

Article

Conceptualising the Factors that Influence the Commercialisation of Non-Timber Forest Products: The Case of Wild Plant Gathering by Organic Herb Farmers in South Tyrol (Italy)

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Abstract: The gathering and commercialisation of non-timber forest products (NTFP) in Europe has repeatedly been praised for its potential to support rural development. However, political support mechanisms explicitly targeting NTFP remain underdeveloped. In this study, we aimed to contribute to the design of support mechanisms by understanding the factors that influence the commercialisation of wild plants by organic farmers. We first developed a conceptual framework based on fifteen factors and then applied the framework to a case study in South Tyrol (Alto Adige), Italy. Semi-structured interviews were conducted with all fourteen members of the *Vereinigung Südtiroler Kräuteranbauer* (*Associazione Coltivatori Sudtirolesi Piante Officinali*), who commercialised wild plant species, and the data were then analysed using qualitative content analysis. Agricultural intensification, pesticide drift, limited access to gathering sites suitable for organic certification, legal restrictions, lack of consumer awareness about the additional value of organic wild plant certification, and limited product diversity were perceived as limiting factors; management techniques in organic farming, organic certification, a trend for wild, regional and healthy foods, the availability of training, and favourable cultural values and attitudes towards wild plant gathering were perceived as supportive. This study offers a comprehensive understanding of the many diverse factors that may influence wild plant commercialisation in Europe and beyond and provides guidance on how political support mechanisms could unlock the much heralded potential of wild plant commercialisation for rural development.

Keywords: ethnobotany; foraging; health foods; medicinal and aromatic plants; organic agriculture; organic consumer; policy; traditional knowledge; wild food; wild herbs

1. Introduction

The gathering and commercialisation of non-timber forest products (NTFP) in Europe has repeatedly been praised for its potential to support rural development. However, political support mechanisms explicitly targeting such products remain underdeveloped [1,2]. Although the economy, forestry, agriculture, rural development and other public sectors may address NTFP, there is usually no one sector explicitly dealing with this [2].

The diversity of products and actors involved in NTFP commercialisation further impedes the creation of coherent policies and support mechanisms [3]. The products encompass a multitude of plants and animal species of wild, semi-domesticated and incipiently domesticated origin, growing and living in a diversity of ecosystems—not just forests—and subject to different degrees of management [4],

ranging from unmanaged to cultivated [5]. The use of each species is bound to various specific cultural, economic and political conditions [3]. Furthermore, discussions about NTFP usually centre on foresters, whereas a range of rural actors engage in their commercialisation. These actors can include large international businesses buying wild mushrooms or berries from thousands of gatherers to entrepreneurs with just a few employees [6], or traditional landowners in rural areas, especially farmers [7]. Designing support mechanisms that take this diversity into account would need an extensive knowledge base, which is often not available [3].

Farming families are one of the actors frequently engaged in NTFP commercialisation, but they are rarely mentioned explicitly in related scientific discourses in Europe. Therefore, little is known about the conditions and factors that influence their wild plant commercialisation, and thus how their activities could be supported. Farmers are land and forest owners throughout Europe and are supposedly closely connected to their land. They gather, process and commercialise a diversity of traditional and innovative plant-based NTFP in, for example, Albania [8], Austria [7,9,10], Spain [11] or the United Kingdom [1]. Although the relevance of farmers to NTFP commercialisation is evident, the knowledge base is limited.

One symptom of the separation of farmers from the discourse is the different wording used in the forestry sector versus the farming sector. While the former refers to NTFP, in the latter, plant-based NTFP are commonly referred to as *wild plants*—a subcategory of NTFP definable as plant- and mushroom-based NTFP that “grow spontaneously in self-maintaining populations” [12]. Wild plants have specific demands in terms of sustainable management compared to plant species subject to human selection processes. In particular, the sustainability of gathering activities is a concern frequently raised about commercial gathering [5]. Several certification schemes have therefore been developed to monitor and maintain sustainable NTFP production, with organic certification being the most widespread scheme in Europe [13].

In this study, we aimed to understand the factors that influence the commercialisation of wild plants, including mushrooms, by organic farmers and contribute to the design of support mechanisms for NTFP commercialisation. We first developed a conceptual framework with respect to the factors that influence commercialisation, and then applied this framework to a case study involving organic farmers in South Tyrol (Italy) who rely on the cultivation, wild gathering and processing of herbs for direct marketing as their main business activities. In this study, farmers were considered as one subgroup of actors engaged in the commercialisation of NTFP, and organically certified wild plants as a subcategory of NTFP. Understanding the circumstances that support and limit NTFP commercialisation in such specific cases is a precondition for designing support mechanisms within and between European countries [3].

2. Conceptual Framework

The conceptual framework was derived from a review of the body of literature related to the commercialisation of wild plants, including mushrooms, in Europe and the United States. Other world regions were excluded from this study, because the different socio-economic contexts would not enable conclusive comparisons to be made. This review highlighted a series of interrelated ecosystem, political, socio-economic, market-related and cultural factors (Figure 1).

