is sold during the annual chestnut festival, in form of roasted chestnuts and sweets.

Figure 3.28 The fresh chestnuts sold in nets

From the beginning, the Association recognised the importance of working in cooperation with the touristic sector. It promoted, and still promotes, together with the restaurants of the Brentonico plateau, menus based on chestnuts, especially during autumn. It also organises, in collaboration with the hotels, organised and educational tours of the chestnuts orchards. In this way horizontal alliances have been created, for the purpose of selling complementary products and services within the same territory. A territory with a centuries-old history, rich in tradition and with high quality food and wines is offered to the people willing to discover it.

The need to improve growers' knowledge led the Association starting to discuss with other organizations in the Province and at national level. Thanks to this process, the municipality of Brentonico, that includes the village of Castione, became an active member of the National Association of Chestnut Cities[108], a network in which experiences and innovation related to chestnuts are shared.

The Association organises, develops and promotes several initiatives:

- It organizes courses on chestnut grafting and pruning in various parts of the north-east Italy;
- it takes care of the management of chestnut plantations in other areas of Trentino and of an experimental chestnut woodland in the municipality of Cavedine, where all local ecotypes of marrone Trentino are represented;
- it restored the chestnuts orchards in 5 Municipalities of Trentino, which account for 10% of the entire Provincial chestnuts surface;
- it publishes books, as "Il Castagno alle pendici del Baldo", addressed to the chestnut growers and to all the people concerned with traditional management and agriculture;
- it publishes periodically the bulletin "…*nel castagneto*", a magazine that reaches hundreds of chestnut producers in Italy (Figure 2.8);
- every year, in October, at the end of the harvesting period, the Chestnut Festival takes place in Castione. It is the most important event of the Association, which gathers thousands of people. During the Festival, roasted chestnuts, sweets made with chestnuts, as long as other typical products and handcraft products are sold, and many activities take place;

Figure 3.29 Some numbers of the bulletin "..nel castagneto"

- in 2002 the national conference "The Chestnut, King of the Mountain" was held; as an

[108] www.cittadelcastagno.it

outcome the national project "The School and the Environment: along the Chestnut Street from the Alps to the Madonie" was launched the following year, involving 22 institutions and more than 60 classes all around Italy studying and writing papers on the chestnut and its culture;

- the Association has been the promoter of Castanea, the European network of chestnut growers and processors[109];
- in 2008, during the Festival, rose up the idea of the “National chestnuts plan”[110], which than become reality thanks to the cooperation with the Ministry of the Agricultural Policies;
- it organises guided tours, where people can observe the chestnut orchards and learn the characteristic of the cultivation and traditional processing (Figure 3.30);

Figure 3.30 A moment of the guided tour in the chestnuts orchards

- It promotes seminars, exhibitions, courses, competitions:
    - in 2008 the "First national competition of desserts made with chestnuts" was held, and the best recipes were published in a book;
    - it was established the photographic competition: “*Obiettivo castagna*”;
    - it was created the painting competition for children, “*La castagna disegnata*”;
- The Association is very active in the fight against *Dryocosmus kuriphilus yasumatsu*, with the use of the antagonist *Torymus sinensis*. The *Torymus sinensis* was bred, and distributed throughout Italy thanks to the project BIOINFOCAST, emerged from the National Chestnuts plan, whose origins date back to October 2008, precisely in Castione. There are centres of multiplication and some autonomous private farms, including the centre for breeding in Castione, which is entirely self-financed. The Association started soon the monitoring of the areas, and later the breeding of the antagonists. In 2012 was carried out, in collaboration with E. Mach Foundation, and funded by MiPAFF, the first release of *Torymus sinensis* in Castione. In 2013, following the first launches, the first breeding was activated The parasitization reached at that time the value of 7.56%. During the spring of 2014 more than 23,000 individuals of *Torymus sinensis* were born. From these births were performed 70 releases (110 in the areas of Castione, Besagno, Crosano, 17 others in other parts of Trentino. Moreover there were made releases of

[109] http://www.castaneanetwork.eu/
[110] https://www.politicheagricole.it/flex/cm/pages/ServeBLOB.php/L/IT/IDPagina/3277

other 473 parasitoids. In 2014, the parasitization exceeded the 80%.

The life inside the Association is based on some periodical meetings, in which the news is diffused, the ideas are discussed and the events and actions programmed. Alongside this, there is the external network, as the initiative “Città del Castagno”, which links the most important cities in Italy where chestnuts are cultivated, and Castanea, the European network.
Regarding the financing, the Association is first of all maintained by the work of the volunteers that give their time for free, all year long. Thanks to their contribution during the chestnuts Festival, local products and handcrafts are sold, and the revenues are used to maintain the activities of the Association.
Obviously chestnuts farmers support their own work by commercialising fresh chestnuts.
According to Stefano Viesi (the vice-president), at the beginning the Association was co-financed by territorial bodies and in particular by the the autonomous province of Trento, the Municipality, the Valley Community[111], and the APT (Association for the Promotion of the Tourism). Together all these initiatives were able to provide 50% of the necessary funds. Now this contribute is less consistent, not because the territorial bodies don’t trust anymore in the Association, but because there are lesser funds. Viesi says that they never asked for European Union funds, neither funds from Rural Development Programme. However, more or less all the chestnuts farmers, privately and autonomously (so not in the name of the Association) apply for RDP funds and Provincial funds, and received them, for restoring the orchards, for cleaning and pruning.
Other channels of finance are private sponsors, mainly small and medium enterprises of the area, and “casse rurali”(local banks) which give some amounts and sponsor the Association, and receive back an advertisement on the bulletin “…nel castagneto”. This sponsorship, according to Viesi, as well as the economic help coming from the Province, in time of economic crisis, is less and less consistent.
The sale of some processed products, as the chestnuts cream and *Marroncino di Castione*, via different channels, contributes to bring other revenues.
According to Viesi, today the Association is maintained with the financing illustrated in Figure 3.31. In Figure 3.36 is represented the sharing of the expenses.

[111] The territorial body which, in Trentino, is in between the municipality and the province.

Figure 3.31 Financing of the Association

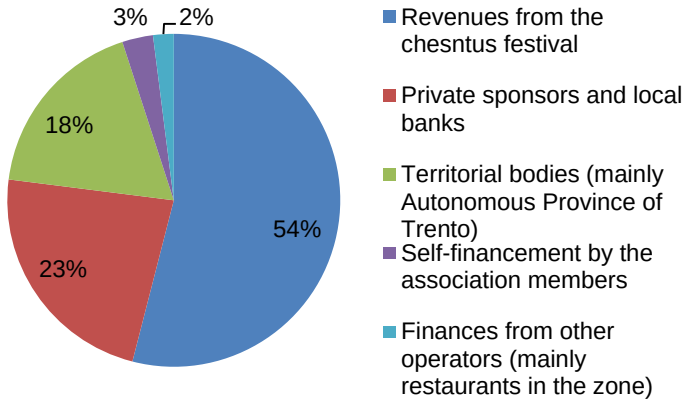
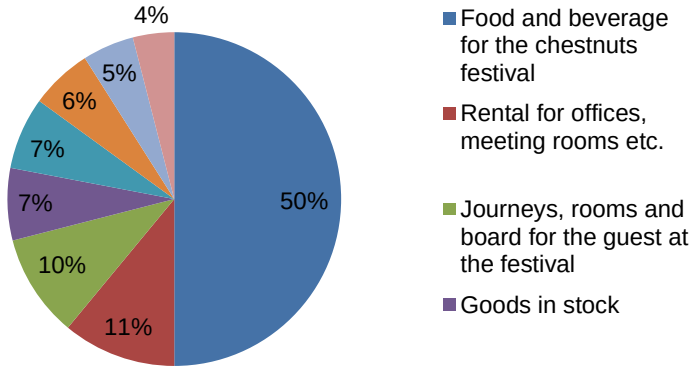


Figure 3.32 Expenses of the Association



Among all the initiatives carried out by the Association, the president named some of particular importance: the gastronomic competition “Wine and chestnut: the excellent combination", the “National Festival of Arts Graphic Humour – The smile of chestnut", and the product Marroncino di Castione.

The gastronomic competition: "Wine and chestnut: the excellent combination".

The eno-gastronomic competition: "Wine and chestnut: the excellent combination" is a competition in which an important chef of Trentino yearly defines a complete menu based on chestnuts (first course, second course and dessert). Once the menu is defined, it is divulgated to all those wineries which are willing to participate (paying a 50 euros fee for the enrolment). The winery decides, among its wines, which is the best one to be consumed with the courses. In the recent years also grappa has been included in the competition. A committee composed by experts is gathered to taste food and wines and to decide the excellent combination. The winner is proclaimed and he wins a plaque and the acknowledgment advertised on the bulletin of the Association, on the blog of the president of the committee, and on local newspaper.

The initiative gathers the most important wineries of the Province. Last year 51 wines competed in. Wineries think that taking part to this competition, which reaches its *clou* during the Festival,

among thousands of persons, could be a good way to advertise their products. This way the Association created an initiative which conjugates chestnuts and the excellence of the wine sector in Trentino. Two complementary sectors, food and wine, co-brands their products in a geographic specific horizontal alliance.

"National Festival of Arts Graphic Humour – The smile of chestnut" [112]

Thanks to the encounter between Pierpaolo Perazzolli, an Italian cartoonist, and Fulvio Viesi in 2011, it was born the "National Festival of Arts Graphic Humour - The smile of chestnuts" which is held in Castione during the annual chestnuts Festival. It is a competition "by calling", in the sense that some of the most important Italian cartoonist are invited by Pierpaolo Perazzolli to compete.

The initiative aims at creating an annual event for conjugating the territory, the feast and the art. Perazzolli drawn a logo, which join the fruit and the art of the cartoonist, represented by the pencils over the head of the chestnut (Figure 3.33)

Figure 3.33 Logo of the initiative

At the second edition, more than 150 professional and amateur cartoonists were invited to participate with their works, developing the theme: "Rediscovery the agriculture", with particular focus to the world of chestnut and viticulture. A qualified and independent jury selected the best work which was awarded with the prize "Gold Talent: the smile of chestnuts". The selected works are exhibited during the chestnut festival and published in a book. Some representatives of the cartoonists, during the Festival, also meet the public and draw. This is important not only because some persons can receive an interesting cartoon, but also because "*these artists, after having found a good atmosphere, come back home, they go to other initiatives and performances, and they talk about the Castione's one. It is a way to advertise the reality beyond the Province limits*".

"**Marroncino di Castione**"[113]

The Association has invented a chestnuts liquor, "Marroncino di Castione", a fine creamy drink based on puréed chestnuts and the local grappa Marzemino (Figure 3.34). It is produced by the Distillery Amedeo Tranquillini, in Arco (TN). Marroncino di Castione is today part of the national basket of chestnuts products that bears the logo "Chestnuts Italy ".

[112] http://www.lacastagnadelsorriso.info/
[113] http://www.distilleriatranquillini.com

Figure 3.34 Marroncino di Castione

The idea of the product was generated inside the Association, because it wanted to have some chestnuts products to be consumed all year around, not only during the autumn.There are other liquors with chestnuts on the market, but mainly made with flavors. This, on the contrary, is made with chestnuts puree, and it is totally made in Trentino. From this point of view it is an innovative product. The Association produces the chestnuts puree, by boiling, pealing and smashing the fruits. Then the puree is delivered to the distillery Tranquillini.

Tranquillini adds Marzemino grappa (which was chosen by the Association), a bit of water to decrease the level of alcohol and a puree of sugar. Marroncino is sold in bottle of 0,20 and 0,50 l and it is a registered mark.

The distillery receives the reimbursement for this expense, the grappa, the excise tax and the labour cost by the Association. It does not receive any other money. It is its "*way to contribute to the A*ssociation".*Marroncino* is then sold mainly by the Association to privates and small retailers, during the chestnuts Festival, but also in the restaurants of the zone.

3.2.2.2.3 Summary of supply chains in the region and provision of sustainability aspects

According to the survey, in the Region there are different markets and different supply chains for chestnuts. A distinction can be done with respect to the origin of the chestnuts, local or not local.

i. **Local chestnuts:**
    a. **Trade of the product**. Chestnuts, and in most of the cases marroni, are locally produced in the several areas of the region. Local chestnuts producers are for the great majority small farmers, and the production is considered a secondary activity that complements their income, a tradition and a true passion. Most of the chestnuts producers are member of the 12 associations that are located in the chestnuts production areas of the region, and/or of the chestnuts producers' cooperative. The chestnuts producers associations count about 1,000 members, which represent an indicator of the interest that is growing in the region for this traditional, rediscovered, activity. There are also some relatively bigger producers who are not associated. The very large part of the local chestnuts production (94%) is sold as raw. 96.6% of the local production is sold within the regional boundaries.

    The supply chains are for the vast majority Short Food Supply Chains. Some differences are detectable between the two provinces, Trentino and South Tyrol.

In South Tyrol a great part of the raw production is sold by producers directly to the end consumers (48%), through face-to face SFSC. This happens or directly at the farm, both to people that go there for buying, at farmer market, or to hosts that overnight in the farms.
In Trentino, the production is mainly sold by producers to the chestnuts associations and cooperative (66%) to which the producers take part, which in turn sold the overall production to end consumer during chestnuts festival, and to processors for producing products with the association/cooperative label.
In the region there is a strong prevalence of horizontal integrations among actors and tendency at sharing knowledge and experiences through this form of association. The associations promote the chestnuts cultivation, teach how to manage chestnuts orchards, give standard for the conservation, define prices. They allow aggregation of the supply and also a common and shared marketing.
A part of the chestnuts is sold through spatial proximate SFSC. This happens when producers sell the chestnuts to retailers, who in tun sell them to the customers. Chestnuts are retailed in the area of production, or in the surrounding, and customers, when purchasing, are aware of the “local”nature of the product. According to the retailers, they and their customers strongly appreciate local chestnuts. The intervieweed retailers were always able to specify the village and/or the chestnut association where the products come from.
Chestnuts are also sold at a bigger distance. For example, the chestnuts of the Association Tutela dei Marroni di Castione and of the Chestnuts cooperative are sold in other areas, such as in Veneto region. Being the chesntuts labelled with the Association logo, and being therefore the consumer made aware about the place of production, this type of supply chain can be defined “spatially extended SFSC”, that is where consumer and producers are put in connection even if consumer do not have personal experience of that area.
The presence of SFSC for the regional producers provides sustainability aspects from the economic point of view. SFSC allow small producers, which are less competitive than bigger ones (especially those located in other Italian regions), to have a better access to the market. In the regional context, SFSC are developed as collective economic initiatives between producers, strengthing links among local supply chains’ actors and mobilizing resource in a synergetic way. Through these channels producers are able to receive fair prices.
The social sustainability is connected to the fact that the meanings attributed to a product, in a certain territory, develops a sense of pride and belonging. For chestnuts producers growing and pruning their orchard is a passion, an important tradition, and a way to preserve their territory. The sale of chestnuts through SFSC favours interactions between community members, thus strengthening their social capital in terms of networks, inclusion, knowledge and social cohesion. The social sustainability is also linked to the capacity of SFSC to contribute to the fairness among supply chains actors. The local supply of chesntuts, even if not so much consistent, is yearly completely out of stock

because it is appreciated by consumers. SFSC make easier to establish fairness because they facilitate consumers to pay for products they know and appreciate, therefore allowing producers to receive a better income.

For what concern environmental aspects, the fact that the chestnuts reach through SFCS the consumers embedded with information means that consumers are likely to be informed about the method of production. For regional consumers, chestnuts are the products deriving from the territories that they are used to see and know. Chestnut production in the region is strongly connected to the attachment to the territory and seasonal processes. Thanks to this attachment and the social cohesion of the producers, but also thanks to the collaboration with the research centres of the region and to some policy measures, in the region the fight against chestnuts gall wasp is having extremely positive results, letting the producers overcoming an important phytosanitary problem.

Chestnuts production in the region, but especially in Trentino is based on local varieties, which are well adapted to local environment. The commercialization, by favouring the production, helps to sustain the knowledge about local varieties and traditional territorial management.

b. **Complementary products and services**. Chestnuts are also sold as complementary products and services. In the fall period, which culminate with the chesntuts festivals and *Törggelen*, in specific territories an array of products and services are jointly offered to the consumers. The chestnuts become the imago product of a territory that is promoted through a geographic specific horizontal alliance among different stakeholders. These initiative (festivals, roads of flavours and of typical products, *Törggelen*) connect several actors, among which the chestnuts associations and representatives of the touristic sector, providing the costumers a better experience of the Autum season. Togheter with the raw or roasted chesntuts, during these periods are offered other specialties of the territory, such as wine; the restaurants and hotels in the zone offer menus based on chestnuts; visits to the orchards, trails, tasting experiences, but also experiences such as the festival of arts and graphic humor (in Castione) are organised. The sale of complementary products and services is able to sustain the local economy in a traditionally “low” season. The revenues deriving from these events allows the associations to self sustain and also to buy machineries, renting warehoused etc. in order to enhance the quality of the chestnuts.

c. **Regulatory price signals.** The chestnut sector in the region is also helped by the financial incentives given by both the EU and the provinces. This mechanism is typically ascribable to the “regulatory price signals” market based mechanism.

According to our survey, 71% of the interviewed received funds and all of them stated that these favoured their works. For most of them “*it is not a sum that can change the life, but a contribution for better working*”, anyway underlining that these kind of MBI has the potential to be effective in revitalising the sector.

ii. **Non local chestnuts**.The other supply chain involves big chestnuts producers and wholesalers out of the Region, which supply with raw chestnuts the regional wholesalers

and retailers. Chestnuts mainly come from Cuneo (Piemonte) Tuscany (Monte Amiata) and Avellino (Campania), which are recognised as being the most important productive regions. This confirms that the national production is still competitive against other countries where the manufacturing cost is cheaper. Great quantities of Italian chestnuts reach the region.

Regional wholesalers and retailers for the great majority also sell a minimum quantity of local chestnuts, which is often stated to be not sufficient and discontinuous to cover the demand of end consumers. For this reason, and because of more ecpensive prices, which are given by a number of factors (lack of economies of scales, lack of infrastructures and of mechanization means etc.), wholesalers and retailers cannot rely only on local production. However, many stated that they diversify their purchases by buying a part of the local chestnuts, which are appreciated, and then the other Italian chestnuts. Therefore, development margins for the local production are possible.

3.3 Tradable permits applied to climate regulation-carbon sequestration function of forests

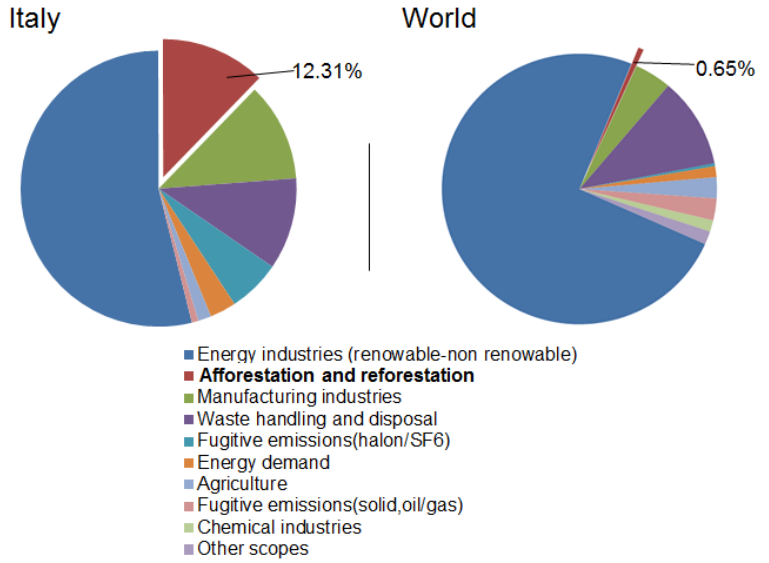
3.3.1 Italian compliance forest carbon market: afforestation and afforestation projects under Kyoto Protocol's Clean Development Mechanism

3.3.1.1 Projects and volumes

Italy participates in 16 A/R CDM projects, about one third of all the A/R CDM projects carried out globally. Projects are developed, in variable partnerships, with other countries: Canada, France, Ireland, Luxembourg, Japan, Netherlands, Norway, Spain, Switzerland and United Kingdom. In Annex VI, the Italian participated projects are briefly described.

