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Executive summary

This report highlights the main recommendations for policy makers deriving from the results of WP 3 of the StarTree project. The focus of the report is on 3 topics: (a) the need of a new definition of Non-Wood Forest Products (NWFP); (b) the use of a NWFP commodity coding suited to trade analysis; (c) how and in which direction an EU policy for supporting NWFP supply chains could be developed.

(a) We suggest, on the basis of art. 12 of Reg. 834/2007 where “wild products” are defined in relation the harvesting activity, a new definition of NWFP not based on a list of species, as it occurs for cropped or farmed products, but on an economic activity that is carried out in (semi)natural forests. A definition of “forest products from the wild” or simply “wild forest products” (WFP) is much more effective in policy making, in external communication and much suited to give the proper attention to a set of products that are widely collected and consumed by the Europeans and have an increasing economic importance in the rural economy.

(b) International trade data are the most detailed source of information available at global scale. Commodities are classified according to international norms that assign to each product a specific code used to trace trade partners, values and quantities. An overview of the trade data of EU28 with the aim of defining the problems related to commodity coding is presented as the second policy recommendation. A list of NWFP commodity groups was created using the HS coding system valid for the period 2007 and 2011 and it accounted for 48 codes; nonetheless a more complete list was generated with a deeper revision of all the HS coding system that have been released from 1988. In total 69 commodity groups has been found, all related to the NWFP growing in EU. This approach in commodity coding allows a trade analysis specific for the forest products under consideration and a more focused definition of trade trends that are of fundamental importance to define the role of internal production and how it can cover the European growing demand for NWFP.



(c) EU28 has never developed target policies to support the European WFP supply chains, hence the economic actors involved in the different supply chains have organized themselves in order to overcome the vast array of un-coordinated norms, limitations and constrains implemented by the EU member states. We demonstrate, through a comparative analysis of the supply chain of *porcini* wild mushrooms in 4 EU countries, that where the NWFP harvesting and selling is regulated through formal and complex laws, the higher the probability that an informal market will flourish. Property and harvesting rights are only one part of the NWFP policies; the most crucial point is the definition of the mechanism that allows to transfer an informal product into a formal supply chain. Tax law, food security law, traceability, trade laws are all affecting NWFP harvesting and should be better coordinated.



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1 Wild forest product as a topic of concern in policy making

There are no policies without a clear definition of the object of the policy. So far, Non-Timber Forest Products (NTFP) and Non-Wood Forest Products (NWFP) as such have been considered in few European policy frameworks, but there is no direct reference to NWFP in the EU legislation. This is easily understandable: regulations need to define a concept in an affirmative way, not through negations, in order to codify a set of rules around the stated concept. In the case of NWFP, the definition developed by FAO and commonly used by forest professionals and scientists is based on a negative statement. Unfortunately, the non-convergence over one common definition shared by forest and non-forest professionals that can be adopted in decision making as well as in regulation design, law enforcement and monitoring represents a crucial obstacle for the creation of new policies for these wide category of forest products.

1.1 Moving toward a new common definition?

In the late '80s De Beer and McDermott (1989) defined NTFP as *“all biological materials other than timber which are extracted from forest for human use”*. A decade later, FAO introduced a new concept to label all the products generated from the forest not made up of wood introducing the wording *“Non-Wood Forest Products”* defined as *“all goods of biological origin other than wood, derived from forests, other wooded land and trees outside forests”*, hence a NWFP may be gathered from the wild, or produced in forest plantations, agroforestry schemes and from trees outside forests (FAO, 1999). While the concept of Non-Wood Forest Products is relatively well-known among foresters, end-users have a minimal understanding of NWFP wording as a product category. The same happens among end-product producers and retailers, which have rarely used NWFP as acronym for their transaction and marketing campaigns. In fact, NWFP has been commonly substituted with alternative wording like *“products from wild collection”*, *“wild harvested products”*, *“natural (or forest) products”*, *“wild crop”*, *“plants and plant products from collection”*, considered to be more easily understandable by the customers (Censkowsky et al. 2007). A recent NWFP market analysis highlighted that most consumers recognize the single species and the related characteristics in the market, rather than the NWFP as a category; and the consumers identify NWFP as *“wild”* products (Kilchling et al. 2009). It is no coincidence that some standards have used wordings like *“wild product”* or *“wild gathered products”* to highlight the products harvested in natural and semi-natural environments. Despite the clear evidence of the consumer's understanding, there is no convergence into a common terminology. This point can be easily proved just looking at the definitions used in some of the widely known standards reported in Table 1, where some definitions focus on the *“action of harvesting”* regardless of the land of origin, others concentrate the attention both on biotic and abiotic products generated from forests, and others focus only on plant products or on by-products derived from forest management activities.

Table 1. Terms and definitions adopted in different standards

Terms	Definition	Type	Source
Non-Timber Forest Products	All products other than timber derived from the Forest Management Unit	FS	(FSC, 2014)
	All forest products except timber, including other materials obtained from trees such as resins and leaves, as well as any other plant and animal products.	FS	(NEPCon, 2014)
	A commodity obtained from the forest that does not necessitate harvesting trees. Non-timber forest products include game animals, fur-bearing animals, nuts and seeds, berries, mushrooms, oils, foliage, medicinal plants, peat and fuelwood, forage, and Christmas trees.	FS	(CSA, 2013)
	Products derived from forests other than roundwood or wood chips. Examples include, but are not limited to, seeds, fruits, nuts, honey, maple syrup and mushrooms	FS	(SFI, 2015)
	Non-timber forest products are economic resources other than timber products acquired from forest, forest understory or other land use, following sustainable management principles.	FS	(CFCC, 2011, 2014)