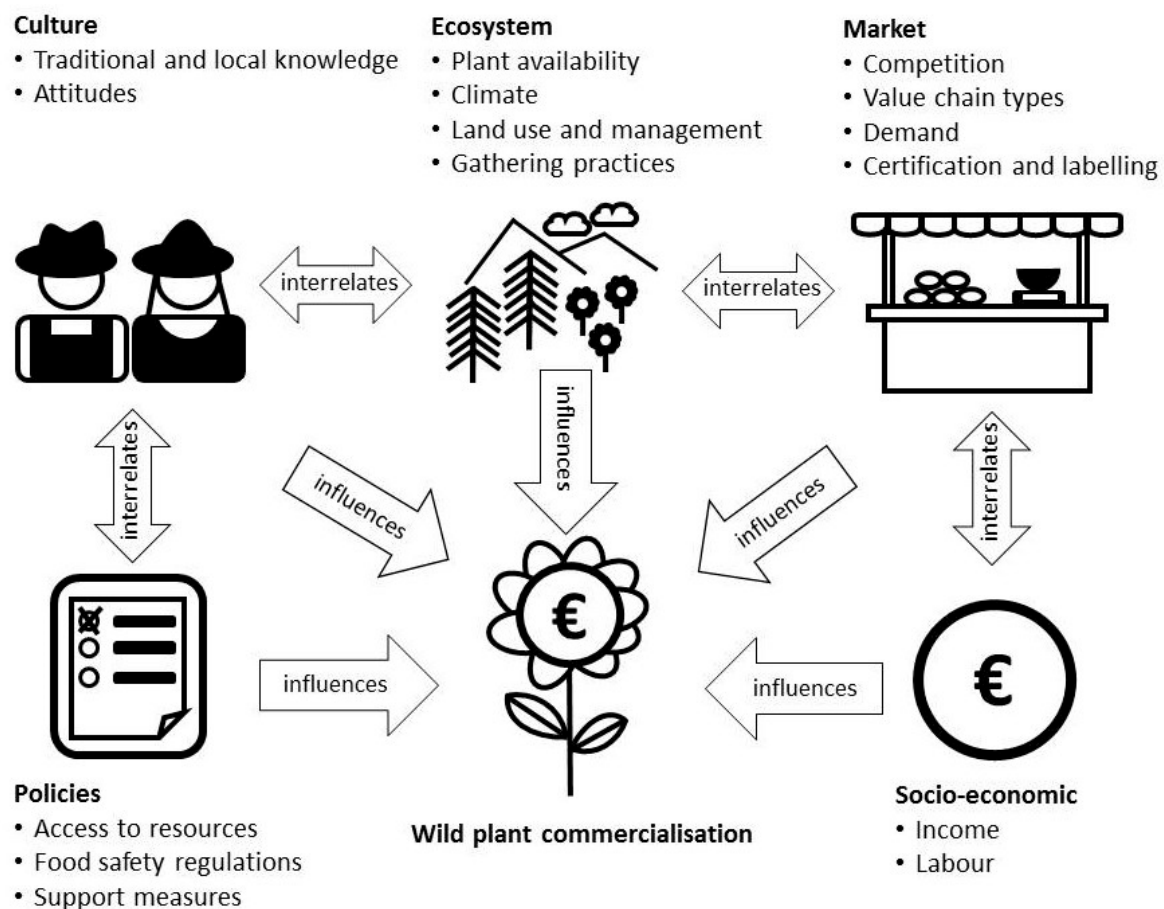


Figure 1. Conceptual framework of factors influencing the commercialisation of wild plant species.

2.1. Ecosystem

2.1.1. Availability

Wild plant species need to be available in abundance to be commercialised [14,15]. The availability of certain wild plant species, however, is hard to predict, and berries and mushrooms in particular may be available in very different volumes from year to year. For example five times more bilberries were sold in 1997 than 1999 by all Finnish households [16], while the turnover of a Finnish company marketing wild edible fungi was twelve times greater in 2007 than in 2003, a year with particularly limited availability [17]. A low availability of wild plant species also leads to fewer gatherers engaging in the gathering of wild plant species, since it takes greater effort to achieve harvesting volumes [16]. Decreasing availability may even result in the transformation of wild plant gathering from a profession to an additional source of income, as in the case of truffle gathering in Piedmont, Italy [18].

2.1.2. Climate

The growth patterns of all plant and mushroom species are closely intertwined with climate. Mushrooms are particularly sensitive to climate variability because both drought and floods adversely affect their growth [19,20]. Climate change with warmer and drier weather may in general have negative effects on mushroom availability [18], but also on the availability of berries because warmer winters lead to early flowering and greater risk of spring frosts [16].