Afforestation and reforestation projects play a prominent role in the Italian CDM portfolio, being the sector with the second highest number of projects after energy industries. The share of A/R projects on the total number of Italian CDM projects is relatively high (12.5%) when compared with the global scenario (Figure 3.35).

Figure 3.35 Proportion (%) at the Italian and global level of registered CDM projects, by scope.



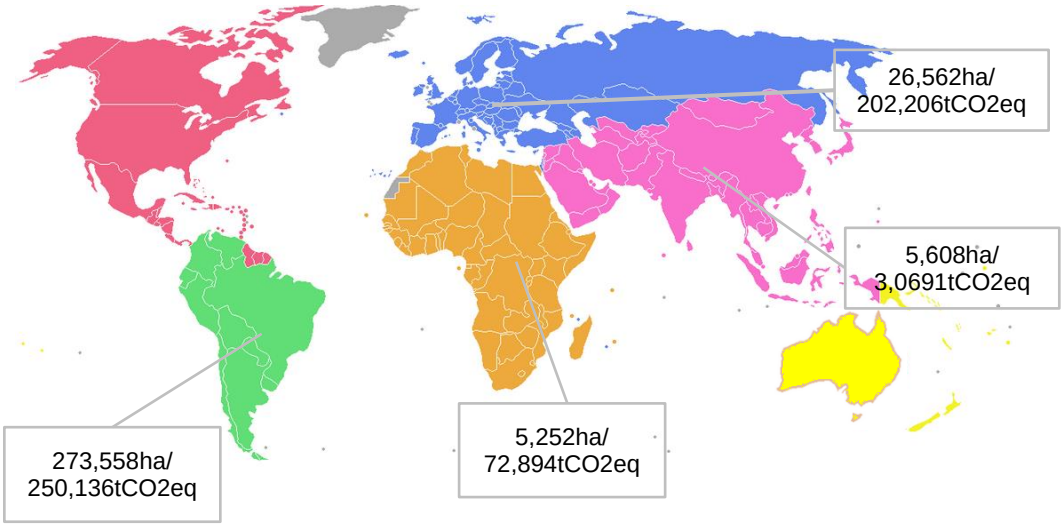
The projects with Italian participation are located in 10 countries[114]. The first Italian participation began in late 2006 with the project "Facilitating Reforestation for Guangxi Watershed Management in Pearl River Basin" in China, the first registered A/R CDM project in the world. In 2011 a large number of projects were registered by Italy (nine in total), which is in line with the international trend (18 news projects globally) (UNFCCC, 2011a), as many projects were pursuing registration ahead of the end of the KP's first commitment period (Peters-Stanley et al., 2012) (Figure 3.36).

According to the PDDs, the total planted surface is 64,777 ha, which is more than the total of newly planted forests in Italy under the EU Rural Development Programme for the period 2007-2013, 30,000 ha up to 2011 (Cesaro et al., 2013), which is the most recent data available.

More than 70% of the total surface was included in 3 projects, located in Brazil and in the

[114] Albania, Brazil (2 projects), China, Costa Rica, Ethiopia, India, Kenya (2 projects), Moldova, Nicaragua, Uganda (5 projects).

Figure 3.36 Hectares impacted and transacted volume by continents (all years)



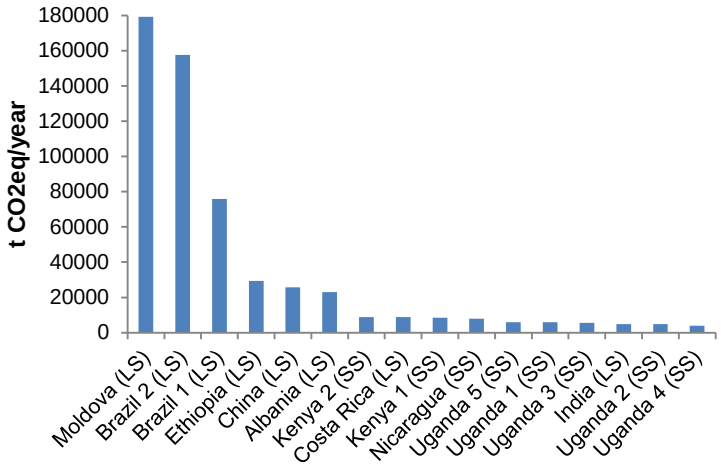
From an assessment of eleven monitoring reports[115], a general decrease in the planted areas in relation to the planned ones was found. In particular, the monitoring report of the project "AES Tietê Afforestation/Reforestation Project in the State of São Paulo", in Brazil, highlights a significant planted area reduction, equivalent to more than 85% of the planned surface. Most of the area was still not planted at the MR's editing time, but the auditor considered this a minor restriction, and he did not ask for corrective actions. Excluding this Brazilian case, the others projects show an average reduction in surface area of 11.6%. The MRs also show that in many projects other parameters have been changed from the PDDs redaction, such as changes in species composition, stocking density, timing and selection of silvicultural operations, project boundaries, parameters, equations, or methods used in tree biomass estimation etc. This reveals a degree of variability in the A/R CDM projects. World Bank (2011) states that because of their dynamic nature, in general A/R projects are likely to deviate from the PDD at implementation. This can happen in projects that involve several farmers who may neglect the agreed land-use contract in favour of other alternatives. Other causes can also lead to deviation from the PDD and to the difficulty of implementing the MR, such as the lack of capacity of local stakeholders for dealing with forest inventories and forest emission estimations (World Bank, 2011).

As stated in the PDDs, the total estimated emission reductions per year is about 556,000 tCO_2 eq, distributed as shown in Figure 3.36 per continent and Figure 3.37 per country. According to the PDDs, only 3 projects reach an annual fixation total higher than 60,000 t CO_2 eq, and 10 projects stock less than 10,000 tCO_2/year. This is also due to the project methodologies adopted. Half of the projects with Italian participation adopted a small scale methodology, and the other half a large scale methodology. Small-scale A/R methodologies provide simplified approaches for project design and monitoring. Small-scale A/R project activities must fulfil two conditions: net anthropogenic removals must be less than 16 k tons

[115] The only available until now.

of CO_2eq per year; and the project activities must be developed or implemented by low-income communities and individuals, as determined by the host Party (UNFCCC, 2005c). Figure 3.37 shows that projects that reach an annual fixation lower than 9 k tCO_2eq are those which adopted a small scale methodology (with the exception of the Costa Rican and Indian projects). Regardless, these projects did not take advantage of the full potential allowed by the methodology requirements, remaining well below the threshold of 16 k tCO_2eq per year.

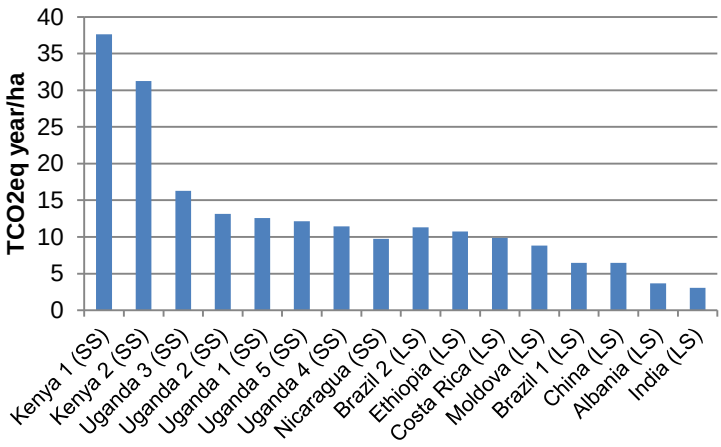
Figure 3.37 Emission reductions per year in the Italian participated CDM registered forest projects, according to the statements in the PDD



Note: LS= Large Scale ; SS=Small Scale

The amount of sequestration per hectare per year ranged widely across the projects, from 3 to 37 tCO_2eq/ha/year. The Kenyan projects achieved the highest sequestration per hectare, while the Indian project had the lowest (Figure 3.38). This wide range has been observed also across all BioCF A/R projects, and according to the World Bank (2011) it mainly depends on the design and objectives of the project, the species used, and the productivity of the site.

Figure 3.38 Emission reductions per hectare per year in the Italian participated CDM registered forest projects, according to the statements in the PDDs



Note: LS= Large Scale ; SS=Small Scale

For all of the projects analysed, the participants decided to use temporary CERs (tCERs)

instead of long term CERs (lCERs). tCER is a certified emission reduction that expires at the end of the commitment period following the one during which it was issued; lCER is a CER that expires at the end of the crediting period for which it was issued (UNFCCC, 2005a).The decision of using tCER is in line with the international trend, which attests that the use of tCERs is largely preferred, because it is considered a more flexible commodity. From the buyer's perspective, the shorter lifespan of tCERs seems to be more compatible with the carbon market and land-use-change dynamics, and with the project risks: since determining prices for lCERs requires long-term information that is not always easily available (World Bank, 2011).

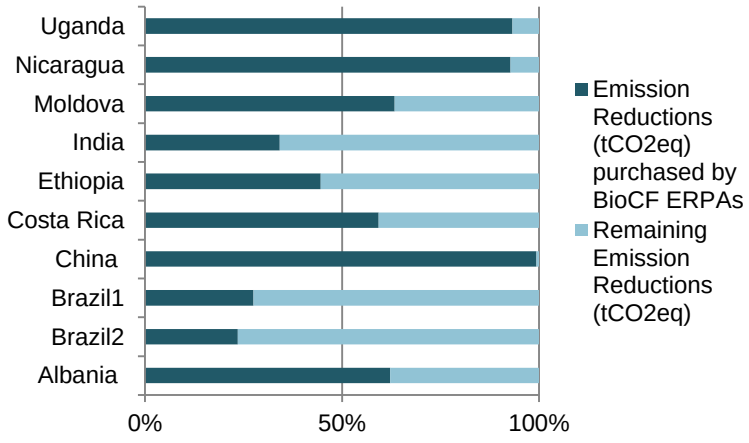
3.3.1.2 The financing

Regarding the financing and the benefit sharing, the UNFCCC database shows that all the A/R CDM projects with Italian participation are funded by the BioCF, with the International Bank for Reconstruction and Development, acting as the managing company, as a Trustee of the BioCF. One project (Moldova Soil Conservation Project) is also financed by another Fund, the Prototype Carbon Fund.

The Ministry for the Environment, Land, and Sea, on behalf of the Government of Italy, is the only authorised Italian participant in the BioCF. Thus in the BioCF there are no other Italian public or private entities involved.

The BioCF, through the Emission Reductions Purchase Agreements (ERPAs), purchases only a part of the carbon credits generated by the projects (The World Bank Group, 2015). The amount purchased is illustrated in Figure 3.39, according to data of the BioCF database (The World Bank Group, 2015). The remaining part of the emission reductions generated by the projects is sold by the other entities involved, according to the contractual agreement. For instance, in the Ethiopian project it is the local community that sells the remaining emission reductions not purchased by the BioCF (World Bank's Africa Region Sustainable Development Department, 2011). However, this kind of information was available for only a few of the projects assessed.

Figure 3.39 Proportion (%) of emission reduction purchased by BioCF, through the Emission Reductions Purchase Agreements (ERPAs), per project



Note: 4 Ugandan projects are considered by the BioCF database as a unique project. The database does not provide data about one of the Ugandan projects and the two Kenian projects.

Regarding the management and the project participation, 69% of the projects with Italian

participation are government and non-profit-led; while the remainder are private sector-led projects (see Annex VI). According to the World Bank (2011), A/R CDM projects that have governmental agencies as leader have, in most cases, performed relatively less well than private sector-led projects, with the exception of the countries with centralized governance. In cases where the project developer is not the government, the World Bank states that success primarily depends on building a constructive collaboration with governmental entities. Private-public partnerships with clear responsibilities for each partner were stated as being the most effective arrangement.

According to a 2009 report of the Italian Supreme Audit Institution (Corte dei Conti. 2009), Italy invested $2.5 million in the BioCF (the minimum possible for entering the BioCF). There are no recent public data that report whether this financing has increased over time, so it has to be assumed that the Italian investment amount remains at the minimum of $2.5 million. The same document report that the participation of Italy in the three WB Funds that finance CDM projects in which Italy is involved (Community Development Carbon Fund, Italian Carbon Fund and BioCarbon Fund) for the period 2008-2012, allowed Italy to receive back 4.5 Mt CO_2 eq/year. However, there is neither specification regarding the share of reduction attributable to each fund, nor to the distribution of tCERs between the parties involved. Consequently, is not possible to determine the exact amount of tCERs that Italy receives from the A/R CDM projects.

Ignoring the exact amount of Italian-pertinent emission reductions, and even accounting for the whole amount of estimated emission reductions produced by the A/R projects; this amount does not have a high impact when compared to the whole Italian CDM sector. In total, the Italian participation in CDM projects in all the sectors achieved a reduction of 55.6 $MtCO_2$ eq per year, of which the A/R projects accounted for a very small part, less than 1%.

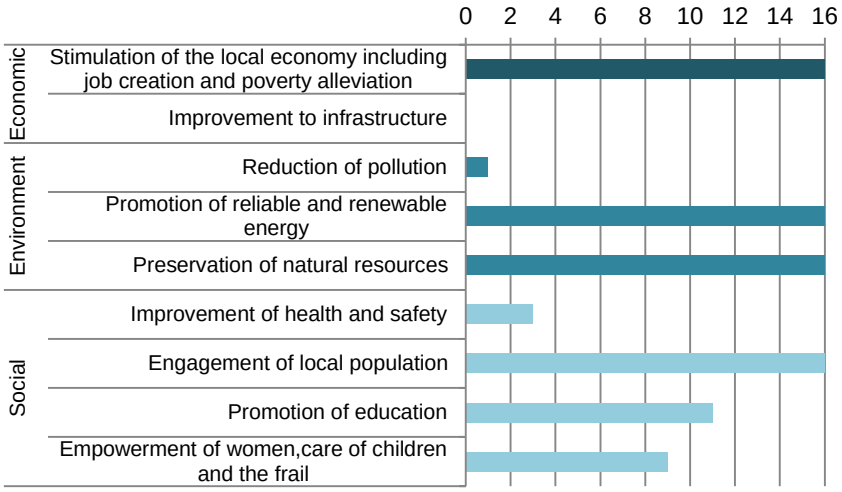
3.3.1.3 Contribution to sustainable development and co-benefits

Regarding the analysis of statements related to sustainable development, Figure 3.40 shows the number of projects that mentioned economic, social, and environmental indicators. All of the projects analysed claimed as co-benefit the “stimulation to the local economy, including job creation and poverty alleviation”, and the “engagement of local population”. This is in line with the international A/R CDM sector, in which these are the most cited benefits (UNFCCC, 2012b).

In addition, all of the Italian projects claimed the “preservation of natural resources”, and the “promotion of reliable and renewable energy”. Neverthless, it is important to consider some specifications. According to the PDDs, the “preservation of natural resources” is obtained through the shift from pressure over natural forest resources towards the newly planted forest. The A/R actvity itself is seen as an action of preserving natural forests. Only a few projects also reported other environmental benefits, such as restoration of protected areas. The “promotion of reliable and renewable energy” is typically attributed to increased production of fuelwood and firewood from new planted forests (e.g “the project would start producing several benefits such as small timber and firewood”). No sources of renewable energy other than products from the new forests were claimed.

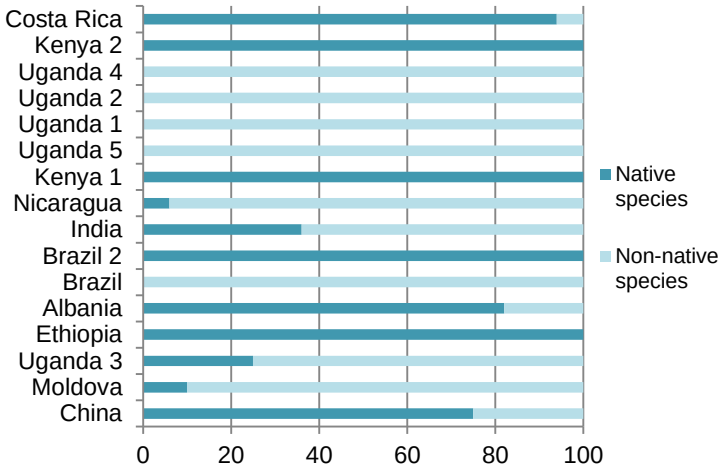
We further investigated the environmental co-benefits by looking at the use of native and non-native species. Each project, depending to its objectives, utilized different tree species in varying proportions. In the PDDs the species are listed and the project developers report if they are native or non-native to the host country.

Figure 3.40 Number of Italian participated CDM registered forest projects with sustainable development claims in PDDs, by indicator



According to the PDDs, about 55% of new forests were planted with non-native species[116]. Five projects use exclusively non-native trees (Figure 3.41).

Figure 3.41 Proportion (%) of native and non-native species used in the registered Italian participated CDM forest projects



Some of the PDDs report that the non-native species used are naturalized or widely adapted in the country, such as in Moldova: "*The long-term experience of forest management in Moldova has shown that Robinia is widely adapted to poor sites, on which other species cannot be established through cost effective means";* or in Ethiopia: "*The naturalized species such as Grevillea robusta and Eucalyptus globulus are also considered for planting* […]". However, there is no common definition among CDM projects of what "naturalized" means for project developer. If the definition of Richardson et al. (2000) is used: "Alien plants that reproduce consistently (cf. casual alien plants) and sustain populations over many life cycles without direct intervention by humans (or in spite of human intervention); they often recruit offspring freely, usually close to adult plants, and do not necessarily invade natural, semi natural or human-made ecosystems", this can be have either positive or negative effects on the local ecosystems, and therefore it should be further specified by CDM project developers.

[116] The non-native species mainly used are *Eucaliptus spp., Pinus nigra, Pinus caribaea var. hondurensis, Robinia pseudoacacia, Gleditschia triachantos, Sophora japonica,* and *Elaeagnus angustifolia*.

Project developers justified the use of non-native species using several arguments (refer to Annex VI) , with the primary justification being the fast growing characteristics of the selected non-native species, which results in high productivity and fast generation of CERs. Also relevant for their selection were other beneficial market characteristics, the preferences of the local communities, as well as the mitigation of risks[117].

The World Bank (2011) observed that worldwide a consistent part of the total CDM A/R surface is planted with non-native species and stated that a reason may also be the lack of suitable data on native species, especially with regard to biomass expansion factors. This may force some projects to reduce the portio of the project area that is planted with native species.

About half of the projects also claimed the creation of employment for women. As increased employment can lead to the enhancement of the position of women in society, it was considered in the indicator "empowerment of women, care of children and the frails". However, the process of empowerment is difficult to measure directly (Oxaal and Baden, 1997; Malhotra et al. 2002). The employment of women can be considered only as a indirect and weak proxy of empowerment; and further data and information should be made available to describe the changes in the level of empowerment to make a more accurate determination.

The "promotion of education's" statements are related to the establishment of training services for people working on the project. These trainings are always only related to the project activities.

Two projects stated that the A/R activities are likely to mitigate the risk of landslides and floods, and therefore were considered relevant to the "improvement of health and safety" condition. One project claimed the benefit of "the restoration of a healthy ecosystem". No project claimed the "improvement of infrastructures" (roads, bridges, etc.) benefit. Only one project specifically stated the benefit of "reduction of pollution" in water bodies.