Terms	Definition	Type	Source
	A diversified economy based on sustainable use of various timber and non-timber forest products, such as forest fruit, oil plants, food, beverages, herbs and materials for chemical industry etc shall be implemented.		
Non-wood products	Forest products other than wood (e.g., honey, water, wild flowers).	FS	(AS, 2007)
Plants growing naturally (Organic plants)	Harvest organic plants by methods so as not to interfere in preserving the ecosystem in collection areas	OS	(MAFF, 2012)
Wild collection	Products collected from the wild (e.g. medicinal and aromatic plants, gums and resins, wild fruits, nuts and seeds, mushrooms)	PS	(FairWild Foundation, 2010)
	The collected plants grow naturally in an area, which has not been treated with prohibited inputs (according to the respective organic regulation) for at least 3 years. The collected plants must grow and regenerate naturally without any agricultural measures.	OS	(IMO/SIPPO, 2005)
	The collection of edible plants or parts thereof, growing naturally in natural areas or forests, where the only human interference consists of the harvest (collecting) of the products	OS	(BioLand, 2013)
Wild crop	Any plant or portion of a plant that is collected or harvested from a site that is not maintained under cultivation or other agricultural management.	OS	(USDA, 2011)
Wild grown products	"Wild grown products" are defined as products that have grown without or with low influence of the operator gathering the products.	OS	(Naturland, 2014)
Wild harvested products	Wild harvested products shall only be derived from a sustainable growing environment. Products shall not be harvested at a rate that exceeds the sustainable yield of the ecosystem, or threaten the existence of plant, fungal or animal species, including those not directly exploited.	OS	(IFOAM, 2012)
Wild Harvesting	the harvesting of plants, plant products and fungi from the wild (but not animals). Some people also call this 'wild crafting'. These standards cover a wide range of products and geographical areas.	OS	(SA, 2014)
Wild plants	Wild plants are defined as edible plants and mushrooms and parts thereof, which grow naturally in forests and on farmland and are not cultivated using agricultural methods. Wild collection is considered as complementary to agricultural production. Collected plants that have been subjected to cultivation measures are agricultural products and are therefore not wild plants as defined in these directives.	OS	(Bio Suisse, 2014)
Wild species	Organisms captive or living in the wild that have not been subject to breeding to alter them from their native state.	OS	(UEBT, 2012)
Collection of wild plants and parts	The collection of wild plants and parts thereof, growing naturally in natural areas, forests and agricultural areas is considered an organic production method	EU Law	Art. 12, Reg. 834/07

Note: FS=Sustainable Forest Management Standard; PS=Sustainable Plant Management Standard; OS=Organic Products Standards. Source: (ITC International Trade Center, 2007) modified and updated.

In the European legislative framework, the NWFP concept does not appear formally, but it has been considered through functional definitions. EU food law (Reg. 178/2002) defined the concept of "primary production" as "the production, rearing or growing of primary products including harvesting, milking and farmed animal production prior to slaughter. It also includes hunting and fishing and the harvesting of wild products" (art. 3 comma 17, Reg. 178/2002) This law has introduced formally the wording "wild products" which is used in other norms like the EU Organic Law (art. 12, Reg. 834/2007). The food safety law (Reg. 852/2004) include NWFP in the concept of primary production. However, only art. 12 of Reg. 834/2007 formally defined "wild product", when the action to obtain some products from the wild is defined; in such a way the definition of NWFP is based on an economic activity rather than on a list of species, as it occurs for cropped or farmed products. This approach in the definition of the products of our concern could be inspirational for the future: policy makers, professionals and scientists could adopt the definition of "forest products from the wild" or simply "wild forest products" (WFP) which is much more effective in external



communication and much suited to give the proper attention to a set of products that are widely collected and consumed by the Europeans and have an increasing economic importance in the rural economy (as we have found from the consumers' survey, 0.5% of European households obtain half of their income from wild forest product collection).

In Table 2, we propose a classification of WFP, also to better connect the different outputs of the StarTree project. Outputs of trade analysis, silviculture models, enterprise assets, institution design, governance models generally stand alone. However, policy makers need to understand how different studies can be connected for designing policies and regulations and to communicate their plans and actions; the concept of WFP can represent, better than that of NWFP, an effective answer to this need. Table is comparing forest products in relation to their ecological definition, NWFP categories and types, WFP definition and the connected main activities. The table highlights WFP as a more restricted, but also much more homogeneous category of forest products than NWFP (or NTFP).

Table 2. Classification of NWFP and WFP

Ecological position	NWFP category	NWFP type	NWFP	WFP	Main activity	
Products of the stem, leaves or tree reproductive system	Stem-based products (tree is cut)	Christmas trees	Yes	No	Cutting	
		Fibre	Yes	No		
		Biorefinery products	Yes	No		
		Tar	Yes	No		
		Sorbitol and mannitol	Yes	No		
	Extracted from tree (tree is kept alive)	Sap	Yes	No	Extraction	
		Natural gums and resins	Yes	No		
		Exudates	Yes	No		
	Bark and cork (tree is kept alive)	Bark products	Yes	No	Cutting	
	Leaf-based products (branches are removed from the tree)	Essential oils	Yes	No	Extraction and distillation	
		Phytochemicals	Yes	No		
		Pigments	Yes	No		
	Fruits and flowers	Foliage	Yes	Yes	Picking or collection	
		Tree flowers	Yes	Yes		
		Fruits	Yes	Yes		
Edible nuts		Yes	Yes			
Flower and bud substances collected by animals	Honey and bee products	Yes	Yes	Husbandry		
Tree-dependent products	Wild fungi	Wild mushrooms	Yes	Yes	Picking or collection	
		Truffles	Yes	Yes		
Forest understorey products	Berries	Berries	Yes	Yes	Picking or collection	
	Forest plants	Live trees/plants	Yes	Yes		
		Medicinal and aromatic plants	Yes	Yes		
		Mosses and lichens	Yes	Yes		
	Litter	Litter	Yes	No		Digging
	Peat	Peat	Yes	No		
Animals and animal parts		Wild fish	Yes	No	Hunting	
		Game meat	Yes	No		
		Live animals	Yes	No		
		Animal parts	Yes	No	Picking or collection	
		Insect, amphibian and snail products	Yes	Yes		



2 International trade

International trade data are the most detailed source of information available at global scale. Despite production data would be definitely a better source of information for policy makers, trade data are recorded daily by custom officers in order to get the custom duties. Commodities are classified according to international norms that assign to each product a specific code used to trace trade partners, values and quantities. This chapter provides an overview of the trade data of EU28 with the aim of defining the problems related to commodity coding.

2.1 EU28 and world trade of “WFP”

Forests provide a large variety of products and services, among which NWFP have showed a rising interest in Europe (Croitoru, 2007; Merlo and Croitoru, 2005) as at global level (Shackleton, Shackleton, & Shanley, 2011). Globally, the majority of the NWFP are harvested and used locally for the household needs, while only a small part is sold for commercial purposes (FAO, 2010b). Despite the small fraction of harvest that reaches the market, NWFP have been commonly traded as raw or semi processed material along several local or international supply chains working as economical bridge between developing and developed countries (FAO, Burgener, & Walter, 2007) since after the second world war (Iqbal, 1995). For example, Italy has supplied 95% of the internal market of wild mushroom from the Eastern European Countries and China (Zuchegna, 2005) where harvesting has no limitation and the raw material has a lower cost of production. The lack of production and trade data did not allow to report a detailed picture of the economic dimension and market structure of NWFP, in order to enhance the better understanding of market complexity at global level. Some attempts have been done by FAO (2000, 2010a) to highlight the social and economic role of NWFP in the global context. Under the FAO Forest Resource Assessment, NWFP have been formally considered in forest databases. At the same time UNECE-FAO (2000) highlighted the overall problem of production data availability at national level also in the developed countries, due to a lack of NWFP statistics, often mixed with information on other agricultural products. For instance, the NWFP production was estimated 1.1 billion € for Europe in the year 1995, while in the last available assessment is reported a conspicuous increase of the NWFP economic value from the year 1995 to 2007, accounting for 2.76 billion € (Forest Europe, UNECE and FAO & Europe, 2011). The most frequently reported NWFP were game meat, Christmas trees, wild mushrooms and berries, whereas only scattered information were collected for foliage, cork, pine resin, medicinal and aromatic plants, honey and nuts, often sourced from agriculture sector. Nevertheless, the same data have been re-evaluated by FAO (2014) at 4.53 billion € for the same geographic area and year, showing a persistency of data reliability on the production side¹. These discrepancies on NWFP production are due in part to the improvement of the estimation over time, nevertheless still only few countries report regular and reliable statistics on NWFP, mainly based on the harvesting permits issued by the forest administration, or data collected among the forest owners. Notwithstanding this progress in data estimation, there is a persistent lack of data availability due to the high costs of data collection and a non-homogenous nomenclature among the EU countries on NWFP categories, either produced in the forest, plantation or on agricultural land. While data on NWFP harvest for personal consumption or for non-market use are costly to be gathered in formal statistics, information along the supply chains are more accessible because formally recorded in the national or regional statistics. In fact, companies involved in any NWFP supply chain are subjected to public control (i.e. health quality in the case of edible products) or they are controlled by national fiscal agencies as they generate taxable economic values. According to Vantomme (2003), international trade data are an important source of information to see the global economic interest on NWFP among countries. Moreover, the analysis of trade data rely on a classification system that considers thousands of species within a set of commodity groups. The Harmonized System (HS) is the most

¹ The value estimation from the FRA assessment in 2005 did not account for informal NWFP production (animal products excluded).



frequent commodity classification system used worldwide for trade data reporting and it is provided by World Custom Organization (WCO). Trade data on NWFP based on HS are quite reliable and they may be recorded weekly, monthly or annually by all economic actors involved in the international trade. Trade data are generally available from national statistical agencies or from international organizations (WTO, UN), while socio-demographic statistics on NWFP production and use are scattered, and are often linked to the specific geographic areas in which a given NWFP has an economic or social significance.

Table 3. Trade overview of EU28

Products	HS6 Code	Level of processing	Part of wild harvest?	World 2011	From EU28 2011	To EU28 2011	EU28 balance	World-EU28 Exp. %	World-EU28 Imp. %
Honey	040900	Raw	Yes	1906	616	1019	-403	32.34	53.48
Mosses	060410	Raw	Yes	58	33	37	-4	55.98	62.61
Fresh foliage	060491	Mix	Yes	1210	729	887	-157	60.29	73.28
Dry foliage	060499	Mix	Yes	367	170	231	-61	46.33	63.06
Fresh & frozen Agaricus	070951	Raw	No	1302	1102	972	129	84.63	74.68
Fresh & frozen truffles	070952	Raw	Yes	1	0	1	-	-	-
Fresh & frozen mushrooms	070959	Raw	Yes	785	414	480	-66	52.69	61.12
Preserved Agaricus	071151	Processed	No	101	32	53	-21	32.07	52.99
Preserved mushrooms	071159	Processed	Yes	119	17	85	-68	14.45	71.68
Dried mushrooms	071230	Raw	Yes	0	0	0	-	-	-
Dried Agaricus	071231	Raw	No	116	41	58	-17	35.52	49.94
Dried Auricularia	071232	Raw	Yes	196	4	16	-12	1.95	8.12
Dried Tremella	071233	Raw	Yes	55	1	2	0	2.30	3.08
Dried mushrooms	071239	Raw	Yes	1370	71	170	-100	5.17	12.44
Prepared Agaricus	200310	Processed	No	1179	572	568	4	48.48	48.17
Prepared truffles	200320	Processed	Yes	29	24	17	6	82.02	59.62
Prepared mushrooms	200390	Processed	Yes	228	84	87	-3	36.77	38.20
Almonds	080211	Raw	No	1043	36	55	-19	3.41	5.28
Shelled almonds	080212	Processed	No	3369	671	1710	-1038	19.93	50.75
Hazelnuts	080221	Raw	No	180	25	41	-17	13.61	23.00
Shelled hazelnuts	080222	Processed	No	1782	296	1342	-1046	16.60	75.32
Walnuts	080231	Raw	No	987	164	308	-144	16.61	31.23
Shelled walnuts	080232	Processed	No	1545	219	678	-459	14.15	43.88
Chestnuts	080240	Mix	Yes	299	153	121	31	51.05	40.60
Pistachios	080250	Mix	No	3013	524	1287	-763	17.38	42.70
Fresh strawberries	081010	Raw	No	2579	1604	1533	71	62.18	59.41
Fresh raspberry	081020	Raw	No	1173	410	442	-32	34.97	37.70
Fresh currants	081030	Raw	No	0	0	0	-	-	-
Fresh cranberries	081040	Raw	Yes	1428	345	488	-143	24.14	34.18
Fresh other	081090	Raw	No	2948	713	914	-201	24.19	30.99
Frozen strawberries	081110	Raw	No	1090	479	706	-227	43.95	64.73
Frozen raspberries	081120	Raw	No	951	416	694	-278	43.72	73.00
Frozen fruits and nuts	081190	Raw	Yes	2530	1033	1484	-451	40.82	58.66
Quebracho tannins	320110	Raw	Yes	85	7	32	-25	8.27	37.07
Wattle tannins	320120	Raw	Yes	130	4	24	-19	3.37	18.25
Other tannins	320190	Mix	Yes	195	92	57	35	47.05	29.12
Natural Cork	450110	Raw	Yes	147	140	132	8	94.88	89.67
Cork in pieces	450190	Processed	Yes	93	79	69	10	84.94	74.10
Cork squared	450200	Processed	Yes	72	63	42	21	87.82	58.45
Cork Stopper	450310	Processed	Yes	743	705	406	299	94.92	54.71
Total overview				35404	12086	17248	-5162	34.14	48.72
Total overview (only raw and partially wild sourced products)				11705	3192	5171	-1980	27.27	44.18