It has to be mentioned that none of the projects had an official UNFCCC "CDM Sustainable Development co-benefits description report". This report is voluntarily prepared by CDM project participants and managing entities to describe co-benefits in a consistent and structured way, using the sustainable development co-Benefits tool (UNFCCC, 2015). The statements for technology transfer show that about 80% of the projects declared that they transferred knowledge through trainings, while about 20% did not claim any transfer, or claimed that technology transfer was not applicable. This is in line with the general assumption that planted forests projects are normally connected to the use of consolidated technologies (Jindal et al., 2008) and have limited potential in the transfer of truly innovative products or processes, particularly when based on small scale investments (Seres et al., 2009).

[117] To illustrate, the following statements are examples taken from the PDDs; India project: "During the PRA process, the scoring assessment on tree species also indicated that local farmers/communities prefer tree species that grow fast and have good market, such as *Eucalyptus* spp, *Casuarina* […]"; China project: "*Eucalyptus was chosen for the project area at the request of local communities who prefer it due to the fact that it can generate a significant amount of CERs in the early stage of the crediting period, compared to other species that grow relatively slow in the first several years"*; Brazil1 project: "*The choice of species is aimed at achieving the highest productivity of sustainable biomass in order to accomplish self-sufficiency of charcoal consumption[…]demanding the smaller land possible. Therefore, mainly Eucalyptus urograndis hybrid cloned sprouts are used […]*". Uganda project: "*In general, experiences with forest plantations based on native tree species are very limited in Uganda and the East African region […]. Further increasing the proportion of native tree species would increase the project risk due to the uncertainty with regards to growth performance and pests.* […]".

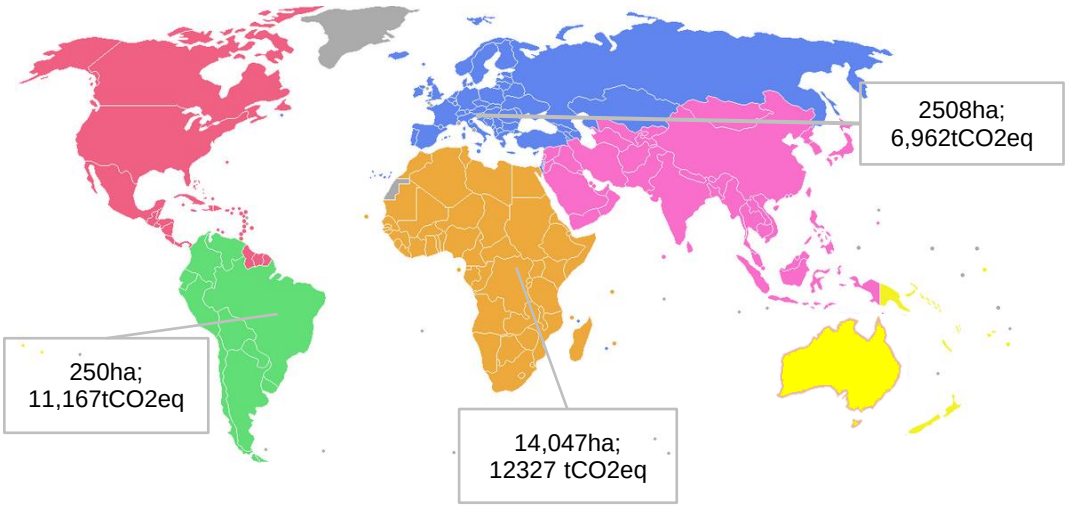
3.3.2 Italian voluntary forest carbon market

The following paragraphs show the results of the survey conducted in 2015 within the project Nucleo del monitoraggio del carbonio. The participants responded with reference to the activities conducted in the year 2014. The study presents both the projects from which are derived the credits generated in 2014, and the analysis of the transactions made by the actors involved, with different roles, in the Italian forest carbon market.

3.3.2.1 Projects, actors, volume and value

The projects reported for the year 2014 are 12 and the total area affected by the projects with Italian participation consists of 16,806 ha, located mostly in Africa (14,047 ha was distributed between Senegal, Uganda and Tanzania), followed by those sited in Europe (represented only by Italy with 2,508 ha), and South America (250 ha in Brazil)[118](Figure 3.42).

Figure 3.42 Hectares impacted and transacted volume by continent in 2014



The total volume of tCO2e generated by the projects and then transacted amounted to 29,876 tCO2e. Differently from what happens in CDM, project developers can invest not only in developing but also in developed countries. In particular, participants to the survey show to prefer to locate projects within the nation: in Italy is recorded the highest number of projects, 9. However, they are small, 313 ha on average (with a very high variability, the smaller spans 0,5ha, the biggest 1734ha), for a transacted volume of 6,962 tCO2eq. Number of projects, surfaces and volumes transacted according to the continents are presented in Figure 3.43.
Regarding project type, the most frequent between projects with Italian participation is afforestation/ reforestation, which has affected the wider area and reached the second position in terms of volume transacted. However, the only REDD + project for which information has been received generated a high amount of tons (three-quarters of the total volume of the year 2014). Among the project types, in 2014, a “new” typology was introduced, the blue carbon[119]. The projects developed under the blue carbon type at the

[118] Brazil and Tanzania are part of a unique project "Getting Reddy".

[119] Over half (55%) of the biological carbon captured in the world, is captured by marine living organisms. Blue carbon is defined as the carbon stored, sequestered or released from coastal ecosystems of tidal marshes, mangroves and seagrass meadow (Nellemann et al., 2009). By preserving these ecosystems is possible to avoid the release of carbon/ to enhance the sinks.

time of the survey did not yet transacted offsets; however, they were in the pipeline and we found worthy to mention them in terms of number of projects and surface (but not yet in volume). Figure 3.44 shows the volume transacted, the surface and the number of projects in relation to the project types.

Figure 3.43 Number of projects, surfaces and volumes according to the continent where the projects are located

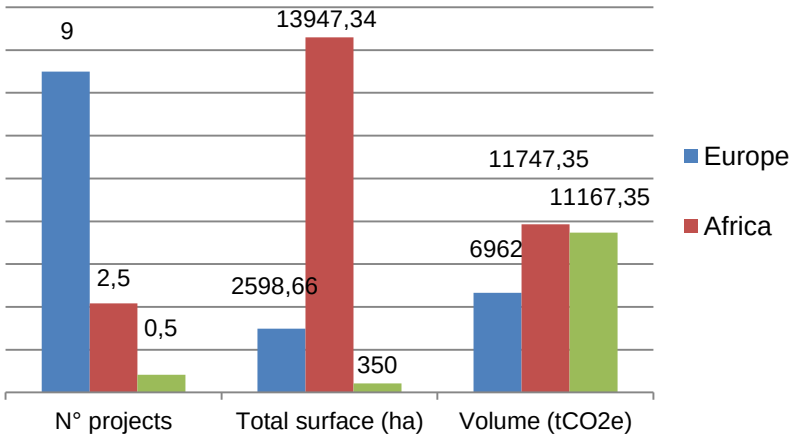
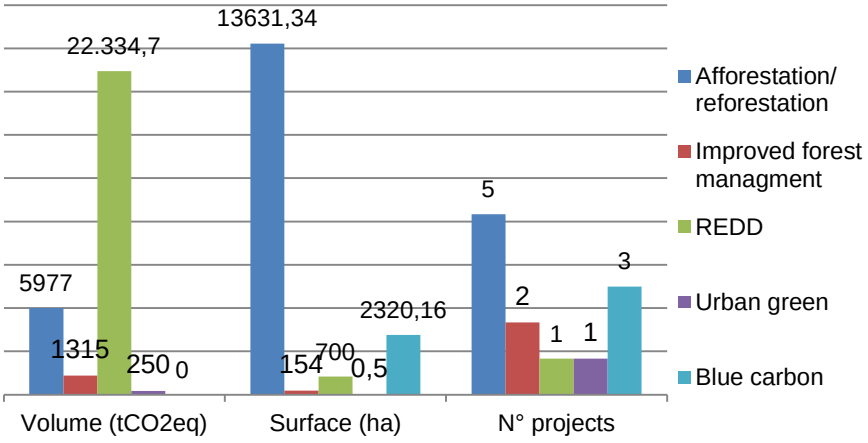


Figure 3.44 Volume transacted, the surface and the number of projects in relation to the project types



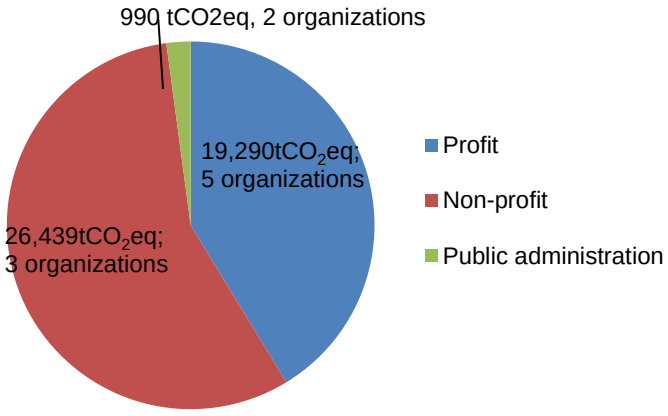
The Italian participated projects in general transact very small quantities of carbon. The majority of the projects are micro projects (less than 5.000 tCO2eq/year), and only two stock more than 100.000 tCO2eq/year (Table 3.15).

Table 3.15 N° of projects and surfaces according to dimensional classes

Dimensions (tCO_2eq/year)	N° projects	Surface (ha)
Micro (< 5000)	6	188
Small (5,000 – 19,999)	2	1,756
Medium (20,000 – 99,999)	2	12,886
Large (100,000 – 499,999)	2	1,975
Total	12	16,806

Ten organizations filled the questionnaire and half of them are the developer of the aforementioned 12 projects. The other organizations are consultants for companies, such as certification bodies, as a broker or as mediators of the local market.
Regarding the status of the organizations (profit, non-profit, public administration), the non-profit holds the record in terms of transaction volume exchanged with 26,439tCO_2eq (Figure 3.45), while the profit sector stands for the number of organizations involved (5 organizations). In total, the volume of credits transacted by Italian organizations during 2014 amounted to 46,720 tCO_2eq.
It is interesting to note that the credits transacted have in most of the cases followed a short supply chain, from the project developers to the buyer. The great part of the credits (92%) have been indeed retired: this means that the credits sold or purchased have been effectively used by those that want to make an offset, and the credits cannot be re-sold to anyone else. This indicated that the transactions are effectively linked to offsets, excluding that credits transacted are instead linked to further investments or speculations.
Another good indicator of the market is that some of the organizations[120] declared that in the next period they will continue to be actors in the voluntary carbon market. Asked about the volume of carbon credits that organizations plan to produce over the next five years (1 January 2015 - 1st January 2020), they answered about an estimate total of 90,500 tCO_2eq.
The prices recorded in the survey in 2014 range from a minimum of 2.6 to a maximum of € 67 per tCO_2eq, with a weighted average (by removing the extremes) of about € 12 / tCO_2eq.
The total value of the voluntary forest carbon market with Italian participation in 2014 amounted to 560.643€. By asking Ecosystem Marketplace to provide us the extrapolation of the values of the European Union market, we can assess that the Italian market is small, being only 2% of the European Union one.

Figure 3.45 Volume transacted and number of organizations involved, according to organization's status

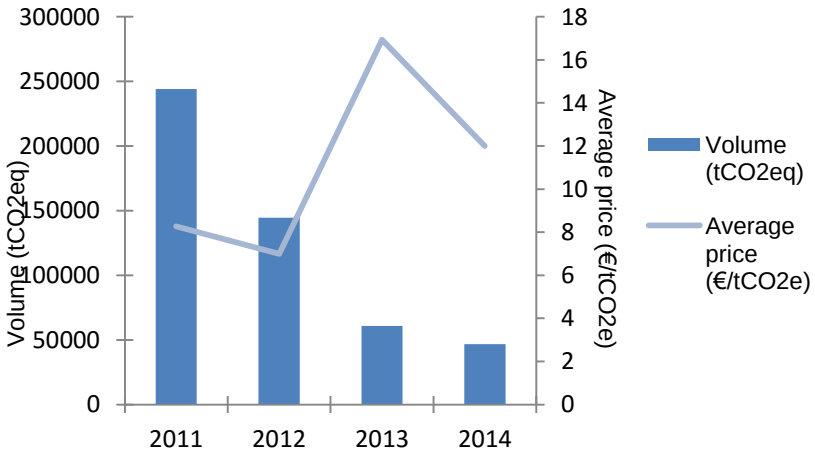


Considering all the survey period (2011-2014), 57 projects have been monitored through years. From the beginning, there has been a negative trend in terms of number of organizations involved and the number of projects monitored. This decrease is partly due to the lack of response, in the more recent years, by some of market players but also the end of initiatives such as the Zero Emissions project of the autonomous province of Trento. Jointly, the volume of carbon credits transacted steadily declined: in 2011, the Italian voluntary forest

[120] Only three answered to the question and they responded in the affirmative.

carbon market recorded 240,000 tCO_2eq transacted, while today amounts to 46,720 tCO_2eq. A reverse trend was observed for the average price: while in 2011 the average price was € 8 / tCO_2eq, today the price is about 12 €/ tCO_2eq (Figure 3.46). The total market value in 2014 is € 560,643, about a quarter of the figure recorded in 2011, which amounted to 2.02 M €. However, there are some new promising projects in the pipeline that will start to transact form the next year.

Figure 3.46 Volume and average price for the carbon tonne (011-2014)



3.3.2.2 Use of standards and co-benefits

Differently from what happens in the international context, in the Italian market the use of third party standards is very limited. Only two organizations declared of having used third party certification for forest carbon, and in particular the Verified Carbon Standard (VCS)[121] and The Gold Standard[122].

However, almost two thirds used second party certifications (Bneutral[123], Carbomark[124], Codice Etico Parchi per Kyoto[125])[126]. One organization is first party certified and one did not use any standard or guideline. If we look at all the years of survey, up to now, the Italian organizations have been used 17 methodologies and standards.

Regarding the standards for the generation of co-benefits, they were used by 2 organizations, which utilised Forest Stewardship Council (FSC)[127], Climate, Community and Biodiversity (CCB)[128] and International Sustainability and Carbon Certification (ISCC)[129].

Beyond the use of standards, some of the project participants declared that the activities in which are involved deliver co-benefits. For the socio-economic benefits, for seven projects it was stated that the local stakeholders were involved in activities at different levels (eg. pre-consultation for the feasibility of the project; implementation of project activities; monitoring of project activities). Only for a project it was stated that there was not direct involvement of

[121] http://www.v-c-s.org/
[122] http://www.goldstandard.org/
[123] http://new.certbios.it/
[124] http://www.carbomark.org/
[125] http://www.parchiperkyoto.it/index.php/chi-siamo/codice-etico/
[126] Two organizations declared to use second party certification but did not report information about it.
[127] https://us.fsc.org/en-us
[128] http://www.climate-standards.org/
[129] http://www.iscc-system.org/en/

communities. In total, thanks to the projects, 128 local people were trained (mainly on issues of forest monitoring and carbon accounting). 7 persons have been fulltime and permanently hired, 25 seasonally hired and 1 part- time.

For the environmental benefits, a project carried out in Italy provides for a mechanism of payment for other ecosystem services, that is the improvement of forests and its usability. Four projects implemented activities of protection of areas with High Conservation Value.

Most of the projects[130], contrarily from what happen in the CDM projects, used exclusively native species. Two projects do not foreseen tree plantations, including the REDD project, and only one declare to use both native and non-native species, with more that 50% native. The total amount of non-native species area is less than 1625 ha, which represent 9.6% of the total. This indicates the attention of the project developers toward ecological sustainibility of the projects.

[130] 8 on 11 (one did not provided information on this).

3.4 Voluntary price signals: NWFP certification

Grounding on the studies of Shanley et al., (2002), Vantomme and Walter (2003), Walter (2006), Shanley et al., (2008), an updated overview of the certification schemes of major interest for NWFP and their scopes is illustrated. Moreover, for each certification scheme is presented an assessment of whether it directly targets NWFP and whether the standards contain ecological specifications for NWFP (such as quantity/period/methodology of harvesting) in order to assess if the application of the standards lead to a sustainable NWFP collection.

Sustainable Forest Management certification

Forest certification is a relatively recent Market Based Instrument that aims at encouraging sustainable forest management (SFM). Forest certification was launched after Rio Earth Summit, mainly to drive the forest manager to achieve a sustainable timber extraction especially in tropical forests and plantations. SFM assesses the impact of forest exploitation through a set of principle, criteria and indicators to proof the sustainable use of the forest. Pierce et al. (2008) argued that, although each certification system applicable to NWFP has created its own standards, forest certification standards are able to give the most comprehensive assessments of forest ecosystems. Forest certification refers to two processes, namely forest management certification (FM) and chain of custody certification (CoC). FM certification is a process which verifies that the area of forest/plantation is being managed according to a standard, while CoC certification tracks forest products from the certified forest to the sale point. Today more than 50 sustainable forest management certification standards exist in the world, with national, regional or global scope. The two largest certification schemes are the Forest Stewardship Council (FSC) and the Programme for the Endorsement of the Forest Certification (PEFC). Both FSC and PEFC have certificates that include NWFP (named Non Timber Forest Products-NTFP) production and chain of custody.

The Forest Stewardship Council was the first global forest certification programme to be established, in 1993. Discussions for incorporating NWFP[131] into the FSC standards began in the mid 1990s. FSC opted for the system in which every FSC endorsed organization, such as certification bodies, could create and implement its own NWFP standard, rather than basing on a unique, central standard (Brown et al., 2000). The result of this process is that each case-specific addendum includes more or less restrictive ecological specifications such as the need to keep track of recruiting rates of reproductive individuals and death rates of the target specie (i.e. Brazil nut in Bolivia) (FSC, 2001), or the maximum harvesting intensity per forest management unit (i.e. set at 35% of the mature Guadua bamboo in Colombia) (FSC, 2006).

Chicle-gum from Mexico was the first FSC certified NWFP in June 1999. From that moment, several NWFP have been certified all around the world, either within FM certification or as CoC, like cork in Portugal, Spain, Oregon and Italy, maple syrup in USA, pine resin in Belarus, essential oils in Nepal, UK and Brazil and mushrooms in Poland (Figure 3.47).

The need to go beyond the case-by case approach pushed NEPCon, a FSC certification body, to develop a NWFP addendum applicable on a global scale (NEPCon, 2014). It suggests that population size of a specie, structure of the population, harvest rates, growth

[131] Defined as "*All products other than timber derived from the Forest Management Unit*" (FSC, 2014).

and regeneration rates have to be recorded and monitored through specific indicators for the different NWFP types like plant exudates, vegetative structures (apical buds, bark, roots, leaves), reproductive structures (fruits, seeds) and for all the other NWFP categories.

Figure 3.47 Examples of Sustainable Forest Management certified NWFP

PEFC certified Mugolio essential oil
Source: Autonomous Province of Bolzano website

FSC certified Gin
Source: (www.nepcon.net)

FSC certified Maple syroup
Source: Maple Ridge Farm

Summary of the Sustainable Forest Management certification (in the FSC example)

- Specificity to NWFP: SFM standards directly targets NWFP category (named NTFP);
- Ecological specifications: included;
- Scale: addenda to standards were developed on a case-by case basis, but recently NEPCon developed an addendum that is globally applicable.

Wild certification

The “wild” message is widely used to commercialize NWFP, and several examples can be found in the market (Figure 3.48).

Figure 3.48 Example of NWFP or products made with NWFP marketed with the wild message

However, not always the promoted message “wild” really reveals a connection to wild origins of the products. To avoid greenwashing, wild certification assures the wild origin of the harvested species.

The most significant example of wild certification for NWFP is the FairWild[132] certification.

Fair wild certification does not only assess the origin of the products, but it aims at assuring that a sustainable wild collection has been performed. In this certification scheme, plants and fungithat grow naturally should be collected in a way that i) *plant populations do not*

[132] http://www.fairwild.org/

decrease, ii) *the species survive in the long-term*, iii) *their surroundings are not damaged*, iv) *no other plants or animals are disturbed* (IMO Istitution of Marketecology, 2010).