Note: source COMTRADE database (2013); Mix = cropped and wild forest product

The international trade of NWFP might be seen both in positive and negative terms for the European forest sector. On one hand it allowed to maintain within the European boundaries competences and firms specialized on processing and marketing, while on the other it move the production of many commodities on cheap labour countries. The same happened for many European countries, though the enlargement of European Union on the east improved the overall NWFP trade balance of the present EU28. The movement of labour intensive production to the East and Far East is a well know trend; nevertheless, the work carried out in WP3 of the StarTree project highlighted some peculiarities of the EU forest, like cork, chestnuts and



truffles that are core products sourced from the European forests and still able to compete in the international market.

The high dependence on international trade for NWFP should make the European and its Member States' policy makers rethinking the role of forests. Forests provide not only wood and wood products, and the value of raw NWFP may worth approximately 40% of the wood and biomass value (estimated at 26.8 B US\$). The EU-28 and even more Italy, invested quite strong effort on the introduction of quality standards and new rules in order to create new barriers on import. Nevertheless, the high demand of NWFP stimulated the global trade to enhance the production quality. The implicit effort of European food and environmental standards has already been translated into a higher quality of the imported commodities, and an increment of global prices. While it is unrealistic to cover the demand for all the NWFP from European forests in the short run, more attention should be given to the enhancement of the standards and overall quality of the internal supply, in order to differentiate the market and to cover the high quality segments (i.e. higher prices). This target can be reached with an increase in innovation in production techniques, in marketing and in general with more advanced entrepreneurship by NWFP internal producers and processors. EU28 have shown a positive trade balance on the NWFP trade that might be seen as a key message for the European forest sector: timber is important but NWFP are important as well. Despite the limited outputs, trade analysis allows us to provide an overview on the use of certain commodities at global scale as well to understand biological effects on the production due to pests or large scale damages or the effects of policy acts on the production and commercialization of certain commodities like chestnuts.

The future of European forests looks promising for the importance of NWFP with regard the traditional timber and wood production; nonetheless there would need large investments on new silviculture techniques and land management tools in order to enhance production of NWFP and coordination of the stakeholder involved in the supply chains, starting from the weaker one: the forest owners. The implementation of a clear property right system would allow the internalization of the revenues that consequently would stimulate the forest owners to invest on NWFP provision. There are few cases in Italy where the NWFP are considered primary forest outputs, but the recent studies show that the trend on this perspective is more than comfortable, though the policy makers almost forget the NWFP existence on the forest sector. NWFP user awareness, the coordination of the forest owners and the formation of new skilled technicians are three key factors that might trigger the economic role of the NWFP in the near future.

The adoption of a new NWFP classification taxonomy and the provision of regional and national statistics could help the economic actors to invest on NWFP. Despite the distinction between cultivated and wild harvested origins for the same product is not relevant for the agencies that collect and publish trade statistics on international commodities, they are fundamental for the policy makers for structuring new policy tools. Detailed trade data are required to study complex commodity groups (i.e. tannins, mushroom, berries, nuts, etc.). For instance, the use of databases with higher commodity code specification (i.e. HS8 and HS10) will help to trace global trade at the species level, which would then lead to more detailed overview frequently asked by the main player of the sectors. Would the public authorities be willing to hear the needs of the local economic actors? Hard to say, but a question that needs to be answered.

2.2 Commodity coding as essential tool to study global trade

There are over 200,000 commodities, which are today exchanged at international level. Historically, United Nations has promoted an international commodity classification system to allow the comparison among national trade statistics. From the "*Minimum List*" of traded commodities promoted by the League of Nations in 1938, the World Custom Organization (WCO) lunched the first version of the international *Harmonized System* (HS) in 1988 (UN 2006). The initial version contained 4208 sub-heading to classify the product into common categories, today raised up to 5206, among which over 120 consider NWFP collected in the wild



and approximately 80 commodity groups based on NWFP grow in the European forests. It is worth to be mentioned there are also other classification system, like the Combine Nomenclature (CN) or the Standard International Trade Classification (SITC), but the most widely used commodity classification remains the HS. Within HS, a commodity group can be referred to a single species, traded as raw material or “end-use” product, or on the contrary it may group up different species used for the same “end product” category. An example of commodity group based on a single species may be 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 single code (2009.80). The commodity groups are quite stable over time, but the limited economic value of NWFP let the WCO change the commodity definitions or the related commodity codes over time according to the inputs and observations the WCO receives. The main parameter that leads the coding or definition change is the economic value of the traded commodities and whenever a commodity group changes, the time series have to be rebuilt for any trade analysis.

In general, a commodity group may change definition, or two commodity codes may be merged into a new or existing commodity code group, or finally a commodity code may be split into two or more codes; while the first two cases generate problems for product specific analysis, because the data time series is interrupted for the specific commodity group, in the second case can be easily built merging the commodity codes generated after the commodity group change. To analyse some time series of international trade, we traced back all the changes in the coding and definitions which have occurred from the first release of the HS coding, a fundamental step to understand the comparability of trade data.

According to the selected NWFP types in Table 3, we reported the data availability for the related commodity groups from the first HS release. Despite the fact that majority of the commodity groups were related to agricultural sector, we considered all the codes that contain also a minimal part of NWFP harvested in the wild. In Table 4, we reported the codes’ validity period along the five HS versions, a useful information to build up the time series for the trade analysis.

A first list of NWFP commodity groups was created using the HS coding system valid for the period 2007 and 2011 and it accounted for 48 codes; nonetheless a more complete list was generated with a deeper revision of all the HS coding system that have been released from 1988. In total 69 commodity groups have been found, all related to the NWFP growing in EU. The majority of the codes and the related definitions have 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 most strongly affected by changes, highlighting the increment of economic interest on these NWFP, both cultivated and collected in wild. Also the commodities generated through the use of wild mushrooms were affected to a large change in 2002, with eight new commodity groups that highlight the important role of wild and medicinal mushrooms. Unfortunately, fresh truffles were merged with wild mushroom group in 2007, and canned truffles were merged with prepared wild mushroom. Also mosses and lichens commodity group has recently been merged with two larger commodity groups: fresh and dry foliage, probably due to the small economic value of their international trade. The most stable codes are related to the NWFP, which are more frequently traded. For instance, cork and cork products have not been affected by changes, but within the tannins commodity groups, tannins extracted “from oak and chestnut wood” were merged into the larger group of “vegetable tanning extracts”. Fresh and frozen nuts and berries have not been modified thanks to the large volume of their trade.

Table 4: Data availability for the selected NWFP types



NWFP type	Category	Commodity group	HS Code	Period of validity				
				1992-1995	1996-2001	2002-2006	2007-2011	2012-2017
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
	Other nuts	Shelled	080252					x
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
	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 truffle from 2012)	200390			x	x	
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 ber.	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	
Berry jam	Fennel seeds, juniper berries	Entire and crushed	090950	x	x	x	x	
		Not crushed	090961					x
	Berry jam	Crushed	090962					x
		Homogenised jams, jellies, etc.	200710	x	x	x	x	x
			Jams, fruit jellies, purees and pastes, except citrus	200799	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	

Source: UN COMTRADE (2014).

Note: In **bold**: the commodity groups that contain the majority of NWFP collected from the wild.

However, we excluded some NWFP types from the work. “Essential oils” was excluded, because the resinoids are by-products of the wood industries, and within the “other” category there are essential oils extracted



mainly from agricultural products. On the contrary, we considered “*berries*” (exclude in the previous version of the deliverable) due the specific interest of some project members, though there is a minimal fraction of traded wild products; also “*foliage*” has been included in the analysis, thanks to the last release (on May 2014) of the data that converted the majority of the reported trade data from unit value to metric tons. Moreover, foliage among all the other NWFP commodity group has a large variety of species falling into the category, hence the price estimation was assessed only to give an average number of the average bulk value of the commodities. Finally, between monthly data and annual data we used only this latter because they cover a larger variety of products.



3 Policy effect on Wild Forest Product supply chains

EU28 has never developed target policies to support the European WFP supply chains, hence the economic actors involved in the different supply chains have organized themselves in order to overcome to vast array of un-coordinated norms, limitations and constrains implemented by the EU member states. In the chapter we summarize a key outputs of the project that highlighted the dramatic effects that policies have on the regional supply chains of wild mushrooms. The chapter close with an overview of the actual taxation system of two extreme countries in terms of taxation system.

3.1 The examples of wild mushroom supply chain and the effect of different policies

The supply chain structures can be studied in different ways. Star-tree project has used the approach of price evolution of a single product (porcini mushrooms for the fresh market - first and second class), along the entire supply chain (see Figure 1). In principle, the lower the price variability on each actor of the chain, the greater its stability in the market, while wider is the variability of the price, the greater the risk for the focal actor. The hypothesis tested is that a linear increase in the price provides a fair distribution of added value in proportional terms (i.e. Serbia and the TAA), while an increase in parabolic indicates problems in local consumption or high commercialization costs (new markets or markets in crisis) (i.e. Finland) or vice versa in a trend with logarithmic shape curve indicates a fast and stable chain where the margins of wholesalers and retailers is low due to the fast financial payback time and to the mature demand that knows the product (i.e. Spain).

Case A: in Serbia, the porcini mushrooms are collected by informal collectors (almost all) that confer to the mushroom buyers. The mushrooms are harvested with the roots in order to extend the post-harvest mushroom life as long as possible. The mushrooms are transported and sold in collection centres, where the mushrooms are purchased in cash with different prices for each category at the time of sale (places where there is a buyer with small refrigerator containers, or where mushroom companies have different collecting points within an organized conferring system with refrigerated vans that buy mushrooms). The part of the mushrooms that follows the fresh chain remains they were harvested, then transferred to be processors who put in boxes and ship them to local or international wholesale. The transformers, depending on the market in which they want to sell, they have to clean the mushroom from the roots; for example, the German market requires mushrooms without roots and cut in half to see the real absence of worms. The clean-up of the mushroom's "roots" in the forest is also standard practice for Finns gatherers, giving a clean and ready product for different business uses. The raw material is the same between the two countries and the price range is very similar, although average labour wages differ by an order of magnitude between North Karelia (2600 €/month gross minimum wage) and Serbia (380 €/month gross minimum wage). Why? Briefly, it is due by a combination of two main factors: *a)* the attitude to follow company's standards, basically higher on Finnish pickers basically more available to adopt common specific standards on mushroom collection and storage (i.e. clean the mushroom in forest, carry the mushroom in forest with open baskets, etc.), *b)* the system of taxation imposed on the pickers and to the companies; *in Serbia*, these lasts assume the costs of the commercial harvesting licenses, although it is carried out by informal pickers (without VAT code) that do no reward the owner of the forest for the mushroom harvesting; *in Finland*, totally tax-free harvesting and commercialization (zero VAT and income tax) for Finnish pickers as long as the single picker declares every money that derives from mushroom harvesting. When we consider that already at the picker level in Finland, we have a product that in Serbia is available at the transformer level, there is a clear message on the level of taxation if we consider that the mushroom availability in forest is even higher in Serbia. A tax traceability system based on the shift of taxation from picker to the first formal buyer, increases the speed, efficiency and performance of the supply chain, which can afford the formation of a collector with leaflets, events or campaigns.