Figure 3.49 The Fair Wild label

Source: www.fairwild.net

The FairWild Foundation was born in 2008 and it created a unified standard and certification system that is based both on ecological and social aspects. In particular, the ecological part is based on the International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP). It defines guidelines and provides tools to harvester, producers and other stakeholders for the creation of a sustainable resource management system based on the Good Agricultural and Collection Practices (GACP)[133](FairWild, 2009). Today FairWild is based on the FairWild Standard version 2.0 (Fair Wild Foundation, 2010). The standard includes detailed ecological specifications.

The certification system provides other useful documents, such as guidance manuals and resource assessment documents[134].

Probably because FairWild certification requires the endorsement of species on a case by case basis, at August 2015 few FairWild certified ingredients have been certified, deriving from only 20 species. Only 10 companies applied for the FairWild certification (FairWild Foundation, 2015).

Summary of the wild certification (in the FairWild example)

- Specificity to NWFP: wild certification does not directly target NWFP as a category, rather the sustainable wild collection;
- Ecological specifications: included;
- Scale: requires individual approval of each product.

Organic certification

Organic certification was developed over the concerns that food production and consumption have a significant impact on the environment; organic agriculture was defined "*a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved*"(IFOAM, 2008). An increasing number of consumers, in some countries more than in others have changed their purchasing behaviour, favouring organic products (Thogersen, 2010; Ruiz de Maya et al., 2011).

[133] The development of this standard was supported by the German Federal Agency for Nature Conservation, TRAFFIC, World Wildlife Fund (WWF), and IUCN (International Union for Conservation of Nature).

[134] Often created by the two authorised certification bodies: Institute for Marketecology (IMOswiss AG), Switzerland (http://www.imo.ch) and Austria BioGarantie GmbH & AgroVet GmbH (http://www.abg.at).

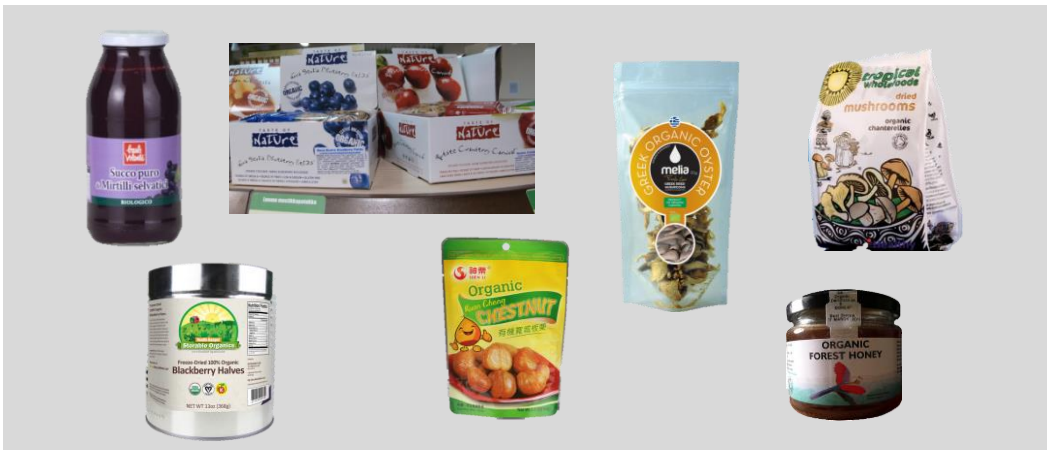
Today there are hundreds of organic third party certifications programmes and standards throughout the world. Some are government regulations, such as United States, Canada, Mexico and Japan, and some others are private organisations, such as farmers' and organic sector associations (e.g. Demeter, Bio Suisse, Soil Association), control bodies (e.g. Ecocert) and other private organisations (Janssen and Hamm, 2012). Organic certification is of major interest for NWFP because most of the standards consider as organic both wild collected and semi-domesticated NWFP, and at the same time, organic certification is well recognized and appreciated by the end-users.

For the International Federation of Organic Agriculture Movements (IFOAM), organically collected plant material should: i) *derive from a stable and sustainable growing environment*; ii) *be harvested in a way not exceeding sustainable yields*; iii) *derive from a clearly defined collecting area; not be exposed to prohibited substances*; iv) *be harvested in an area that should be at an appropriate distance from conventional farming, pollution and contamination*; v) *be harvested by operators, who shall be clearly identified and be familiar with the collecting area* (Walter, 2002). Also the European Union organic framework[135], considers wild plants and their parts as organic. EU organic framework considers wild collection a sufficient action for obtaining the organic certification if: i) *the plants have grown naturally in natural areas, forests and agricultural areas*, ii) *in those areas have not, for a period of at least three years before the collection, received treatment with products other than those authorised for use in organic production* […], and iii) *the collection does not affect the stability of the natural habitat or the maintenance of the species in the collection area*.

Similarly to wild certification, organic certification does not mention the NWFP concept, and does not specifically focus on forest ecosystems, but rather concentrates the attention to the quality of the land in which the product is sourced, like not contaminated areas.

Today, over the 45% of the land certified under organic certification scheme (69.7 Mha in total) are used to produce organic NWFP (Willer et al., 2013). A large and increasing number of NWFP and products containing NWFP have been certified according to organic standards all over the world, including berries and berries juices, as well as mushrooms, medicinal plants and plants used by different industries (examples in Figure 3.50).

Figure 3.50 Organic certified NWFP or products with NWFP ingredients



[135] Defined Council Regulation (EC) No. 834/2007 of 28 June 2007 on organic production and labelling of organic products and repealing Regulation (EEC) No. 2092/91

Summary of the organic certification (most of the standards)

- Specificity to NWFP: organic certification does not directly target NWFP as a category, but rather the wild environment and wild collection, considering it as organic under some specifications;
- Ecological specifications : includes only general ecological specifications (e.g. ”sustainable harvest”)

Environmental performance certification

Environmental friendly behaviour has become increasingly relevant to countries, companies and consumers (Ruiz de Maya et al., 2011). Environmental performance certification rose on the concern about how some products (not NWFP in specific) can be harmful to the environment. Therefore it does not specifically target NWFP, neither specifically target ecological issues, but still it can award NWFP that respect environmental performance criteria.

Since West Germany introduced in 1978 the first environmental label, the Blue Angel, many others, either national or regional, have flourished. “Ecolabels” are a sub-group of environmental labels, they are third party certified and they respond to special criteria of comprehensiveness, independence and reliability (UNOPS, 2009).They help in identifying products and services that have a reduced environmental impact throughout their life cycle, from the extraction to the disposal. An example of a regional ecolabelling scheme, coming from public initiative, is the European Union Ecolabel[136](Figure 3.51). For the NWFP category, EU Ecolabel has been applied on cork and cork products, such as coverings and panels, as well as to the category of soap and shampoos, which can contain extracts and essential oils deriving from NWFP[137].

Figure 3.51 Cork products, awardable with the EU Ecolabel

An ecolabel that targets a specific issue is the carbon labelling, which serves to communicate carbon footprint measurement and reduction of the organisation's products and services. Originally published in 2008 as the world’s first framework methodology for product carbon footprinting, PAS 2050, (now in the version 2050:2011) is a publicly available specification providing a method for assessing the life cycle greenhouse gas emissions of goods and services. Food is included in the list of the products that can be commercialised with carbon

[136] Introduced by Regulation (EC) No 880/92 and amended by Regulation (EC) No 1980/2000 and Regulation (EC) No 66/2010 http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=URISERV:co0012

[137] Among the categories of products and services awardable with the EU Ecolabel food is not included. Avoiding the use of EU Ecolabel for food has been defined as a “victory” of International Federation of Organic Agriculture (IFOAM) because ecolabel for food would have caused consumer confusion and unfair competition for the organic label.

labelling, so any NWFP, edible and non edible,can potentially be awarded by this label.

Summary of Environmental performance certification (in the EU Ecolabel example)

- Specifity to NWFP: EU ecolabel does not directly target NWFP, and it does not use a terminology neither for NWFP nor for wild collection;
- Ecological specifications: not included.

Quality and food safety certification

Quality control and food safety certifications aim at assuring the proper preparation of the products that enter in the market. Products have to be in compliance with legal requirements and meet certain quality parameters defined to ensure higher quality on food product to the consumers with respects to non-certified products. The International Standard Organization (ISO) developed the most important standards in this sector. In particular ISO 9001[138] family addresses various aspects of quality management, and the ISO 22000[139] family addresses food safety management along the entire supply chain. An example of a strong food safety certification programme based on the principle of ISO 9000 standard, as well as on the requirements of the Codex Alimentarius system, is the BRC Global Standards. Edible NWFP can be awarded by this standard..

Summary of quality and food safety certification (in the ISO example)

- Specificity to NWFP: it does not directly target NWFP, and it does not use a terminology neither for NWFP nor for wild collection;
- Ecological specifications: not included.

A special typology of quality certification is the one based on the Good Agricultural and Collection Practices (GACP) guidelines, published by the World Health Organization (WHO). In the context of quality assurance and control of herbal medicines, WHO developed these guidelines that include general harvesting technical guidance and also aim at promoting sustainable use of medicinal plants. This model can be adapted at national and regional level (WHO, 2003).

Similarly to GACP, there are also certifications based on Good manufacturing practices guidelines for facilities, personnel and processing procedures for herbal medicines) and wildcrafter guidelines that define best harvesting practices for collectors (e.g., European Herb Growers Association Guidelines for Good Wildcrafting Practice of Medicinal and Aromatic Plants) (Shanley et al., 2008).

[138] http://www.iso.org/iso/home/standards/management-standards/iso_9000.htm
[139] http://www.iso.org/iso/home/standards/management-standards/iso22000.htm

Summary of Good Agriculture and Collection Practices certification (in the WHO guidelines example)

- Specificity to NWFP : it does not target NWFP category, rather herbs and medicinal plants;
- Ecological specifications: includes only general ecological specifications.

Socio-economic certification

Socio economic certification refers to the schemes that have social and economic focus. This is the case, for example, of Fair Trade certification. Fair Trade standards aim at ensuring fair prices and thus at empowering producers in the poorest countries of the world. There are Fair Trade standards specific for small producer organizations, for hired labour, for contract production and trader standards. Standards also include requirements for environmentally friendly agricultural practices, such as safe use of agrochemicals, waste management, maintenance of soil fertility and water resources and no use of genetically modified organisms (Fairtrade Labelling Organizations International, 2011).
Several NWFP and products containing NWFP have been certified according to Fair Trade standards, such as herbs, herbal teas, spices, juices, honey (Figure 3.52), and for each category of product a specific standard has been set (e.g Fairtrade Labelling Organization International, 2011b). However, these standards do not include ecological specifications.

Figure 3.52 Example of FairTrade certified products with NWFP ingredients

Summary of socio-economic certification (in the Fair Trade example)

- Specificity to NWFP :does not directly target NWFP as a category, but it has standards for many products in the NWFP category (such as herbs, herbal teas and spices);
- Ecological specifications: not included;
- Scale: requires individual approval of each product.

Origin, geographical indications and traditional specialties certification

Since globalization exposes many regions of the world to similar influences and bring traditions and cultures into alignment, local identity can be threatened. For this reason an increasing number of consumers opt for products with a recognizable, traditional, identity (Messely et al., 2008). Certification schemes that assure characteristics of origin, of geographical indication and of traditional knowledge are increasingly utilised. NWFP are good candidates for this type of certifications, because their collection is, in most of the

cases, connected to traditions and local culture.

An example of a certification scheme at large-scale level is defined by European Union. According to the EU Regulation 509/2006, three EU schemes promote and protect names of quality agricultural products and foods: Protected Designation of Origin (PDO), Protected Geographical Indication (PGI) and Traditional Speciality Guaranteed (TSG)[140] (Table 3.16).

Table 3.16 EU geographical indications and traditional specialties

Name	Description	Logo
Protected Designation of Origin - PDO	Covers agricultural products and foodstuffs which are produced, processed and prepared in a given geographical area using recognised know-how	
Protected Geographical Indication - PGI	Covers agricultural products and foodstuffs closely linked to the geographical area. At least one of the stages of production, processing or preparation takes place in the area	
Traditional Speciality Guaranteed - TSG	Highlights traditional character, either in the composition or means of production	

Source: EU Door Database

This type of certification does not target in specific neither NWFP nor wild collection. However, there are several cases of NWFP labelled with this type of certification. Standards of this scheme do not include ecological specifications.

Although the framework is common for all the 28 EU countries, some countries more than others take advantage of the EU system. To illustrate, the example of two countries is reported, one in the North Europe, Finland, and one in the South, Italy. According to the EU Door database[141], in Finland there are in total 10 products labelled with the three logos. Of those, only one product is made with NWFP ingredients, a beer made with junipers berries. The Italian scenario is different: there are in total 299 products, of which 29 are made with NWFP or NWFP ingredients. Of these, 24 are raw (or semi raw) NWFP: 13 types of chestnuts, 4 types of honey, 4 types of nuts, 1 mushroom (Figure 3.53).

However, even if Finland does not use EU labels for a large extent, the concepts of origin, geographical indications and traditional specialties have importance as well. In the Finnish market several products, including NWFP and products made with NWFP ingredients, such as juices, jams, frozen and dry berries etc., are labelled with the "*Made in Finland*" concept. As for the EU framework, these schemes do not directly target NWFP and they do not include ecological specifications.

There are four types of labels in the Finnish market: the Uniquely Finnish (Maakuntien parhaat)[142,] the Hyvää Suomesta[143], the Kotimaiset Kasvikset[144], and the Avainlippu[145] and

[140] Council Regulation (EC) No 509/2006 of 20 March 2006 on agricultural products and foodstuffs as traditional specialities guaranteed. http://eur-lex.europa.eu/legal-content/FI/TXT/?uri=URISERV:l66043

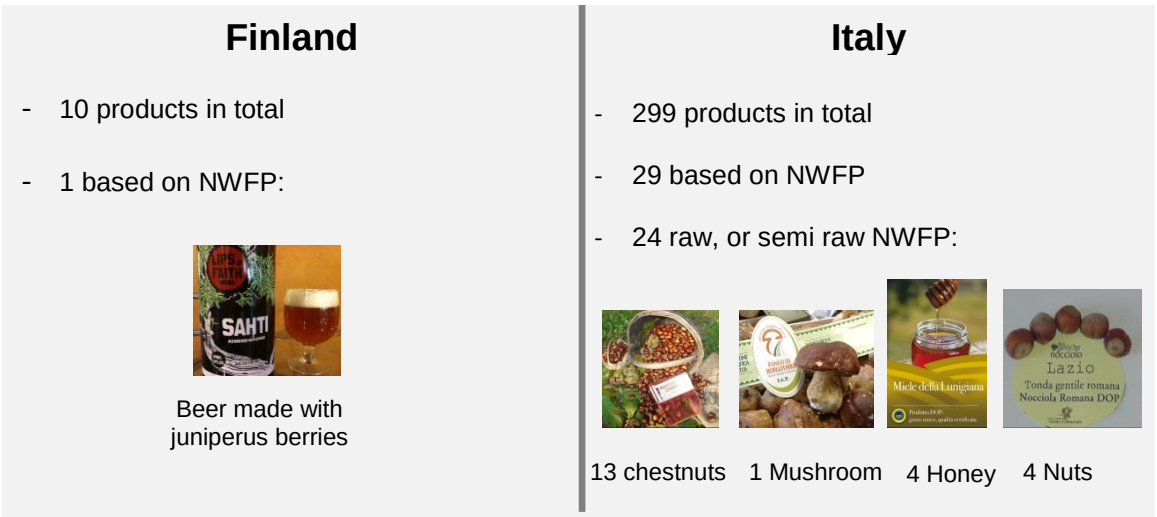
[141] http://ec.europa.eu/agriculture/quality/door/list.html?locale=it

[142] http://www.maakuntienparhaat.fi . As an example of NWFP, there are 9 companies which commercialize berries and berry products with the Uniquely Finnish label.

[143] http://www.hyvaasuomesta.fi .

three of these systems require a regular audit. For bearing the labels, raw material and final products are required to be produced, manufactured or packaged in Finland for different degrees, depending on the system (for instance, Hyvää Suomesta require that no less than 75% of the ingredients come from Finland and the labour is 100% domestic) (Table 3.17)

Figure 3.53 Finnish and Italian EU geographical indications and traditional specialties: total number of products and number of NWFP based products



Source: data from EU Door database

Table 3.17 "Made in Finland" certifications schemes

Certification scheme	Material	Production and processing	Control	Logo
Hyvää Suomesta	The label can be applied on the package of a food product that is manufactured and packaged in Finland and contains no less than 75% Finnish ingredients.	Up to 100% of domestic (as well as manufacturing and packaging)	Audit every 3 years	
Avainlippu	No claim of the raw material being domestic	Made in Finland	No audit	
Kotimaiset Kasvikset Sirkkalehtilippu	Domestic plant raw material, processed products, other raw materials is not the criteria	Finnish cultivation of raw plants	Audit	
Maakuntien parhaat- Uniquely Finnish	The main raw materials has to be 100% domestic. 80% of the cost of the product (including work and materials) has to be domestic	At least 80 per cent of the cost of the product (including work and materials) has to be domestic	Audit every 3 years	

Other examples of territorial certification can be found at smaller scale. A good example at regional scale is the umbrella mark "South Tyrol" and its quality label (Box 3.4).

[144] http://www.kasvikset.fi .
[145] http://www.avainlippu.fi

Box 3.4 The South Tyrol territorial brand

In recent years, Trentino-South Tyrol developed a successful strategy of regional territorial marketing, "*a perfect blend of virtuous government administration and an outstanding natural heritage*" (Sambrotta, 2010). The strategy looked at a crucial sector for the Region, the tourism. Public and privates stakeholders aimed at not binding their offer only to the winter season, but rather to promote activities all over the year. Part of the revaluation consisted in creating events different from the stereotypes, creating a more complete offer, based both on tradition and innovation.

Some examples of big events to which the whole region is now linked are the World Cup of mountain bike and downhill, and the Festival of Economics. However, the main role is played by activities linked with minority sports, agritourisms, wellness, food and wine. The enogastronomic sector is crucial. "Trentino and South Tyrol have been able to use the characteristics of its products and cultural identity for some attractive deals " (Sambrotta, 2010). An event especially successful is the Route of wine and Flavours of Trentino. These route, as well as other similar, is created by a network of actors from different sectors all linked by the desire to create a more complete offering for the tourist, connecting territory, wine, tourism and culture. The Wine Roads of South Tyrol won the first prize at the Rome Wine Festival 2009.

The region uses another important tool for territorial branding, the visual system. Both provinces developed a logo connected with the brands "Trentino" and "Alto Adige- Südtirol". In particular, South Tyrol developed in 2005 the umbrella brand Alto Adige[146]. To the umbrella label are associated other labels, that is the enterprise label, which is applied to the enterprises located in the Province, and the quality label. (Figure 3.54). In particular, the quality label is recognition of controlled quality for agricultural products and foodstuffs. It ensures: i) South Tyrolean origin II) use of traditional methods, iii) quality level higher than that required by the law iv) control by accredited independent bodies.

Figure 3.54 The umbrella brand Alto Adige

More than 1025 enterprises use the enterprise label and more than 270 products bear the quality label. Among the products that are currently commercialized under this label there are, for the NWFP sector, medicinal and aromatic plants. Potentially, other NWFP could join the initiative.

Summary of origin, geographical indication and traditional specialty (in the EU framework example)

- Specificity to NWFP: does not specifically target neither NWFP category nor wild collection, and it does not use a terminology for NWFP;
- Ecological specifications: not included.

[146] The new one, because the first version of the logo is of 1976.

Other certifications schemes of interest for NWFP

Similarly to what described for the organic certification, there are other certifications schemes applicable to NWFP that focus on the healthy message for human consumption. In countries where Genetic Modified Organisms (GMO) are allowed, there is an increasing discussion on the harmful of GMO, and a consequent increasing attention for Non-GMO products. In North America operates the Non-GMO project[147] , a non-profit organization committed at providing verified non-GMO choices. The Non-GMO label on a product indicates that the product bearing the seal has gone through verification process that certifies that less than 0,9% of GMO are contained in that product. The Non-GMO Project is the only organization offering independent verification of testing and GMO controls for products in the US and Canada. Non-GMO certification does not specifically targets NWFP, rather all the edible products, and it does not include ecological specifications. However, products such as berries, herbs, spices and honey have been third- party verified by Non-GMO project.