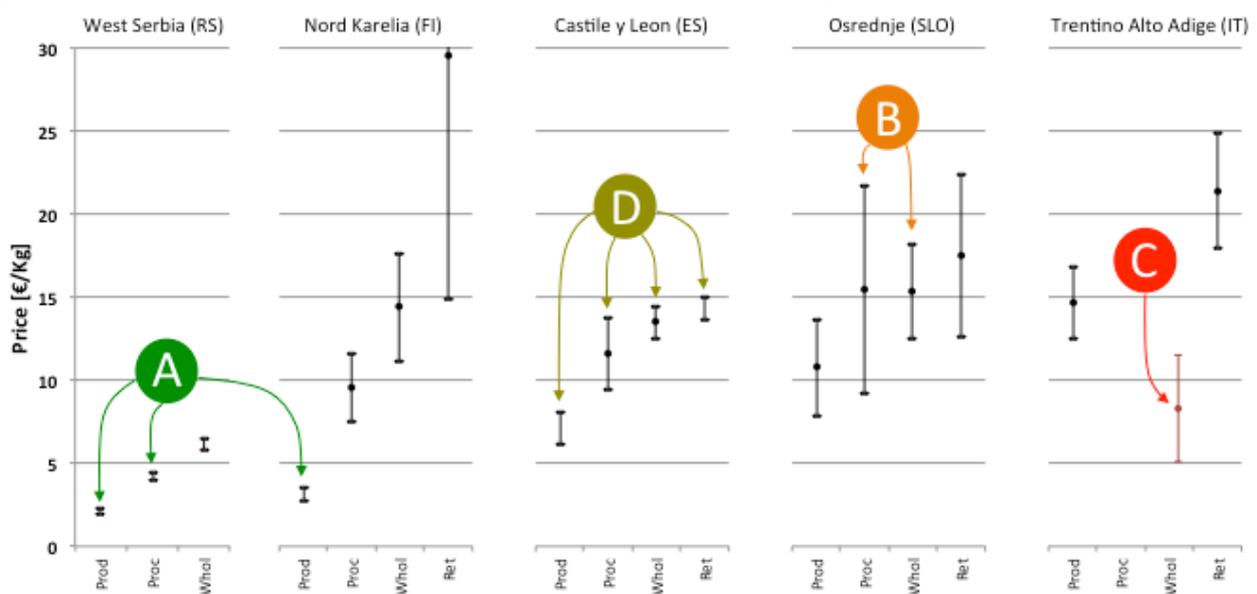


Case B: introduction of limits to the collection to 2 kg/person/day, regardless whether the picker is professional or recreational. If a company buys from a picker wild mushroom, it can purchase maximum 2 Kg of harvested product only with a state voucher (basically, 25% fee and pension contribution, 75% net revenue). Since the introduction in 2007 until today, the effect has been very heavy for the central players in the sector, especially the locally produced transformers, while wholesalers have started to import foreign products.

Case C: in Trentino Alto Adige, the high production costs are related mainly to the high number of rules that limit the harvest, and regulate the commercialization of wild mushrooms through a lot of bureaucratic formalities. The direct consequence is the scarcity of commercial pickers (about 250). The result is a sale price double of picker price, in which time costs of bureaucracy and cost of mycological control reduces the profit of the retailer specialized in wild mushrooms selling. The shortage of product available has prompted wholesalers to import the raw material from abroad, which accounts for 70-95% of consumed products. If on one side the law has pushed the marketing of picking permits (in a natural monopoly), on the other, the law inhibited the commercialization of wild mushrooms as a product. Anyhow, the coexistence of commercial with recreational pickers is present in a few areas of Italy, where a marketing, silviculture and wild mushroom picking are coordinated within a common strategic plan.

Case D: free collection without limitations. The concentration of added value in the collection and processing denotes that the first and second actor in the supply chain have much more market power than the second part of the chain, thanks to a steady demand.

Figure 1: Wild mushroom (*Boletus edulis*) supply chain in 5 different regions of European Countries



Limiting harvest is a common valid practice for certain NWFPs such as medicinal and aromatic plants. However, for certain other products, such as wild mushrooms, truffles, berries and forest fruits, harvesting has a minimal or null impact on the sustainability of the resource. Limiting harvest has a direct negative effect on collectors' income and consequently on value creation in the supply chain. Limitations should be considered carefully also considering the negative impact on rural economy, always in light of the precautionary principle applied the target resources.

The introduction of a tax exemption for collectors makes it possible to achieve a higher level of product traceability and to reduce the informal market. Although a tax exemption for non-professional collectors might mean a loss for the fiscal agency, the reduction of control costs and the concentration of attention on

a few processing companies would improve tax revenue for the State. A simple system for tracing collector–buyer transactions would increase the speed, efficiency and performance of the supply chain and help in targeting communication materials, events or campaigns for training and informing collectors.

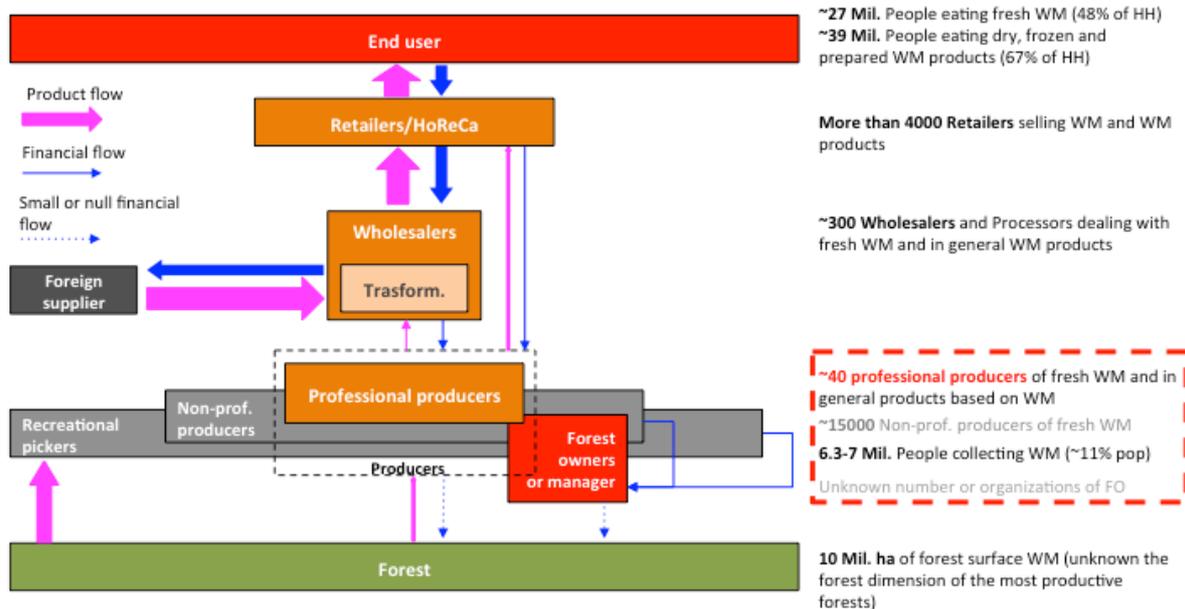
Where the simple action of harvesting and selling an NWFP becomes complex in a formalized economy, the more complex the mechanism, the higher the probability that an informal market will flourish.