Figure 3.55 Non – GMO project label and verified products

Other type of certification that can be applicable to NWFP are those that focuses on non-use of animal ingredients such as the Vegetarian and Vegan certification, such as VegeCert[148], Vegan Action[149] and on animal welfare, that mainly apply on cosmetics products. In Canada for example there is the Coalition for Consumer Information on Cosmetics[150], whose label is the Leaping Bunny, which provides the assurance that no animal testing is used in any phase of product development.

All the standards of these certification schemes do not directly target NWFP and do not include ecological specifications.

Summary of the certification schemes of interest for NWFP

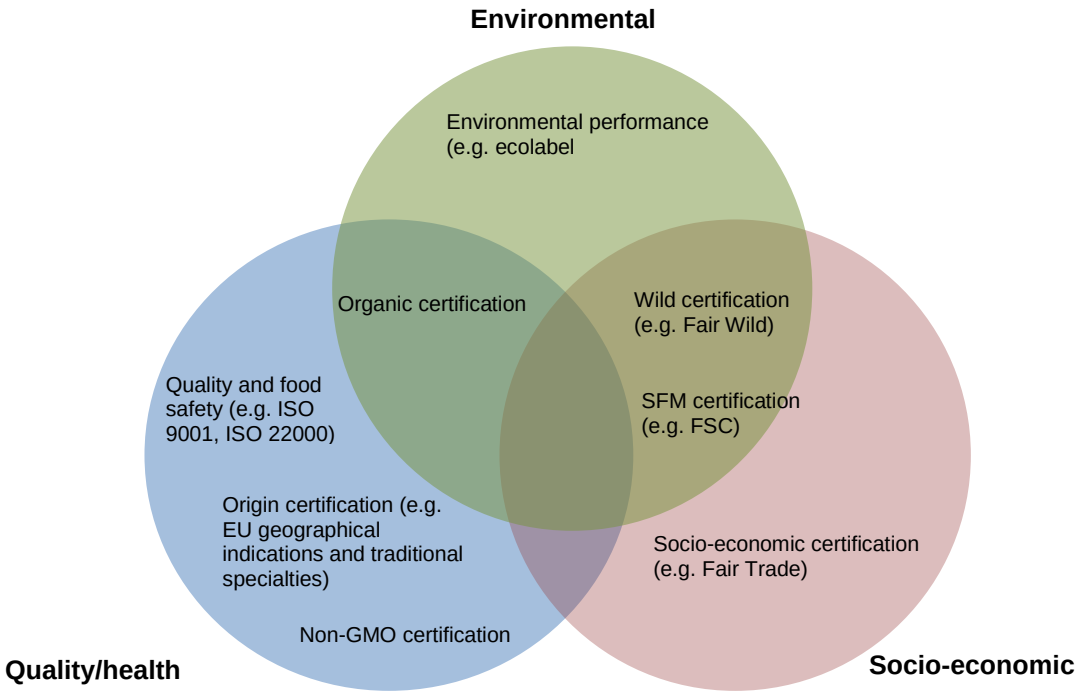
The aforementioned certifications schemes have different scopes, which follow in different degree under the spheres of socio-economic and environmental sustainability and of assurance of quality and health benefits (Figure 3.56). They also target different parts of the supply chain.

All of these certifications are applicable to NWFP, and there are NWFP on the market bearing these labels.

However, only some of them specifically target NWFP or wild collection. In particular, only sustainable forest management certification standards utilises the NWFP term (usually NTFP), while wild certification standards and organic standards prefer the term “wild”.

[147] http://www.nongmoproject.org/
[148] www.vegecert.com
[149] http://vegan.org/
[150] www.leapingbunny.org/

Figure 3.56 Sustainability spheres to which NWFP certifications schemes belong to, according to their main scopes



The application of these certifications can provide numerous benefits, such as market visibility of products and premium price for producers, together to the benefits strictly related to the objectives of the specific certification. However, among the assessed certifications standards only two, sustainable forest management and wild certification, include detailed ecological specifications for sustainable harvesting, while some others only indicate general principles. Only in these cases the economic actors give signals that the ecological impact of the NWFP harvesting is positive, or at least not negative.

Errore. L'autoriferimento non è valido per un segnalibro. summarizes the main scope of each certification type, whether each certification directly targets NWFP or wild collection, and the inclusion of ecological specifications in the standards.

Table 3.18 Direct target to NWFP or wild collection and presence of ecological specifications, according to the certificationschemes and standards

Issue / Certification type	Main scope	Specificity to NWFP or wild collection		Inclusion in the standards of ecological specifications
		To NWFP	To wild collection	
SFM (in the FSC example)	Assessment of Sustainable Forest Management	Yes	-	Yes
Wild certification (in the Fair Wild example)	Assessment of sustainable wild harvesting	-	Yes	Yes
Organic (in most of the standards)	Insurance of organic production (e.g. no use of pesticides, not contaminated areas)	-	Yes	Only general specifications
Environmental performance In the EU Ecolabel example	Assessment of low environmental impact	No		No

	In the carbon example	Assessment	No	No
Quality and food safety	In the ISO example	Assessment of quality of the products	No	No
	In the WHO GAPC example	Assurance of use of good agricultural and harvesting technical guidelines	No (but some species in the NWFP category)	Only general specifications
Fair Trade		Assurance of fair prices and empowerment of producers	No (but some species in the NWFP category)	No
Origin, geographical indications and traditional specialties	In the EU example	Assessment of the origin and the traditional know-how	No	No
	In the Finnish example	Assessment of origin	No	No
Non-GMO		Assurance that the product contain less than 0,9% of GMO	No	No
Vegan		Assurance that the product does not contain animal ingredients	No	No

4 Conclusions

Ecosystem services are the benefits that people obtain, directly or indirectly, from ecosystems. Forests are fundamentally important in relation to the multitude of provisioning, regulating and maintenance and cultural ecosystem services they provide.
Many ecosystem services provided by forests are positive externalities and public goods. Economists refer to them as market failures: people can benefit from ecosystem services without contributing to their sustainment. The failure in assigning a proper value may lead to degradation of forest ecosystems, or to abandonment of forest management, resulting in a consequent under provision of the service, with substantial economic and social losses to society.
To preserve and sustain ecosystem services, including those provided by forests, and especially when public funds for conservation are limited, there is an increasing agreement in favour of Market Based Instruments (MBI). MBI encourage behaviour through market signals rather than through explicit directives. The main common characteristic of MBI is the use of monetary values in one way or another through a commodification process.
MBI are heterogeneous and many authors have listed and classified them, in different ways. The present research adopted the classification of Pirard (2012) which aims at distinguishing between the various instruments on the basis of their intrinsic economic characteristics, the nature of their relations to the markets and the nature of the market that is considered with the instrument. Six types of MBI were described: direct deals, tradable permits, regulatory price signals, voluntary price signals, reverse auctions and Coasean type agreements.
Among the several ecosystem services provided by forests, some, more than others, have experienced a process of commodification, testified by several examples worldwide. This is the case of Non-Wood Forest Products (NWFP) and of the climate regulation that derives from the carbon sequestration function of forests.
The research aimed at analysing the application of Market Based Instruments to NWFP and to forest carbon, at different scales. In this last chapter we also look at the policy implications of the main results of the thesis.

Literature analysis

The first part of the research focused on assessing which are the most important MBI applied to NWFP and to the climate regulation that derives from the carbon sequestration function of forests (forest carbon), according to the scientific literature.
One of the first highlights is that MBI related terms may be misleading when they are used and interpreted in different ways. For example, several papers target the REDD+ mechanism as a global scale payment for ecosystem services (PES). However, it actually fits with the "regulatory price signal mechanism" when referring to the mechanism according to which industrialised countries finance developing countries for preparing laws and developing strategy to reduce emissions from forests and invest in low-carbon paths to sustainable development; or to "tradable permits mechanism" when referring to the project activity that leads at reducing emissions at project level and at creating and commercialising carbon credits. Therefore, clarity about terms is necessary.

The research about NWFP show that NWFP were, and in many cases still are, open access resources or common goods used under everyman's rights of collection.
The analysis of the academic journals, conducted using Scopus database, showed that they experienced commodification mainly though "direct deals" (that is all markets that are created

in view of exchanging environmental products). The reviewed researches stress that NWFP commercialization through markets, by increasing the economic value of the forests, can both conserve forest ecosystems and contribute to the livelihoods of people that depend on forests. Lack of information on many statistical data and NWFP markets, in terms of dimension and structure, quantities and values traded, represents a barrier for decision making, both at level of enterprises and governments. Some papers, referring to example of overexploitation, warn us that the harvesting for commercialization can deplete the NWFP resources, due to overuses. Measures that target sustainability of collection should be adopted.

To avoid this potential for negative consequences, another reported MBI is certification, or more in detail, standard development, control and use of labels. This is actually the second MBI of main importance for NWFP, according to the research on the scientific literature. Benefits of the use of certification for NWFP can be manifold, touching the social, the economic and the environmental sphere. A range of certification schemes that can be applied to NWFP exists in the market; certification schemes can be differentiated according to the specific focus they have. Despite the high importance of all three dimensions of sustainability, the ecological sphere should be particularly considered in NWFP certification: since the collection and supply chains are logically based on the presence of renewability of the resources, undermining the sustainability of NWFP would mean jeopardising both the socio and economic spheres as well.

The analysis of the academic journals for the climate regulation derived from the carbon sequestration function of forests (forest carbon for simplicity) showed that the main MBI reported by the scientific literature is “tradable permits” (the mechanism of exchanging permits/credits among actors for the use of a resource), with reference to the compliance and voluntary markets that, at different scales, exists worldwide, and “regulatory price signals” (which work by assigning, on a mandatory basis, a price to environmental impacts through the imposition of positive incentives or deterrent), mainly with reference to the Reducing Emission from Deforestation and Forest Degradation mechanism.

Forest projects developed for creating carbon credits are reported to have a high potential for conserving and improvingly managing forests, by rewarding forest managers and local communities.

In opposition to this, few articles contest forest carbon projects depicting them as unjust and environmentally unsound strategies to mitigate climate change. Some other articles suggest resizing the importance of the market: looking at the main drivers of deforestation, that are livestock, soy, palm oil, and wood products, funding for forest carbon markets and for REDD mechanism are very “small potatoes”. However, this commodification process was able to channel considerable amount of money, committed by governments, companies and privates for carbon finance.

Direct deals for NWFP: International trade analysis

The analysis of “direct markets” applied to NWFP confirms that commodification of NWFP is so extended that nowadays many NWFP are traded at international scale.

In these, Italy covers a key role at international level for the trade of some NWFP. The research, conducted using the UN Comtrade database, utilising the Harmonised Commodity Description and Coding System, shows that Italy has a leading position within the five main global importers and/or exporters in the last decade for vegetable tannins, cork stoppers,

chestnuts and wild mushrooms.

For tannins, Italy, and the entire Europe as well, has not anymore a strong position internationally as a producer (historically from oak and chestnuts trees). The international market is now leaded by southern hemisphere's countries, where "new tannins", quebracho and wattle, are produced. However, Italy still covers and important role as a tannin importer and processor. Tannins are refined for being used in the leather industry, sector in which Italy plays a powerful role. The processing of tannins recently allowed Italy to become a net exporter. Even if the role of Italy as a processor is not linked with the Italian forestry sector, some opportunities can be contemplated. The strong role of Italy as a tannin refiner, together with the introduction of the EU regulation that disfavours synthetic tannins, and joint to the current trend of price increment for vegetable tannins, might in the future allow to create a profitable national tannin production, re-establishing the role of chestnut and oak forests in producing these compounds.

For cork, the analysis shows that EU28 production accounts for the 94.7% of the global export. The most valuable cork products, that are also among the most valuable NWFP-by products exported from EU, are cork stoppers. Portugal is the main producer and exporter with about 524million US$ of value. In the recent past also Italy was one of the main cork stoppers exporters. However, Italy recently disappeared from the top 5 and this is probably due to the high demand on the internal market, arguably for another sector in which Italy is the global leader: the wine industry. This actually resulted in a growing position of Italy as global importer. The development of the cork stopper sector, as well as the creation of innovative products such as cork panels, composites, high performance insulators and tissues could continue to support the Italian traditional Mediterranean forestry.

The analysis of the international chestnuts trade shows that Italy is still one of the main producer and exporters for chestnuts worldwide. Despite China leads the market in terms of quantities, Italy is the leader in terms of value (in 2011), with about 80M$ of export, to more than 50 export partners countries. However, due to the several pests (in particular the chestnuts gall wasp) that in recent years affected the Italian production, Italy has lost a considerable share of its production; in order to make up for the internal quantity, Italy became also the third global importer. Positive signals for the sector are given by the fight against the chestnuts gall wasp with *Torymus sinensis* Kamijo. The prompt and effective use of the natural antagonist, also attested by the survey conducted in Trentino-South Tyrol, was able to recover part of the domestic production.

The analysis of the mushrooms global trade shows a continuous increase in terms of volume and value. On the totality of mushrooms traded, wild mushrooms account for the 26.4% of the volume (that is 0.47Mt over 1.79 Mt) and 45.6% of the value (that is $2.27B over $4.98 B in 2011).This suggests that despite mushroom domestication and cultivation has become widely experienced, wild products still cover a large segment of the market. In this framework Italy is among the top 5 exporters worldwide in terms of value of WM. Despite it was not possible to separate the trade of truffles from the WM trade because of the aggregation with the other HS codes, the strong Italian role as exporter is arguably due to the trade of truffles, which are very valuable specialties of some Italian regions. For what concern the other wild mushrooms, in Italy the quantities of imported mushrooms mostly exceed those of exported mushrooms. WM collected in Italy are not exported. As confirmed by the survey in South Tyrol, local mushrooms are almost only sold fresh and locally. The trend of mushrooms import is surely due to the cheapest manufacturing cost occurring abroad, but also to the

effect of the regulations that domestically limit the harvesting quantities, usually at 2kg per person per day. Therefore, it can be assumed that, except for truffles, mushroom export from Italy actually derives from mushrooms imported from other countries: mushrooms are imported and then simply resold, or, in the case of dried or preserved mushrooms, treated and packaged before being exported.

For the Italian forest sector, the international trade analysis show negative and positive results. On one side the globalization of trade moved the NWFP production where the manufacturing costs, both of raw material and of labour, are cheaper. This is the case of tannins, whose European production was totally displaced by southern hemisphere's producer, and of mushrooms, whose production and export is leaded by China. On the other, the analysis shows that strong specialised Italian processing enterprises were able to survive and to sharpen their competences, allowing Italy to remain among the key trader for processed products worldwide (for processed tannins and for processed mushrooms, for example). However, the Italian forest sector is still enhanced by the production and commercialization of some products: chestnuts, truffle, and in minor part, cork. These productions, which are internationally recognised for their valuable quality, allow Italy to be placed among the leaders in global NWFP trade.

The International trade of wild forest products is increasing, also as a consequence of an increasing global demand of most of the forest products and services. This could be an opportunity for Italy and for European Union in general, to promote a sustainable forest management based on multifunctionality, which include use and commercialization of NWFP.

Lack of a proper system of wild classification is a threat for the development and coordination of European forest policies in the sector. The decreasing availability of data is not related to the economic, social and environmental importance of NWFP but rather to a problem of data collection and coordination by several national statistical agencies. An improved NWFP classification system to be used in production and trade statistics could be useful for clearly distinguish wild from cultivated products, to promote standards and to give transparency in trade relations and better information to the final consumers.

Direct deals for NWFP: regional market analysis

The survey conducted in Trentino-South Tyrol for wild mushrooms and chestnuts, through the submission of face-to-face questionnaire to the supply chain actors (producers, processor, wholesalers and retailers) and other stakeholders, provided number of actors in the region and estimated NWFP quantities and prices; it also showed the presence of different types of markets and food supply chains. Distinction can be done with reference to the origin of the NWFP, local and non-local. Non local products sold within the regional boundaries abundantly exceed the local ones. This is driven by the same logics that rule the trade of other commodities, such as the cheaper raw material and labour cost obtainable in some foreign countries.

For mushrooms, the regional survey confirmed the data of the international analysis. For example, regional processor, three in the region, but powerful, buy and process a great amount of mushrooms, more than 1,610 tons of mushrooms, but no one mushroom derives from the region. The cheaper costs, together with the high and continuous availability of the products, made Eastern European countries and China to become preferred partners. Same dynamic drives regional wholesalers, and consequently retailers, which supply fresh mushrooms especially from Eastern European countries.

The local production of mushrooms is traded in much lower quantities, and 100% remain within regional boundaries (at least the formal part of the market).
Local mushrooms are collected by many “informal pickers” and sold to “professional mushrooms producers and sellers” who are very few in the region, which in turn sell them to privates and retailers, mainly at the market square in the biggest centres. There, mushrooms are controlled by the local sanitary authority. The trade occurs through Short Food Supply Chain, and in particular face-to face SFSC. Mushrooms producers stress that they mostly have loyal customers, which appreciate locality and quality of the product. Economically, this type of supply chain allows these small-medium producers to find out a target market in which they can avoid the competition with bigger wholesalers and large retailers (which usually sell only foreign mushrooms). These producers, who are actually family based enterprises, are able to base their entire business on local mushrooms, earning fair profits. This trade respects natural seasonal processes (from June to October) and it gives value to local mushrooms varieties. The dozens of species sold confirm the ecological mushroom variety of the territory. Since the collection of mushrooms is strictly regulated by the provincial laws that limit the quantity and indicate methods of collection, the collection can be assessed as sustainable by definition.
Other consideration could be done for the informal or illegal trade that surely exist in the region, but that was not assessed by the present study.
No MBI such as public financial incentives for the sector are in place. Mushrooms production, contrary to other forest activities, is not targeted by the Rural Development Programme. At the same way, there are no silvicultural practices set for enhancing mushroom production. Public measure to support supply chains based on wild and ecologically sustainable products could improve the mushroom sector.
In the region, as well as generally in Italy, another MBI is in place for mushrooms: municipalities sell permits of mushrooms collection to non-resident, according to a MBI that can be classified as being in between the tradable permits mechanism and the regulatory price signals’ one. The present research targeted Fiemme valley, in which a horizontal geographic-specific alliance has been set for the purpose of mushroom picking. Magnifica Comunità di Fiemme, municipalities and owners with more than 100 ha made an agreement for sharing expenses and incomes deriving from the sale of mushroom picking permits, and for offering an improved service to the customers. Every year, more than 9,400 mushroom picking permits are sold, with 200,000 € of revenues. This, without the introduction of the payment for permits for harvesting that began in early ‘90, would have meant a loss of income for the valley. However, a question that one might ask is whether the introduction of the limit of collection has strongly discouraged the business of the sale of mushrooms as a product. If so, we should compare the revenue from permits with the lost revenue for the direct sale of mushrooms, probably resulting in an economic loss. Nevertheless, the harvestable limit of 2kg is a regulation that comes from public administrations, both at provincial and national level, and it was set for the purpose of ecological sustainability. Therefore, given the legislative *status quo,* we can assess that the presence of the permits bring direct revenues to the valley. Regarding the environmental sustainability of the process, the strict rules for the quantity and for the methods of collection should be able to guarantee ecological sustainability. This is enforced by the presence of the mushroom guards, which are specifically hired. The perceived sustainability of the collection was also confirmed during the survey in Fiemme valley by the interviewees to the residents. At the net of the expenses,

the earning deriving from the permits goes for maintenance of forest roads, for the management of grazing areas, for infrastructures against landslide and for the service of mushroom recognition by a mycologist. However, nothing goes directly for the improvement of forest ecosystems for the specific purpose of mushroom production and no silvicultural activities for improving availability of mushrooms or any other NWFP is in place. These could be measures to be adopted in the future.
The national and regional imposition of a minimal quantity of mushrooms harvestable per day, set for ecological reason, surely limited the creation of large markets. By remaining in a sustainable collection range and respecting the seasonality and the wild nature of the products, further researches may be addressed at assessing the possibility of defining some specific zones for mushroom production for commercialization. After having assessed the mycological potential, specific silvicultural measures may be adopted. These areas could even potentially be the ones more marginal from the timber extraction point of view. These areas, where the harvestable quantities should be risen or made free such as happens in Northern European countries, could provide raw material for supply chains based on of local mushrooms.