3.2 Taxation system and informal WFP producers: key topics to sustain rural economy

The number of economic actors involved in a supply chain allows to understand a wider array of information like the supply chain structure, the product path from forest to the end users, and the financial flows that pay back the entire chain. Thus, small or large number of economic actors allows to highlight weak or strong categories, bottle neck of the chain or unclear financial or product paths.

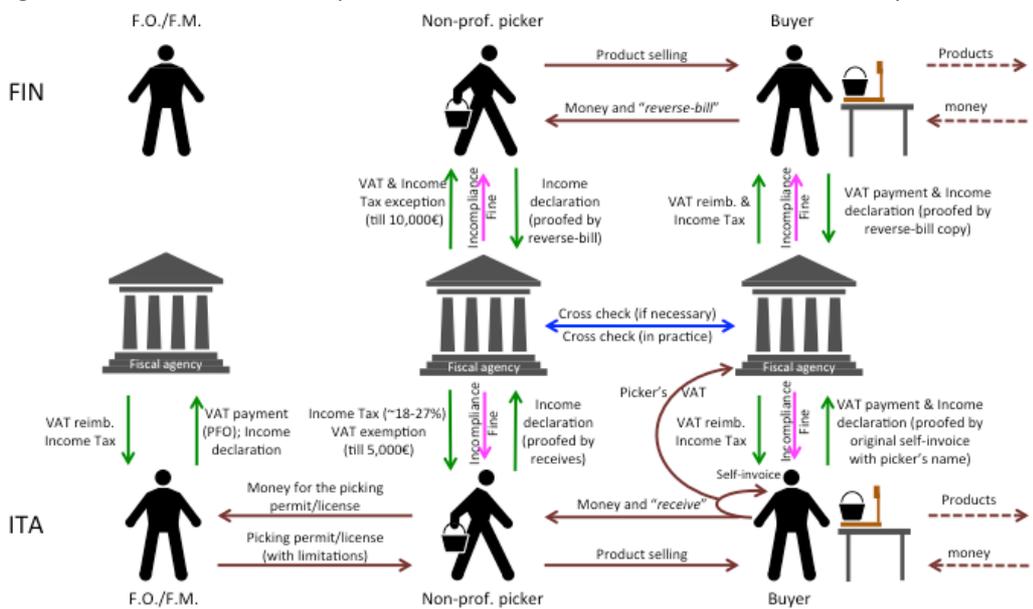
The Figure 2 on the side describes synthetically the example of wild mushroom supply chain in Italy, in which product and financial flows describe proportionally the volumes and values exchange among the actor categories. Moving from forest to the end-user, the main source of wild mushrooms is the different typology of forest that covers the Italian peninsula; however, there is an unknown proportion of productive wild mushroom forest and even less information about the number of forest owners. There are only few forest owners that actively produce wild mushrooms on purpose or by the direct management of forest, but they are mainly public forest owner or community forestry. Among the so called “producers”, the recreational pickers are represented in larger number and they occasionally sell part of their harvest, while there are approximately 15000 non-professional producers, which sell the majority of their harvests. A key number is represented by professional producers that are exiguous compared to the volume supplied by the categories (between 300 and 4000 tons annually with high fluctuation among years and almost all supplied by non-professional pickers). The national production is mainly sold to restaurant and retailers, while only a small part flows into wholesalers and processors, which are as well the main importer of wild mushrooms (70-96% of the total volume of traded wild mushrooms that amounted between the 11 and 16,000 t). The chain ends to the end-users, which are over half of the national population (fresh and process products). For further readings see (Vidale et al. 2015; Vidale et al. 2016)

Figure 2: Wild mushroom (Boletus edulis) supply chain in Italy



Most of the European countries adopt the civil law system in which the property rights of the NWFP are written and implemented in several different ways. For instance, in Italy forest owner (public or private) can limit the access to certain NWFP like wild mushroom, truffles, berries or edible plants to the public and they may as well implement market-based mechanisms (i.e. picking license and permit) to commercialize the harvesting right to NWFP pickers (see Figure 3). On the other hands, there are also countries in which there is the application of the “*res nullius*” principle that impede the forest owner to claim the NWFP property right on certain species (mainly wild mushrooms, berries and edible plants) like in the case of Finland. According to the property regime in which the NWFP are harvested, pickers can collect NWFP according the specific norms set up by the forest owner and then they can use their harvest for different purposes. The scheme reported here tries to describe process to commercialize a NWFP like wild mushroom that is supplied by a non-professional picker in two countries like Italy and Finland. In case an Italian non-professional picker would sell its harvest it must consider that it needs to have a harvesting license or permit for certain species, some harvesting limitation (mainly quantity collected per day) and it must pay quite heavy taxes out of the profit it makes, especially if it passes the VAT exemption level that is relatively low. The picker collecting the same quantity of NWFP in Finland has a lower taxation with a higher fiscal exemption level, hence it might collect its harvest at lower cost. Moreover, the buyers have different purchasing procedure, basically smooth and simple in Finland (exchange of NWFP for money, in which the company provide a reverse bill or purchasing bill to the seller), while quite complex and bureaucratic in the case of Italy, where the buyer has to pay also the VAT for the non-professional pickers and create fiscal documents (the receive) to meet the requirement of the fiscal traceability. Comparing the two systems, it is quite clear that the taxation, bureaucracy and harvesting limitations are the main problems beyond the high number of informal non-professional pickers or the low number of professional pickers in Italy. The brief overview allows to understand how a simple action like NWFP harvesting and selling may be dramatically complex in a formalized economy. However, the more the mechanism is articulated, the higher is the probability that informal market will flourish.