The chestnuts market analysis showed that a great part of the product that passes though regional wholesalers and retailers is non local. Big chestnuts producers out of the region supply with raw chestnuts the regional wholesalers and retailers. Chestnuts mainly come from Cuneo (Piemonte) Tuscany (Monte Amiata) and Avellino (Campania), where specialised and intensive methods of production are in place. This confirms data of the international trade analysis: the Italian production is still competitive, even with respect to other countries where the manufacturing cost is cheaper.
Many regional wholesalers also sell a minimum quantity of local chestnuts. Retailers do it much more. According to these SME, local production is stated to be not sufficient and discontinuous to cover the demand. For this reason, and because of the more expensive prices of local products, which are given by a number of factors (lack of economies of scales, lack of mechanization means etc.), wholesalers and retailers cannot rely only on local production. However, many stated that they diversify their purchases also buying a part of the local chestnuts, which are much appreciated. Therefore, development margins for increasing the commercialization of the local production are possible.
Chestnuts production in the region is a rooted, now revitalised, activity. Local chestnuts, and in most of the cases marroni, are produced in several areas. Chestnuts producers are for the great majority small farmers, and the production is considered a secondary activity that complements their income, a tradition and a true passion.
The very large part of the local chestnuts production (94%) is sold as raw. The market is local: 96.6% of the production is sold within the regional boundaries.
The trade occurs for the vast majority through Short Food Supply Chains, either face-to face, spatial proximate of spatially extended. While is South Tyrol the chestnuts are mainly sold by producers through direct sale to end consumers, in Trentino, the production is mainly sold by producers to the chestnuts associations and cooperative (66%) to which the producers take part, which in turn sold the overall production to end consumer during chestnuts festival, and to processors for producing products with the association/cooperative label.
In the region there is a strong prevalence of horizontal integrations among actors and

tendency at sharing knowledge and experiences through associations. Most of the chestnuts producers are indeed member of the 12 associations of the region, and/or of the chestnuts producers' cooperative. The associations count about 1,000 members, representing a good indicator of the interest that is growing for this traditional, rediscovered, activity. The associations promote the chestnuts cultivation, teach how to manage chestnuts orchards, give standard for the conservation, and define prices. They allow aggregation of the supply and also a common and shared marketing. The role of associations is especially important in years of production crisis. They act like a social security cushion, buying the chestnuts of the producers, even in minimal quantity.

Beyond proximate sale, chestnuts are also sold at a bigger distance. For example, the Association Tutela dei Marroni di Castione and the Chestnuts cooperative Trentino-Alto Adige sell chestnuts in other areas, such as in Veneto region. Being the chestnuts labelled with the Association logo, and being therefore the consumer made aware about the place of production, this type of supply chain can be defined "spatially extended SFSC": it allows consumers to be put in connection with producers even if they do not have personal experience of that area. However, only the labels of these two associations exist.

The idea of promoting with a unique label the regional production, or at least the valuable production of *marrone Trentino,* which was developed in the past but that was not then realised, could be relaunched. Elements of promotion could be the locality of the product, its connection with traditional woodland management, as well as the organic nature of the activity, since no pesticides are used. From the promotion of an ecotype of chestnuts as a "regional" or "provincial" fruit, many positive trades-offs could be generated in the territory, with special regards to the touristic activities.

The presence of SFSC for the regional producers provides sustainability aspects from the economic point of view. SFSC allow small producers, which are less competitive than the bigger ones located in other Italian regions, to have a better access to the local market. In the local context, SFSC are developed as collective economic initiatives between producers, strengthening links among local supply chains' actors and mobilizing resource in a synergetic way.

The sale of chestnuts through SFSC favours interactions between community members, thus strengthening their social capital in terms of networks, inclusion, knowledge and social cohesion. The local supply of chestnuts, even if not so much consistent, is yearly completely out of stock because it is appreciated by consumers. SFSC make easier to establish fairness because they facilitate consumers to pay for products they know and appreciate, therefore allowing producers to receive a better income.

Chestnut production in the region is strongly connected to the attachment to the territory and seasonal processes. Thanks to this attachment and the social cohesion of the producers, but also thanks to the collaboration with the research centres of the region and to some policy measures, in the region the fight against chestnuts gall wasp is having extremely positive results, letting the producers overcoming an important phytosanitary problem. Especially in Trentino, the production is based on local varieties, which are well adapted to local environment. The commercialization, by favouring the production, helps to sustain the knowledge about local varieties and traditional territorial management.

The regional chestnuts sector is enhanced also by the sale of "complementary products and services". In the fall period an array of products and services are jointly offered to the consumers. The chestnuts become the imago product of a territory that is promoted through

a geographic specific horizontal alliance among different stakeholders. These initiative (festivals, roads of flavours and of typical products, *Törggelen*) connect several actors, among which the chestnuts associations and representatives of the touristic sector, providing the costumers a better experience of the autumn season. Together with the raw or roasted chestnuts, during these periods are offered other specialties of the territory, such as wine; the restaurants and hotels in the zone offer menus based on chestnuts; visits to the orchards, trails, tasting experiences, but also experiences such as the festival of arts and graphic humour (in Castione) are organised. The sale of complementary products and services is able to sustain the local economy in a traditionally "low" season.
The chestnut sector in the region is also helped by the financial incentives given by both the EU and the provinces, which are typically ascribable to the "regulatory price signals" MBI. According to our survey, 71% of the interviewed received funds and all of them stated that these favoured their works. For most of them t "*it is not a sum that can change the life, but a contribution for better working*", anyway underlining that these kind of MBI has the potential to be effective in revitalising the sector.

Tradable permits: Italian compliance forest carbon market

The analysis of tradable permits application to the climate regulation (carbon sequestration function of forest), in the Italian Clean Development Mechanism example, shows that Italian Government participates, along with other 10 countries, in a high number of Afforestation/Reforestation CDM projects (16), located in 10 host countries. The total surface corresponds to about 65,000 ha planted, which is more than the total of newly planted forests in Italy under EU rural Development Programme 2007-2013. On the contrary the Italian Government, domestically, has been indifferent to the development of carbon compensation schemes in general, and in the forest voluntary market (NMC, 2014) specifically.
The research shows that forestry projects cover a prominent role in the overall Italian CDM portfolio. Half of the Italian CDM projects adopted a large scale approach, a practice that is not followed in Italy (mainly due to structural reasons), whereas public authorities financially support planted forests as small as 0.5 ha.
This analysis demonstrates that in the UNFCCC and BioCF databases an adequate amount of information is publicly available to build a picture of the technical, spatial, and financial aspects of the implemented projects; as well as their impacts in terms of carbon sequestration. When compared with other large scale planted forest programs promoted by public authorities, such as those financed since 1992 under the Rural Development Programs by the European Union, transparency and accountability of forest CDM projects are much higher.
These forestry projects in developing countries were able to produce a relevant amount of climatic benefits, about 556,000 tCO_2eq. However, the connection "carbon forestry project-conservation of native forests and of biodiversity" is not automatic, since 55% of the new forests was planted with non-native species. The choice of using non-native species has not to be condemned, and it is justified by several arguments by project developers, with the primary justification being the fast growing characteristics of the selected non-native species. However, it has to be stressed that, while planting of non-native trees is discouraged in Italy, in developing countries this strategy is widely used by CDM project developers, underlying that fast growing and fast generation of carbon credits is placed before the need of conserving native forests.

Regarding how Italian CDM forest projects contribute to sustainable development, the analysis of the statements of the project design documents shows that all the projects claim that they stimulate the local economy, including short and long term employment in the project area, and that they engage the local population. However, the system of indicators developed by UNFCCC does not provide a method for assessing *how much* a project contributes to sustainable development. Project participants might overcome this by using the official, voluntary UNFCCC tool "CDM Sustainable Development co-benefits description report"; however, until now none of the projects with Italian participation have made this effort. Integration of the available information from the Ministry for the Environment, Land and Sea would be particularly valuable, also considering the relevant financial involvement of Italy in these activities and the positive lessons to be learned from the ongoing experience in the light of the future development of the UNFCCC negotiations.

Tradable permits: Italian voluntary forest carbon market

The analysis of the tradable permits in the example of the Italian voluntary forest carbon market shows the presence, for the year 2014, of 12 active projects to which Italian organizations take part. Projects are mostly located in Africa, but many are also sited within the Italian boundaries. Thanks to the projects were transacted a total of 29,876 tCO_2e, plus the credits transacted by the Italian organizations with other roles than project developers, for a total volume of the Italian forest carbon market of 46,720 tCO_2e. The average price of the carbon credit was 12 €/ t, with an overall estimated value of 560,643€. By a comparison with the European Union voluntary forest carbon market it can be assessed that the Italian market is small, being only 2% in terms of value with respect to the EU one.

By looking at the trends during years, the Italian market shows a decline in terms of number of actors involved and the projects developed. As a result is also observed a decrease in the volume of credits transacted passing from 240,000 tCO_2e in 2011 to about 46,000 tCO_2e in 2014. The prices are instead in positive countertrend with respect to international situation, which remain at an average value of 12€/tCO_2e (around13$), much higher than the international average price of 5.4$.

The Italian sector is characterized by a balanced presence of profit and no-profit organizations, which develop more and more small and micro projects in Italy, which are characterized by lower volumes but higher credit prices.

The decrease in volumes and the rise of prices might suggest a selection of projects towards higher quality. This is only partially true. In fact, if 2014 confirms the trend that began in 2013 with the increasing of projects with third party certification (VCS and Gold Standard) it cannot be ignored the most of the projects operate in the absence of certification and standards. This is completely different from the international situation, where 91% of the credits are transacted under a third party standard. However, many projects use guidelines and internal quality standards, a strategy aimed at containing costs for the micro or small scale projects. This choice might, however, raise criticisms. A good sign in terms of environmental benefits is given by the fact that most of the projects, contrarily from what happen in the CDM projects, used exclusively native species. The total area planted with non-native species spans less than 1625 ha, representing 9.6% of the total.

A solution that may allow Italian forest project developers to overcome the problem of cost of certification is the aggregation of projects, which actually is to not occurring. The cost of certification may be shared thanks to form of cooperation such as those used for forest

certification (e.g. Forest Stewardship Council – FSC or Programme for the Endorsement of Forest Certification schemes – PEFC). Another solution for the reduction of the costs may be a shared campaign of promotion of the forest carbon credits, using form of marketing such as the portal CO2Resa151 and Fair Carbon[152] the first Italian marketplace for the sale of carbon credits.

Since problems of double counting with Kyoto based initiatives could undermine the development of the sector, the voluntary carbon market is looking for official signals from the Italian Government. Currently there is a legislative gap about this, and the voluntary carbon market's actors are waiting from official responses (NMC, 2014). With clear and precise directives, a more stable strategy for the sector could be implemented, also looking at the successful examples of domestic markets that exist in many EU countries.

Voluntary price signals: NWFP certification

The research about the application of voluntary price signals to NWFP shows that certification is a MBI promoted as a solution to address the many ecological, economic, and social challenges associated with NWFP commercialization. Several certification schemes are used in the market, namely sustainable forest management certification, wild certification, organic certification, environmental performance certification, quality and food safety certification, socio-economic certification, origin and traditional specialties certification. The different certifications schemes have different scopes, which follow in different degree under the spheres of socio-economic and environmental sustainability and of assurance of quality and health benefits.

Many certification schemes are generally applicable to many types of food and non-food products. Only some schemes (sustainable forest management certification, wild certification and organic certification) specifically target NWFP and/or wild collection, aiming at specifically giving value to these wild and semi-wild products.

Among the assessed standards only two, sustainable forest management and wild certification, include detailed ecological specifications for sustainable harvesting. These standards suggest that population size of a specie, structure of the population, harvest rates, growth and regeneration rates have to be recorded and monitored through specific indicators for the different NWFP types like plant exudates, vegetative structures (apical buds, bark, roots, leaves), reproductive structures (fruits, seeds) etc. Being the entire NWFP supply chain indissolubly connected to the availability of the NWFP itself, these recommendations are of particular importance. Therefore, a certification scheme willing at targeting NWFP should include this kind of specifications. Only this way the economic actors can give signals to the consumers that the impact of harvesting is positive, or at least not negative on NWFP provision.

By the assessment of the standards, an element clearly emerges: the acronym NWFP is exclusively used by forest standards. The other certification schemes and the market in general do not adopt it, showing a preference for the term "wild", counter posed to cultivated. Therefore, for promoting the non-wood products coming from forest, a marketing, but also policy strategy hinged upon their intrinsic wild nature could be more beneficial.

[151] www.co2resa.it
[152] www.faircarbon.it/en

An overview

The research, through the literature analysis, the analysis of international databases and the direct surveys conducted at Italian and regional level confirms that NWFP and climate regulations deriving from the carbon sequestration function of forests have experienced commodification processes through the use of Market Based Instruments.

Market Based Instruments are mechanisms that can provide economic values to forest ecosystems, also providing greater flexibility of the management of the resources and to changing conditions.

The application of some MBI to ecosystem services can perform well even at global scale level, for example in the case of tradable permits for climate regulations deriving from the carbon sequestration function of forests. Wherever they take place, activities that mitigate GHG emissions contribute equally to reduce global climate change. This, together with the wide diversity in cost of abatement across regions, is the basic principle for a carbon market, as a cost effective solution to reduce global GHG emissions, and the forest carbon credit commodity is exchanged internationally. Some other MBI are often more appropriate to be applied at the local or regional level, as the contexts, incentives and constraints that face users and providers may be peculiar to a particular place.

In both cases MBI have not to be idealistically seen as the solution; however they can, if carefully designed and implemented, complement regulations or provide alternatives.

Sometime the best combination can be the joint use of regulation and MBI. For example the maximum harvestable level for a specific NWFP is set by a regulation and then the market is used. Some other good solutions can be the use in synergy of two MBI, for example tradable permits for climate regulations deriving from the carbon sequestration function of forests and the use of voluntary price signals (e.g. certification) for assuring the provision of co-benefits and that natural ecosystems are not depleted; or combination of regulatory price signals (e.g. financial incentives) for chestnuts orchards restoration, also with landscape benefits, and then the use of direct deals for remunerating farmers.

The definition of the best option should be carefully designed at specific scale, especially aiming at including the delivering of sustainable aspects, with particular reference to the place where the forest resources are. At the same way, due to heterogeneity of MBI and of the contexts where they are implemented, MBI effectiveness in managing ecosystems cannot be *a priori* assessed and other indicators, applied at specific scale, should be used.

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Annexes

Contents

Annex I Harmonised System codes for NWFP types and period of validity

NWFP type	Category	Commodity group	HS Code	Period of validity				
				1992-1995	1996-2001	2002-2006	2007-2011	2012-20..
Tannins	Tannins	Quebracho tanning extract	320110	x	x	x	x	x
		Wattle tanning extract	320120	x	x	x	x	x
		Oak or chestnut tanning extract	320130	x				
		Vegetable tanning extracts	320190	x	x	x	x	x
		Tanning or dyeing extracts	320300					x
Essential oils	Essential oils	Resinoids	330130	x	x	x	x	x
		Other	330190	x	x	x	x	x
Foliage	Foliage, branches and other parts of plants	Mosses & lichens	060410	x	x	x	x	
		Fresh (mosses & lichens included)	060420					x
		Other (generally dry) (mosses & lichens included)	060490					x
		Fresh	060491	x	x	x	x	
		Other (generally dry)	060499	x	x	x	x	
Bark products	Cork and cork products	Cork as harvested	450110	x	x	x	x	x
		Cork in pieces	450190	x	x	x	x	x
		Cork squared	450200	x	x	x	x	x
		Cork stoppers	450310	x	x	x	x	x
		Cork articles	450390	x	x	x	x	x
		Cork agglomerates	450410	x	x	x	x	x
		Cork agglomerates products	450490	x	x	x	x	x
Edible nuts	Hazelnuts and filberts	In shell	080221	x	x	x	x	x
		Shelled	080222	x	x	x	x	x
	Walnuts	In shell	080231	x	x	x	x	x
		Shelled	080232	x	x	x	x	x
	Chestnuts	Unsorted	080240	x	x	x	x	
		In shell	080241					x
		Shelled	080242					x
	Pistachio	Unsorted	080250	x	x	x	x	
		In shell	080251					x
		Shelled	080252					x
	Other nuts	Unsorted	080290	x	x	x	x	x
Wild mushrooms and truffles	Fresh or chilled	Mushroom of genus Agaricus	070951	x	x	x	x	x
		Truffles	070952	x	x	x		
		Other mushrooms both wild & cultivated (and truffle from 2007)	070959			x	x	x
	Provisionally preserved	Mushroom of genus Agaricus	071151			x	x	x
		Other mushrooms	071159			x	x	x
	Dried	Mushrooms	071230	x	x			
		Mushrooms of genus Agaricus	071231			x	x	x
		Mushrooms of genus Auricularia	071232			x	x	x
		Mushrooms of genus Tremella	071233			x	x	x
		Mushrooms of other species	071239			x	x	x
	Prepared or preserved	Mushroom of genus Agaricus	200310	x	x	x	x	x
		Truffles	200320	x	x	x	x	
		Other mushrooms both wild & cultivated (and	200390			x	x	x

		truffle from 2012)						
Berries	Fresh Berries	Strawberries	081010	x	x	x	x	x
		Raspberry, blackberry, mulberry and loganberry	081020	x	x	x	x	x
		Black, white or red currants and gooseberries	081030	x	x	x		x
		Cranberries, bilberries, similar fruits	081040	x	x	x	x	x
		Other fruits	081090	x	x	x	x	x
	Frozen Berries	Strawberries, (uncooked steamed or boiled)	081110	x	x	x	x	x
		Raspberries, mulberries, etc. (uncooked, steam, boil)	081120	x	x	x	x	x
		Fruits and nuts (uncooked, steamed, boiled)	081190	x	x	x	x	x
	Provisionally preserved berries	Strawberries provisionally preserved	081220	x	x			
		Fruits and nuts, provisionally preserved	081290	x	x	x	x	x
	Dried berries	Fruits	081340	x	x	x	x	x
		Mixtures of edible nuts, dried and preserved fruits	081350	x	x	x	x	x
	Fennel seeds, juniper berries	Entire and crushed	090950	x	x	x	x	
		Not crushed	090961					x
		Crushed	090962					x
	Berry jam	Homogenised jams, jellies, etc.	200710	x	x	x	x	x
		Jams, fruit jellies, purees and pastes, except citrus	200799	x	x	x	x	x
	Berry prepared or preserved	Strawberries	200880	x	x	x	x	x
		Mixtures of edible parts of plants	200892	x	x	x	x	
		Cranberries (*Vaccinium macrocarpon*, V. oxycoccos, *V. vitis-idaea*)	200893					x
		Mixtures	200897					x
		Other	200899	x	x	x	x	x
	Berry juice	Single fruit juice (not fermented or in spirit)	200980	x	x	x	x	
		Cranberries (*Vaccinium macrocarpon*, *V. oxycoccos, V. vitis-idaea*)	200981					x
		Other fruits juice	200989					x
		Mixtures of juices	200990	x	x	x	x	x

Annex II The turpentine of larch and the essential oil mugolio (Source: for turpentine direct interview with Mauro Iori; for mugolio Battistel and Pietrogiovanna ,2006)

The **turpentine**, which is obtained from the distillation of the resin, can be extracted from pines and firs, but the one extracted from the larch is the most valuable. The turpentine is used as a solvent in the paint industry, to melt the wax, for mastics, adhesives, lubricants, and in pharmacy for its revulsive action (decongestant). It was once used as a pitch in the caulking of the boats. Until the '50s of the last century, the extraction of this resin was widely practiced in north Italy, especially in the mountains of Trentino-South Tyrol, Friuli and Veneto.