Figure 3: Commercialization process of Wild Mushrooms in Finland and Italy



Property and harvesting rights are only one part of the NWFP policies; the most crucial point is the definition of the mechanism that allows to transfer an informal product into a formal supply chain. Tax law, food security law, traceability, trade laws are all affecting NWFP harvesting and should be better coordinated.



4 Looking ahead

Who are the NWFP producers? How an informal economy can be formalized and transformed in regularly functioning, transparent and efficient economic system? In many developing countries these two questions seem still without clear answers, while we assume that in the EU clear and univocal answers have been given to such questions. In reality several EU states are still very far from having a regularly functioning, transparent and efficient economic system related to wild forest products harvesting.

Cultivated and wild gathered species are regulated under two different production and fiscal legal frameworks, respectively that one applied for agricultural products and that one for other normal business activities. Moreover, a person can run such activity as a professional business or a non-professional or occasional activity, again under different legal framework with impacts on traceability and control of the products. Finally, there might be business activities that rely totally on small supplies by non-professional pickers. In total there might be five different types of NWFP producers. Till now only the farm-based activities have been clearly defined by EU and national norms, but wild gathering has not been considered in practice an activity of the primary sector. In EU-28, for instance, annex VII of the Directive 112/2006 does not report the wild gathering among the listed agricultural activities and this is crucial to be eligible to “*flat-rate scheme*”. i.e. a taxation scheme that is dramatically softer compared to normal business activities. The flat rate was introduced for reducing the economic pressure to activities that are subjected to seasonal climatic risks, though some NWFP depend from weather conditions (e.g.: wild mushroom, truffle, berries). The introduction of wild harvested products in the annex of the Directive would solve a huge problem on taxation regime, while national implementation would be needed to define parallel norms on farm accountability and product traceability, especially for the non-professional pickers or forest owners.

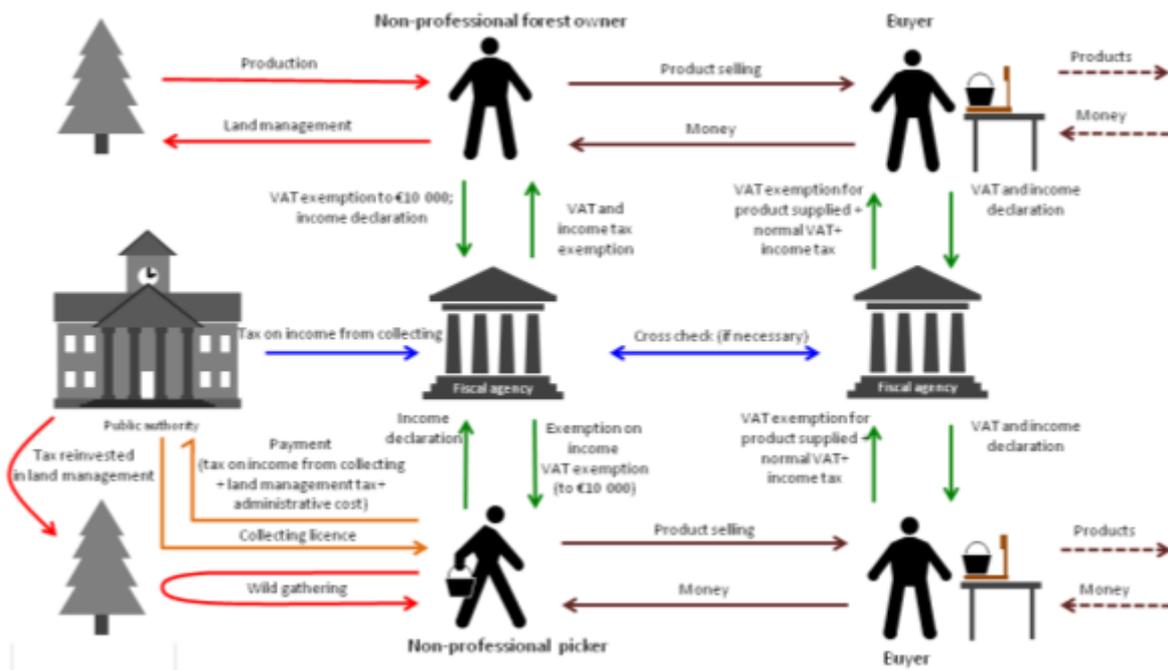
In

Figure 4 we reported a tentative proposal that would be in line with many national taxation systems. Basically, the cultivation of forest for NWFP would be considered as a farm activity in which the exemption level is defined at EU or national level, while wild gathering would be based on a picking license system in which the picker need to pay three types of taxes like income picking tax, land management tax and the administrative costs, that in total can be a small cost for the picker, and again with an exemption level equal to the forest owner. On the other hands, public administration would be in charge to reinvest the taxation revenues in the forest and pay the small income taxes for the picker that actively sell part of its harvests.

Policies introduce specific principles to drive the addressed system to obtain the expected outcomes, which means to introduce definitions of the actors and the object involve in the policy. NWFP policies should aim to define a) what are the NWFP or their main categories of NWFP, b) how NWFP are collected and transfer out of the forest, c) who the producers are, d) and how the commercialization should occur.



Figure 4: A new system to align WFP collection to farm production.



NWFP consumption involves almost 90% of the European households. On the other hand, the collection of NWFP is a typical activity of Europeans and has an important role to create sources of incomes in some, mainly marginal, rural areas. The bridge (made of fiscal regulations, incentives, technical support, ...) that policy makers can built between the forest owners and managers and the NWFP end user is of fundamental importance to keep the NWFP value chains viable and efficient. The redefinition of the taxation system applied to the wild gathering and the adoption of certain limitation in the case when harvest sustainability is threatened are the two main field of policy action that need to be considered in order to maintain an important financial flow in remote rural areas where NWFP are gathered.



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