In Val di Sole, Trentino, the extraction of the resin from the larch has been developed more than in other parts, because of the great quantity of larches. The man who conducted this activity was called *argaiól*, from *argà* (= turpentine). Now, in Trentino, as in other areas, this activity is almost completely disappeared.

Mauro Iori is an exception. He is the only one that today practices this activity in Trentino, except for an old man in Grauno, which does not sell it. Iori has a firm in Monclassico and he manufactures and exports pure larch turpentine. He is a small artisan, working at this only in summer and autumn (during the winter he has another job). Now also his daughter has joined the profession, with satisfaction.

To obtain the resin, the larches are incised with a hand auger at the level of the base of the plant, creating a hole of about 32mm. The depth of the hole is variable, depending on the diameter of the tree. Subsequently, the hole is closed with a plug of wood. The collection occurs 2/3/4 years later, during the autumn, using a specific spatula and a bucket made of wood. After being collected, the resin is filtered, obtaining the so called argà (Fig.1).

Fig.1 The plugged hole in a larch and a can of turpentine of larch

Iori learned the expertise from his father-in law. However, in the '90, when he learned how to work on the larches, the extraction of the resin was no longer possible: in Trentino in 1952 this activity was banned by the Provincial authority. According to the authority, the extraction ruined the trees, so it was decided that it was no longer tolerable. Iori started to study the literature, and he discovered scientific evidences that this is not true. The resination of the larch does not compromise the ecologic functions and the wood production. He decided to bring these evidences at Provincial level. And after a discussion that took a period of time, the authorities decided that the activity can be conducted.

So Iori started his work in 1999. He re-created all the hands tools, thanks to his father-in-law's memory and his inventive.

Now he produces about 1200-1300 kg of product per year, drilling about 1000 larches/year. The trees are on the Municipal territory, or on the ASUC's one153, with whom he stipulates a

[153] Amministrazione Separata Usi Civici (Separated Administration of Commons).

contract, paying a sum, to obtain the permission to withdraw the turpentine from the larches.
Iori started from zero and he searched the buyers in Italy and abroad. In Italy there is a minimal demand of the turpentine extracted from the plants, which has been overcome by the chemical's one. There is a little niche market for cosmetic products, so he sells to little firms in the region and in Veneto. He sells also the product to a firm in Florence, which use it in the painting industry. This niche market absorbs 1% of the production. The bulk goes in Germany and in Austria, where it is used for the pharmaceutic industry and for wood treatments.
A side activity related to this re-discovered craft is based on the fact that it represents a pride for the valley. Iori became famous and he shares with public speaking the characteristic of a traditional and ecological compatible job. In the valley the "itinerary of the turpentine" has been created, co-financed by the funds of Rural Development Programme, Axis 4-LEADER, European Agricultural Fund for Rural Development (EAFRD), by State Funds and by Provincial Funds

Mugolio is an essential oil derived from Pinus mugo. Its extraction is a traditional, still in place, activity than occurs mainly in South Tyrol.
Once obtained the permission from the Provincial forest service, the operator manually cuts the branches of the pine. The crushing of the tree material permits the release of the essences, which are found in various parts of the plant: in the wood, in the needles and in the cones.

Fig.2 Mugolio

The transformation process takes place through steam distillation, which consists in bringing the bio material into contact with water vapour that drags with it the essential oils. The distillation lasts from 5 to 6 hours. 100 kg of raw material produce around 650-1,000 g of essence.
The medicinal properties of the essential oil are traditionally used for purifying the air, for balsamic scent and for beauty treatment, which are very appreciated also by tourists. The needles are used for a "pesto" that accompanies meat dishes based on game,
Mugolio is the first essential oil in the world certified by Programme for the Endorsement of Forest Certification (PEFC), offering to the buyer the guarantee of the sustainability of the sources and traceability of the origin.

Annex III Questionnaire used in the supply chain survey in Trentino-South Tyrol

Being the questionnaires for the supply chains actors very similar (differing only in some few sections) only the one that targeted producers is reported.

- Information in square brackets is for the interviewer → […]
- Information in the normal brackets is for the respondent → (…)
- The parts highlighted in yellow should be modified by the interviewer according to the supply chain he/she wants to target (substitute [**target NWFP**] with the product indicated in question B).

[START PRELIMINARY INFO]

A. **Please select the NWFP product group for which the respondent was contacted.**

☐ *a.* Tree leaves, flowers and foliage (floral green) ☐ *b.* Forest nuts ☐ *c.* Mushrooms

☐ *d.* Truffles ☐ *e.* Berries ☐ *f.* Edible plants

☐ *g.* Aromatic plants ☐ *h.* Medicinal plants ☐ *i.* Sap or resin

☐ *j.* Other: _____

B. **Municipality of organization/respondent's seat.** ……..

_____

C. **All other location(s).** ……..

_____

D. **Organization/respondent's name.** ……

_____

(Indicate the name of the holding if the organization has two or more controlled firms)

E. **ID number** (progressive number of the interview). ……..

|__|__|__|

[Each ID is unique among all the questionnaires; if the organization answers more than one supply chain questionnaires the ID has to remain the same]

[ABOUT THE ORGANIZATION]

1. **You are a** … (*tick only one option, and fill the related sub-questions*):

☐ *a.* **Single picker/producer or family based activity**;

☐ *b.* **A co-operative**;

1.1. Number of permanent pickers/producers. …….. |__|__|__|

1.2. Number of seasonal pickers/producers. …… |__|__|__|

1.3. When was your organization founded? …….. Year: |__|__|__|__|

☐ *c.* **A small-medium enterprise (between 2-200 employees)**;

1.4. Number of permanent employees. …… |__|__|__|

1.5. Number of seasonal employees/pickers/providers. …… |__|__|__|

1.6. When was your organization founded? …… Year: |__|__|__|__|

☐ *d.* **Other: please explain**

_____

2. **Which of the following classes describes the best your activity?** (if two or more classes are appropriate specify the proportion of time spent on this activity)

☐ Producer (collecting wild products from the forest); …… |__|__|__| % total time

☐ Processor (transforming the raw product); ……. |__|__|__| % total time

☐ Wholesaler (no processing, only selling the products to other retailers); ….. |__|__|__| % total time

☐ Retailer (no processing, selling products to end-users); …….. |__|__|__| % total time

3. **Are you registered in a formal business register?** …….. ☐ yes; ☐ no
   3.1. **In which one?**
   ☐ *a.* the chamber of commerce
   ☐ *b.* an entrepreneur association
   ☐ *c.* other: _____
4. **What was your organization's gross turnover in 2013?**
   ☐ *a.* less than 10,000 €
   ☐ *b.* 10,000 – 50,000 €
   ☐ *c.* 50,000 – 100,000 €
   ☐ *d.* 100,000 – 500,000 €
   ☐ *e.* 500,000 – 2,000,000 €
   ☐ *f.* more than 2,000,000 €
5. **What share of your turnover is generated by NWFP?** .....|__|__|__| %
6. **What change in turnover do you expect for 2014?** ..... |__|__|__| % (write the estimated %, e.g., + 20%)

[SPECIFIC PART]

7. **Are [target NWFP] your main income source?** ☐ yes; ☐ no
8. **What is the total quantity of [target NWFP] that you traded in 2013? |__|__|__|__|__|__|__|__|** kg
9. **Which are the main [target NWFP] species you produce/trade? Please, list them according to the commercial value, from the most to the least important.** [in case of medicinal and aromatic plants or foliage, please use categories instead of species, where the producer has a large variability of species]
   a)_____; (it will be the subject of question 10)
   b) _____; (it will be the subject of question 11)
   c) _____; d) _____; e) _____;
   f) _____; g) _____; h) _____;

The following questions (10 and 11) are related to the first two species from the above list.

[ONLY RAW]

[INPUT RAW - SPECIES A]

10. **About** [insert species "a" name] _____
    10.1. **How many kg did you produce last year (2013)?** …… |__|__|__|__|__|__|__|__|kg
    10.2. **Do you collect only in the wild, or do you also crop this species?** (indicate the percentage)
    ☐ *a.* only in the wild; ☐ *b.* partially cropped.... |__|__|%
    10.3. **How many days were used for producing/collecting this [target NWFP] species last year (2013)?**
    ……..
    |__|__|__|days
    10.3.1. (only for family based activities) Could you estimate the average time per day you spend in the collection/production? ……..……..
    |__|__|hours
    10.4. **Does the production take place in a forest you own or manage (i.e. rented forest)?** ☐ yes; ☐ no
    10.4.1. How many hectares are used for the production?
    |__|__|__| ha in property; |__|__|__| ha rented/managed.
    10.4.2. What percentage of the total production is generated in forests managed by you?
    |__|__|__|%
    10.5. **Do you collect in other forests?** …… ☐ yes, ☐ no
    10.5.1. How much does the license/concession cost per year? |__|__|__| € - free collection ☐
    10.6. **Do you collect only in this (administrative) region?** …… ☐ yes, ☐ no
    10.7. **What is the average distance from your premises to your main collection sites?**|__|__|__|km

[OUTPUT RAW – SPECIES A]

10.8. **Which percentage of the quantity you produce is sold raw (fresh, cleaned, sorted)?**
|__|__|__| % (if 0%, go to 10.16)

10.9. **Do you use any grading scheme when selling your non-processed species?** ☐
yes ☐ no

10.9.1. **What is the basis of the grading system?**
- ☐ Product size;
- ☐ Product shape;
- ☐ Product maturity;
- ☐ Product location;
- ☐ Product aesthetics (absence of biotic damages);
- ☐ Other:_____

10.10. **Do you pack this species?** ……☐
yes, ☐ no

10.10.1. **Do you use your own brand in the packaging?** ……
☐ yes, ☐ no

10.11. **For each category of fresh product, could you state the quantity and average selling price in the last year (2013)?**

10.11.1. ☐ raw unsorted; Quantity: _____kg; Average price _____€/kg

10.11.2. ☐ raw sorted;

10.11.2.1. Grade quality _____ Quantity: _____kg; Average price _____€/kg

10.11.2.2. Grade quality _____ Quantity: _____kg; Average price _____€/kg

10.11.2.3. Grade quality _____ Quantity: _____kg; Average price _____€/kg

10.11.3. ☐ pack un-branded; Quantity: _____kg; Average price _____€/kg

10.11.4. ☐ pack branded; Quantity: _____kg; Average price _____€/kg

10.12. **Who are your customers for this raw species**? Please indicate the percentage for each category.
- ☐ Other producers; …… _____ %;
- ☐ Processors; …… _____ %;
- ☐ Wholesalers; …… _____ %;
- ☐ Large retailers; …… _____ %;
- ☐ Small retailers; …… _____ %;
- ☐ Hotels, Restaurants, Catering; …… _____ %;
- ☐ Private individuals; …… _____ %;
- ☐ Other _____: …… _____ %;

10.13. **What is your target market for this raw species?** Please assess the percentage of the sold products on the different markets.
- ☐ Local; …… (____%)
- ☐ Regional; …… (____%)
- ☐ National; …… (____%)
- ☐ EU countries; …… (____%)

(Please list the two most important countries: 1)_____ 2)_____

☐ International; …… (____%)

(Please list the two most important countries: 1)_____ 2)_____

10.14. **What percentage of your total turnover does this species generate?** _____%

10.15. **Since you are a key actor of the supply chain, could you assess the price evolution of this raw species from the field to the final consumer?** (You can provide further information if needed) [if Face-to-Face take notes if needed]

Pickers/producers	→	Processors	→	Wholesalers	→	Retailers
_____ €/kg		_____ €/kg		_____ €/kg		_____ €/kg

[PROCESSING – SPECIES A]

10.16. **Do you also process part of this species?** …… ☐ yes; ☐ no (go to 11)

10.16.1. **Which products do you generate through the processing?**

Please, list them according to the commercial value, from the most to the least important.

a)_____; (it will be the subject of question 10.16.2)
b) _____; (it will be the subject of question 10.16.2)
c) _____; d) _____; e) _____;
f) _____; g) _____; h) _____;

10.16.2. **Focusing on the first two, could you state the quantity, the average selling price, your customers and the geographical market, in the last year (2013)?**

Processed products	**Selling / OUTPUT PROCESSED – SPECIES A**			
	Average price	**Quantity**	**Customers**	**Market**
a._____ ☐ own brand? Notes: _____	_____€/kg	_____k g or _____unit	☐ other producers __% ☐ processors __% ☐ wholesalers __% ☐ large retailers __% ☐ small retailers __% ☐ hotels, restaurants __% ☐ private individuals __%	☐ Local ___% ☐ Regional ___% ☐ National ___% ☐ EU countries ___% countries: 1)_____ 2)_____ ☐ International ___% countries: 1)_____ 2)_____
b._____ ☐ own brand? Notes: _____	_____€/kg	_____k g or _____unit	☐ other producers __% ☐ processors __% ☐ wholesalers __% ☐ large retailers __% ☐ small retailers __% ☐ hotels, restaurants __% ☐ private individuals __%	☐ Local ___% ☐ Regional ___% ☐ National ___% ☐ EU countries ___% countries: 1)_____ 2)_____ ☐ International ___% countries: 1)_____ 2)_____

[INPUT RAW - SPECIES B]

11. **About** [insert species "b" name] _____

11.1. **How many kg did you produce last year (2013)?** …… |__|__|__|__|__|__|__|__|kg

11.2. **Do you collect only in the wild, or do you also crop this species?** (indicate the percentage)

☐ *a.* only in the wild; ☐ *b.* partially cropped.... |__|__|%

11.3. **How many days were used for producing/collecting this [target NWFP] species last year (2013)?**
……..
|__|__|__|days

11.3.1. (only for family based activities) Could you estimate the average time per day you spend in the collection/production? ……..……..
|__|__|hours

11.4. **Does the production take place in a forest you own or manage (i.e. rented forest)?**
☐ yes; ☐ no

11.4.1. How many hectares are used for the production?
|__|__|__| ha in property; |__|__|__| ha rented/managed.

11.4.2. What percentage of the total production is generated in forests managed by you?
|__|__|__|%

11.5. **Do you collect in other forests?** …… ☐ yes, ☐ no

11.5.1. How much does the license/concession cost per year? |__|__|__| € - free collection ☐

11.6. **Do you collect only in this (administrative) region?** …… ☐ yes, ☐ no

11.7. **What is the average distance from your premises to your main collection sites?**|__|__|__|km

[OUTPUT RAW – SPECIES B]

11.8. **Which percentage of the quantity you produce is sold raw (fresh, cleaned, sorted)?**
|__|__|__| % (if 0%, go to 10.16)

11.9. **Do you use any grading scheme when selling your non-processed species?** ☐
yes ☐ no

11.9.1. **What is the basis of the grading system?**
- ☐ Product size;
- ☐ Product shape;
- ☐ Product maturity;
- ☐ Product location;
- ☐ Product aesthetics (absence of biotic damages);
- ☐ Other:_____

11.10. **Do you pack this species?** ……☐
yes, ☐ no

11.10.1. **What type of packaging do you have?**
- ☐ Box pallet
- ☐ Large package for industry
- ☐ Package for restaurants
- ☐ Family use package;
- ☐ Single use package
- ☐ Other: _____

11.10.2. **Do you use your own brand in the packaging?** …….
☐ yes, ☐ no

11.11. **For each category of fresh product, could you state the quantity and average selling price in the last year (2013)?**

11.11.1. ☐ raw unsorted; Quantity: _____kg; Average price _____€/kg

11.11.2. ☐ raw sorted;

11.11.2.1. Grade quality _____ Quantity: _____kg; Average price _____€/kg

11.11.2.2. Grade quality _____ Quantity: _____kg; Average price _____€/kg

11.11.2.3. Grade quality _____ Quantity: _____kg; Average price _____€/kg

11.11.3. ☐ pack un-branded; Quantity: _____kg; Average price _____€/kg

11.11.4. ☐ pack branded; Quantity: _____kg; Average price _____€/kg

11.12. **Who are your customers for this raw species**? Please indicate the percentage for each category.

☐ Other producers; …… _____ %;

☐ Processors; …… _____ %;

☐ Wholesalers; …… _____ %;

☐ Large retailers; …… _____ %;

☐ Small retailers; …… _____ %;

☐ Hotels, Restaurants, Catering; …… _____ %;

☐ Private individuals; …… _____ %;

☐ Other _____: …… _____ %;

11.13. **What is your target market for this raw species?** Please assess the percentage of the sold products on the different markets.

☐ Local; …… (____%)

☐ Regional; …… (____%)

☐ National; …… (____%)

☐ EU countries; …… (____%)

(Please list the two most important countries: 1)_____ 2)_____

☐ International; …… (____%)

(Please list the two most important countries: 1)_____ 2)_____

11.14. **What percentage of your total turnover does this species generate?** _____%

11.15. **Since you are a key actor of the supply chain, could you assess the price evolution of this raw species from the field to the final consumer?** (You can provide further information if needed) [if Face-to-Face take notes if needed]

Pickers/producers	→	Processors	→	Wholesalers	→	Retailers
_____ €/kg		_____ €/kg		_____ €/kg		_____ €/kg

[PROCESSING – SPECIES B]

11.16. **Do you also process part of this species?** …… ☐ yes; ☐ no (go to 12)

11.16.1. **Which products do you generate through the processing?**

Please, list them according to the commercial value, from the most to the least important.

a)_____; (it will be the subject of question 10.16.2)
b) _____; (it will be the subject of question 10.16.2)
c) _____; d) _____; e) _____;
f) _____; g) _____; h) _____;

11.16.2. **Focusing on the first two, could you state the quantity, the average selling price, your customers and the geographical market, in the last year (2013)?**

Processed products	**Selling / OUTPUT PROCESSED – SPECIES B**			
	Average price	**Quantity**	**Customers**	**Market**
a._____ _ ☐ own brand? Notes:	_____€/kg	_____k g or _____unit	☐ other producers __% ☐ processors __% ☐ wholesalers __% ☐ large retailers __% ☐ small retailers __% ☐ hotels, restaurants __%	☐ Local ___% ☐ Regional ___% ☐ National ___% ☐ EU countries ___% countries: 1)_____

_____ _____			☐ private individuals __%	2)_____ ☐ International ___% countries: 1)_____ 2)_____
b._____ _ ☐ own brand? Notes: _____ _____	_____€/kg	_____k g or _____unit	☐ other producers __% ☐ processors __% ☐ wholesalers __% ☐ large retailers __% ☐ small retailers __% ☐ hotels, restaurants __% ☐ private individuals __%	☐ Local ___% ☐ Regional ___% ☐ National ___% ☐ EU countries ___% countries: 1)_____ 2)_____ ☐ International ___% countries: 1)_____ 2)_____

[GENERAL PROCESSING]

12. **About all [target NWFP], do you also process part of the raw material?** …… ☐ yes; ☐ no (go to 13)

12.1. **How do you process this species?** (provide notes if needed)

Mechanically	**Physically**	**Chemical**	**Other processing**
☐ cutting	☐ cooking	☐ fermentation	
☐ crushing	☐ jamming	☐ denaturation	
	☐ freezing	☐ distillation	
	☐ drying		
	☐ sterilization		
	☐ extraction	☐ other: _____	☐ other: _____
☐ other:_____	☐ other: _____		

12.2. **How many processed products do you totally trade?** |__|__|__|

[ADDITIONAL]

13. **Do you also trade any product that contains…**

Nuts	☐ yes, ☐ no
Berries	☐ yes, ☐ no
Mushrooms	☐ yes, ☐ no
Truffle	☐ yes, ☐ no
Foliage and moss (floral green)	☐ yes, ☐ no
Aromatic plants	☐ yes, ☐ no
Medicinal plants	☐ yes, ☐ no
Other _____	

14. **Could you provide the names of other producers like you in your region?**_____

[CONTACTS INFORMATION]

[The following information should be collected by the CSR before the interview. In case of CAWI you need to add these questions]

15. **Respondent's role in the organization?**
    - ☐ *a.* owner
    - ☐ *b.* manager
    - ☐ *c.* member (for cooperatives)
    - ☐ *d.* employee (expert/technician)
    - ☐ *e.* employee
    - ☐ *f.* external contractor
16. **Phone number**: _____
17. **E-mail:** _____

Annex IV Italian NWFP trade: comparison with global and European trade in MUS$ (Source. Data from Comtrade, 2014)

	Code	Level of processing	Part of wild harvest?	World 2011	From EU28 2011	To EU28 2011	EU28 balance	World-EU28 Exp. %	World-EU28 Imp. %	From IT 2011	To IT 2011	Italian balance	World-Italy Exp. %	World-Italy Imp. %	EU28-Italy Exp. %	EU28-Italy Imp. %
Honey	040900	Raw	Yes	1906	616	1019	-403	32,34	53,48	33	62	-29	1,74	3,28	5,38	6,13
Fresh & frozen Agaricus	070951	Raw	No	1302	1102	972	129	84,63	74,68	4	12	-9	0,27	0,92	0,32	1,24
Fresh & frozen truffles	070952	Raw	Yes	-	-	-	-	-	-	-	-	-	-	-	-	-
Fresh & frozen mushrooms	070959	Raw	Yes	785	414	480	-66	52,69	61,12	58	51	7	7,38	6,45	14,01	10,55
Preserved Agaricus	071151	Processed	No	101	32	53	-21	32,07	52,99	0	31	-31	0,13	30,74	0,41	58,01
Preserved mushrooms	071159	Processed	Yes	119	17	85	-68	14,45	71,68	1	46	-45	1,06	38,73	7,33	54,02
Dried mushrooms	071230	Raw	Yes	-	-	-	-	-	-	-	-	-	-	-	-	-
Dried Agaricus	071231	Raw	No	116	41	58	-17	35,52	49,94	4	7	-3	3,65	5,96	10,27	11,93
Dried Auricularia	071232	Raw	Yes	196	4	16	-12	1,95	8,12	1	1	0	0,59	0,35	30,06	4,27
Dried Tremella	071233	Raw	Yes	55	1	2	0	2,30	3,08	0	1	0	0,58	1,41	25,03	45,85
Dried mushrooms	071239	Raw	Yes	1370	71	170	-100	5,17	12,44	15	40	-25	1,12	2,92	21,63	23,46
Almonds	080211	Raw	No	1043	36	55	-19	3,41	5,28	3	8	-5	0,32	0,80	9,37	15,13
Shelled almonds	080212	Processed	No	3369	671	1710	-1038	19,93	50,75	50	181	-131	1,47	5,37	7,38	10,58
Hazelnuts	080221	Raw	No	180	25	41	-17	13,61	23,00	6	17	-11	3,37	9,52	24,76	41,39
Shelled hazelnuts	080222	Processed	No	1782	296	1342	-1046	16,60	75,32	112	332	-219	6,31	18,63	38,04	24,73
Walnuts	080231	Raw	No	987	164	308	-144	16,61	31,23	5	120	-115	0,50	12,14	2,99	38,87
Shelled walnuts	080232	Processed	No	1545	219	678	-459	14,15	43,88	14	49	-34	0,91	3,14	6,44	7,16
Chestnuts	080240	Raw	Yes	299	153	121	31	51,05	40,60	80	24	55	26,65	8,10	52,19	19,96
Pistachios	080250	Raw	No	3013	524	1287	-763	17,38	42,70	16	119	-103	0,54	3,97	3,11	9,29
Fresh strawberries	081010	Raw	No	2579	1604	1533	71	62,18	59,41	63	109	-46	2,43	4,21	3,90	7,08
Fresh raspberry	081020	Raw	No	1173	410	442	-32	34,97	37,70	7	20	-13	0,58	1,70	1,65	4,52
Fresh currants	081030	Raw	No	-	-	-	-	-	-	-	-	-	-	-	-	-
Fresh cranberries	081040	Raw	Yes	1428	345	488	-143	24,14	34,18	8	20	-12	0,59	1,42	2,43	4,15
Fresh other	081090	Raw	No	2948	713	914	-201	24,19	30,99	21	67	-46	0,73	2,28	3,00	7,37
Frozen strawberries	081110	Raw	No	1090	479	706	-227	43,95	64,73	10	25	-15	0,96	2,30	2,17	3,55
Frozen raspberries	081120	Raw	No	951	416	694	-278	43,72	73,00	4	22	-17	0,44	2,27	1,00	3,11
Frozen fruits and nuts	081190	Raw	Yes	2530	1033	1484	-451	40,82	58,66	60	76	-16	2,35	2,98	5,76	5,09
Prepared Agaricus	200310	Processed	No	1179	572	568	4	48,48	48,17	11	21	-10	0,95	1,80	1,95	3,74
Prepared truffles	200320	Processed	Yes	29	24	17	6	82,02	59,62	14	1	13	49,45	4,47	60,30	7,50
Prepared mushrooms	200390	Processed	Yes	228	84	87	-3	36,77	38,20	9	5	4	4,10	2,38	11,16	6,22
Quebracho tannins	320110	Raw	Yes	85	7	32	-25	8,27	37,07	2	17	-15	2,62	19,73	31,66	53,22
Wattle tannins	320120	Raw	Yes	130	4	24	-19	3,37	18,25	1	11	-10	0,97	8,83	28,73	48,38
Other tannins	320190	Raw	Yes	195	92	57	35	47,05	29,12	26	16	10	13,58	8,42	28,88	28,91
Natural Cork	450110	Raw	Yes	147	140	132	8	94,88	89,67	10	9	0	6,61	6,38	6,97	7,12
Cork in piecies	450190	Processed	Yes	93	79	69	10	84,94	74,10	4	4	0	4,38	3,89	5,16	5,25
Cork squared	450200	Processed	Yes	72	63	42	21	87,82	58,45	1	3	-2	1,12	4,15	1,28	7,09
Cork Stopper	450310	Processed	Yes	743	705	406	299	94,92	54,71	32	53	-21	4,34	7,15	4,58	13,08
		Total overview		35403	12086	17247	-5161	34,14	48,72	796	1629	-833	2,25	4,60	6,59	9,45

Annex V Mushroom picking service organization in Val di Fiemme

Service commercialised	Mushroom picking permits
Product commercialised	None within the Institutional Fiemme valley framework
Customers of the service	Non-residents in Trento Province that are willing to collect mushrooms
Rules for collection	Max 2 kg per person. Persons living in the municipalities of Val di Fiemme and the MCF, persons living in the province of Trento, non-resident owners of a forest of at least one hectare wishing to pick mushrooms in their property, persons born in the Province of Trento but not residing there, are exempt to pay the permit.
Collecting area	Val di Fiemme (about 25,000 ha), except the Municipality of Capriana. Limitation in the Paneveggio Park, where only residents have right of commons
Administrator of the service and beneficiary	Magnifica Comunità di Fiemme
Other administration involved in the decision making and in benefits sharing	Predazzo, Ziano di Fiemme, Panchià, Tesero, Cavalese, Varena, Daiano, Carano, Castello/Molina di Fiemme and Regola Feudale di Predazzo
Other administrations involved	APT- Touristic Board
Promotion	Flyers, websites, (www.visitfiemme.it/cosa-fare/estate/andar-per-funghi),www.mcfiemme.eu, website of the Municipalities
Number of permits sold on average in the period 2003-2013	9,421
Average gross earning per year	200,000 €
Human resources hired with the revenues of the service	4 mushrooms guards seasonally employed
Equipment payed with the revenues of the service	2 cars
Destination of the other revenues (net of expenses)	i) information concerning the behaviour to follow in mushroom picking; ii) environmental education; iii) amelioration of the ecosystems and the agro-forestry-pastoral heritage; Mainly: i) maintenance of forest roads, ii) management of grazing areas, ii) infrastructures against landslides; iv) mushroom identification service
Indirect beneficiary of the service	Touristic facilities, hotels, restaurants and commercial activities in general benefits for mushroom pickers (and their families) presence.

Annex VI List of the Italian participated A/R CDM projects

The table reports the reference to the project number and name, registration date, the host party and the project location, the other parties involved, the finance and management, the methodology used, the species used and the statements of the PDDs about the naturalization of non-native species.

Project number and name	Registration date	Host Party and location	Other Parties involved	Finance and management	Methodology	Species		PDDs statements about naturalization of non-native species
						Native	Non-native	
Project 0547: Facilitating Reforestation for Guangxi Watershed Management in Pearl River Basin	10 Nov 06	China (Guangxi Zhuang autonomous region)	Canada*,Italy, Luxembourg, France,Japan, Spain	BioCF Private Sector led projects	Large scale. AR-AM0001 ver. 2 - Reforestation of degraded land	*Pinus massoniana, Liquidambar formosana, Cunninghamia lanceolata, Schima superba*	*Eucalyptus spp***	Eucalyptus was introduced into China about 100 years ago and has been widely planted in Southern China, including in the Guangxi region, for several decades and has shown no invasive characteristics
Project 1948: Moldova Soil Conservation Project	30 Jan 09	Republic of Moldova (all the Country's district, except of Transnistria)	Canada*, Netherlands, Italy,Finland, Luxembourg, France, Sweden,United Kingdom of Great Britain and Northern Ireland, Japan, Norway,Spain	BioCF Government and Non-Profit led projects	Large scale. AR-AM0002 - Restoration of degraded lands through afforestation/reforestation	*Quercus robur, Fraxinus excelsior, Salix alba, Populus alba, Populus nigra, etc.*	*Robinia pseudoacacia**, *Gleditschia triachantos, Sophora japonica, Elaeagnus angustifolia, Pinus nigra,* etc.	The long-term experience of forest management in Moldova has shown that Robinia is widely adapted to poor sites, on which other species cannot be established through cost effective means. The Robinia plantations account for more than 50% of area

								afforested in the country since 1950
Project 1578: Uganda Nile Basin Reforestation Project No.3	21 Aug 09	Uganda (Mbarara-Rwampara county, Isingiro-Isingiro county and Ntungamo-Ruhama county districts)	Canada*,Italy, Luxembourg, France,Japan , Spain	BioCF Government and Non-Profit led projects	Small scale. AR-AMS0001 ver. 5 - Simplified baseline and monitoring methodologies for small-scale afforestation and reforestation project activities under the clean development mechanism implemented on grasslands or croplands	*Maesopsis eminii, Prunus africana*	*Pinus caribea***	*Pinus caribaea* is widely tested in Uganda and adaptable to a number of site conditions. *P. caribaea* was introduced to Uganda around 1960
Project 2712: Humbo Ethiopia Assisted Natural Regeneration Project	07 Dec 09	Ethiopia (Southern Nations Nationalities and Peoples Region – SNNPR-, Wolayita zone, Humbo Woreda)	Canada*,Italy, Luxembourg, France,Japan, Spain	BioCF Government and Non-Profit led projects	Large scale. AR-AM0003 ver. 4 - Afforestation and reforestation of degraded land through tree planting, assisted natural regeneration and control of animal grazing	*Acacia spp., Aningeria adolfifericii, Podocarpus facutus, Olea africana, Cordia africana, Croton macrostachytus, Erthrina spp., Ficus spp, Hagenia abyssinica*	*Grevillea Robusta*, Eucalyptus globulus***	The naturalized species such as *Grevillea robusta* and *Eucalyptus globulus* are also considered for planting in blocks and on the perimeter of the sites.
Project 2714: Assisted Natural Regeneration of Degraded Lands in Albania	02 Jan 10	Albania (Diber, Elbasan, Korce, Kukes, Shkoder)	Canada*,Italy, Luxembourg, France,Japan, Spain	BioCF Government and Non-Profit led projects	Large scale. AR-AM0003 ver. 4 - Afforestation and reforestation of degraded land through tree planting, assisted natural regeneration and control of animal grazing	*Betula verrucosa, Cerasus avium, Acer spp., Faraxinus excelsior, Juglans regia, Quercus cerris, Quercus frainetto, Quercus petraea, Castanea Sativa, Pinus halepensis Pinus nigra*	*Robinia pseudoacacia**, *Populus canadiensis***	[…]Naturalized species such as *Robinia pseudoacacia* and *Populus canadiensis*
Project 2569: Reforestation as Renewable Source of Wood Supplies for Industrial Use in Brazil	21 Jul 10	Brazil (Minas Gerais)	Netherlands, Italy,Luxembourg, France, Ireland, Switzerland, Japan,Spain, Switzerland, Finland,Norway	BioCF Private Sector led projects	Large scale. AR-AM0005 - Afforestation and reforestation project activities implemented for industrial and/or commercial uses	-	Hybrid clones of *Eucalyptus urophyla*, *Eucalyptus grandis* and *Eucalyptus camaldulensis*	-
Project 3887:AES Tietê Afforestation/Reforestation Project in the State of São Paulo, Brazil	07 Jan 11	Brazil (Southeastern region of Brazil, States of São Paulo and Minas Gerais)	Canada*,Italy, Luxembourg, France,Japan, Spain	BioCF Private Sector led projects	Large scale.AR-AM0010 ver. 4 - Afforestation and reforestation project activities implemented on unmanaged grassland in reserve/protected areas	80 to 126 native tree and shrub species. In large quantities: *Anadenanthera columbrina, Anadenanthera macrocarpa,*	-	-

						Guazuma ulmifolia, Croton floribundus, Vitex montevidensis, Cordia trichotoma, Ficus guaranitica, Peltophorun dubium, Balfourodendron riedelianum, Cariniana estrellensis, Cedrela fissilis		
Project 4531: Improving Rural Livelihoods Through Carbon Sequestration By Adopting Environment Friendly Technology based Agroforestry Practices	28 Feb 11 *(Date of registration action 06 Jun 11)*	India (Districts of Koraput, Kalahandi e Rayagada in Orissa; districts Visakhapatnam, Vizianagaram and Srikakulam in Andhra Pradesh)	Canada*, Italy, Luxembourg France,Japan, Spain	BioCF Private Sector led projects	Large scale. AR-AM0004 ver. 3 - Reforestation or afforestation of land currently under agricultural use	*Casuarina equisetifolia*	*Eucalyptus Clone, Eucalyptus Seed Route, (E. grandis, E. camaldulensis, and E. tereticornis)*	-
Project 3970:Southern Nicaragua CDM Reforestation Project	07 May 11	Nicaragua (Departments of Rivas and Rio San Juan)	Canada*,Italy. Luxembourg, France, Japan, Spain	BioCF Private Sector led projects	Small scale. AR-AMS0001 ver. 5 - Simplified baseline and monitoring methodologies for small-scale afforestation and reforestation project activities under the clean development mechanism implemented on grasslands or croplands	*Astronium graveolens, Bombacopsis quinata, Hymenaea courbaril, Albizia guachapele, Tabebuia rosea, Vochysia Guatemaltensis, Terminalia oblonga, Hyeronyma Alchorneoides, Samanea saman, Virola koschnyi, Schizolobium Parahyba, Swietenia macrophylla Dalbergia retusa, Cedrela odorata, Dipteryx panamensis, Platymiscium pleistotachium*	*Tectona grandis*	-
Project 3206:Aberdare Range/ Mt. Kenya Small Scale Reforestation Initiative Kamae-Kipipiri Small Scale A/R Project	11 Jun 11	Kenya (Lari Constituency, Kinangop Constituency)	Canada*, Italy, Luxembourg, France, Japan Spain	BioCF Government and Non-Profit led projects	Small scale. AR-AMS0001 ver. 5 - Simplified baseline and monitoring methodologies for small-scale afforestation and reforestation project activities under the clean development mechanism	*Croton macrocarpus, Cordia africana, Markhamia lutea, Juniperus procera, Podocarpus sp, Prunis africana, Vitex keniensis*	-	-

					implemented on grasslands or croplands			
Uganda Nile Basin Reforestation Project No.5	20 Jun 11*(Date of registration action 15 Sep 11)*	Uganda (Mbarara-Rwampara county, Isingiro-Isingiro county, and Ntungamo-Ruhama county districts)	Japan, Italy, Spain, Luxembourg, France	BioCF Government and Non-Profit led projects	Small scale. AR-AMS0001 ver. 5 - Simplified baseline and monitoring methodologies for small-scale afforestation and reforestation project activities under the clean development mechanism implemented on grasslands or croplands	-	*Pinus caribea***	*Pinus caribaea is widely tested in Uganda and adaptable to a number of site conditions. P. caribaea was introduced to Uganda around 1960*
Project 4939:Uganda Nile Basin Reforestation Project No. 1	23 Aug 11*(Date of registration action 23 Nov 11)*	Uganda,(Mbarara-Rwampara county, Isingiro-Isingiro county and Ntungamo-Ruhama county) districts	Japan,Italy, Spain, Luxembourg, France	BioCF Government and Non-Profit led projects	Small scale. AR-AMS0001 ver. 5 - Simplified baseline and monitoring methodologies for small-scale afforestation and reforestation project activities under the clean development mechanism implemented on grasslands or croplands	-	*Pinus caribea***	*Pinus caribaea is widely tested in Uganda and adaptable to a number of site conditions. P. caribaea was introduced to Uganda around 1960*
Project 4940:Uganda Nile Basin Reforestation Project No 2	23 Aug 11*(Date of registration action 23 Nov 11)*	Uganda (Mbarara-Rwampara county, Isingiro-Isingiro county and Ntungamo-Ruhama county districts)	Japan, Italy, Spain, Luxembourg, France	BioCF Government and Non-Profit led projects	Small scale. AR-AMS0001 ver. 5 - Simplified baseline and monitoring methodologies for small-scale afforestation and reforestation project activities under the clean development mechanism implemented on grasslands or croplands	-	*Pinus caribea***	*Pinus caribaea* is widely tested in Uganda and adaptable to a number of site conditions. P. caribaea was introduced to Uganda around 1960
Project 4941:Uganda Nile Basin Reforestation Project No 4	29 Aug 11 (Date of registration action 23 Nov 11)	Uganda (Mbarara-Rwampara county, Isingiro-Isingiro county and Ntungamo-Ruhama county districts)	Japan, Italy, Spain, Luxembourg, France	BioCF Government and Non-Profit led projects	Small scale. AR-AMS0001 ver. 5 – Simplified baseline and monitoring methodologies for small-scale afforestation and reforestation project activities under the clean development mechanism implemented on grasslands or croplands	-	*Pinus caribea***	*Pinus caribaea* is widely tested in Uganda and adaptable to a number of site conditions. *P. caribaea* was introduced to Uganda around 1960

Project 3207: Aberdare Range / Mt. Kenya Small Scale Reforestation Initiative Kirimara-Kithithina Small Scale A/R Project	05 Oct 11(Date of registration action 03 Jan 12)	Kenya (Lari Constituency, Kinangop Constituency)	Canada*,Italy, Luxembourg, France,Japan, Spain.	BioCF Government and Non-Profit led projects	Small scale. AR-AMS0001 ver. 5 - Simplified baseline and monitoring methodologies for small-scale afforestation and reforestation project activities under the clean development mechanism implemented on grasslands or croplands	*Croton macrocarpus, Cordia africana, Markhamia lutea, Juniperus procera, Podocarpus sp, Prunis africana, Vitex keniensis*	-	-
Project 7572:Carbon Sequestration in Small and Medium Farms in the Brunca region, Costa Rica (COOPEAGRI Project)	03 Oct 12(Date of registration action 03 Jan 13)	Costa Rica **(**San José/Pérez Zeledón)	Canada* , Japan, Italy, Spain, France, Luxembourg	BioCF Government and Non-Profit led projects	Large scale. AR-AM0004 ver. 4 - Reforestation or afforestation of land currently under agricultural use	*Terminalia amazonica,Hieronyma alchorneoides, Cedrela odorata*, etc.	*Gmelina arborea, Tectona grandis, Eucalyptus deglupta*	-