2.1.3. Land Use and Management

Land use changes are one of the greatest threats to the availability of gatherable wild plant species [21]. In recent decades, land use has been characterised by an extension of agricultural and building land to the detriment of forests and wetlands. These developments reduce the availability of gathering areas [8,18,20,22].

Land management may have limiting but also advantageous effects for gathering. Clear-cut harvesting of timber, for example, may inhibit the growth of mushrooms for about a decade, but the thinning of forests ensures their continuous provision [19]. The selection of tree species also has an impact on which mushrooms grow in a forest [11] and tree density is a key criterion for the suitability of the fruits of strawberry trees (*Arbutus unedo*) for commercial harvesting [23]. Further management activities in forests that impact mushroom availability include fertilisation, fire, grazing and the use of pesticides [19].

2.1.4. Gathering Practices

Especially when intensive, commercial gathering takes place with unsustainable harvesting techniques, the availability of wild plants may be limited by gathering practices. For example competition for wild plant resources may lead to early harvesting and the harvesting of herb stalks with sickles, instead of picking the leaves by hand [8]. Furthermore, unsustainable gathering of the roots of plants, for example uprooting the whole rhizome of the royal fern (*Osmunda regalis*) instead of leaving parts underground, may easily cause damage to the population [24]. Unsustainable gathering techniques are frequently mentioned in association with herbal plants, but are of less relevance for mushrooms [20].

2.2. Policies

2.2.1. Access to Resources

The policies affecting wild plant commercialisation most are those regulating access to gathering locations and the harvesting of wild plant species [25]. Such policies differ widely between countries, when examined in detail, but often have in common that they are not well coordinated between sectors. Instead, they are distributed across policies for forestry, agriculture, protected areas and land tenure [3]. Legislation tends to be drafted reactively, adding to existing legislation, rather than proper legislation being drafted that comprehensively regulate wild plant gathering. In addition, existing laws tend to be poorly implemented [3].

Wild plant species are harvested from communal, private and public land and access rights for harvesting can differ widely between and within countries [3]. In Europe, gathering permits usually have to be granted by landowners for commercial gathering [26]. Since many wild plant species are gathered from large geographic areas that are owned by a series of landowners, difficulties in obtaining ongoing permission to access these resources can be a key restricting factor [27]. Commercial gathering can also be restricted for conservation purposes as in the case of protected areas or when single plant species are protected.

2.2.2. Food Safety Regulations

Commercialization in Europe, guidelines or legislation define which wild foods and medicinal plants can be marketed by whom. For example, lists of marketable wild mushrooms have been issued for many countries [28], and in South Tyrol, an obligatory training course and qualification are needed for mushroom commercialisation (Decree of the Governor, No. 621, 09.09.2005). Such regulations are intended to ensure safety but may also restrict the commercialisation of wild plant products.

2.2.3. Support Measures

Similar to policy regulations, political support measures for innovations in wild plant commercialisation are also usually spread across different sectors, such as forestry, agriculture and rural development. Again, none of these sectors has a pronounced focus on wild plant commercialisation, but all are involved in part. Although they offer a range of different opportunities for information or funding, these support measures are difficult to access [2]. Instead, entrepreneurs rely on their own funds, expertise and experience for business innovations [1,2]. Finland is an exception to this, and the commercialisation of wild plants has been proactively supported since the 1970s with training, tax exemptions and subsidies, which has resulted in a pioneering position in Europe [17,29]. However, the examples from Latvia and British Columbia, Canada, show that the absence of political interest can also provide fruitful ground for the development of wild plant commercialization—at least as long as no major problems occur [30,31].

2.3. Socio-Economic

2.3.1. Income

Gatherers' income can range from a little extra money to a significant proportion of household income [8,32]. For example in Albania, whole villages depend on the income brought in by wild plant gathering [8], whereas in organic farming in Austria, wild plant products are perceived to play a peripheral role with regard to product ranges and income [7]. Its economic relevance may be a decisive factor behind engaging in wild plant gathering and those with lower incomes might be more likely to engage in wild plant gathering, as for example in Finland, where people were found to engage more frequently in commercial wild berry harvesting in regions where income levels were lower [29]. However, in some cases, income might not be a priority when engaging in wild plant gathering, as in the case of the Austrian Bergtee association, whose members engage in wild plant gathering for idealistic rather than economic reasons [9].

2.3.2. Labour

Wild plant gathering tends to be a time-intensive and physically demanding activity [11], and the availability of labour is an important precondition for gathering marketable volumes. While family farms need to have labour available on-farm, large-scale gathering depends on the willingness of local people to engage in wild plant gathering and sell the gathered plant parts to collectors. This willingness is closely associated with the lucrativeness of gathering, which again is linked to the fluctuating availability of wild plant species—in years with better harvests, more gatherers tend to be available [16]—and the availability of other possible sources of income [29]. In Finland and Sweden, thousands of seasonal migrant workers from eastern European and southeast Asian countries are hired every year to compensate for a lack of and fluctuation in labour in the country [16,33]. Socio-demographic characteristics have also been found to relate to wild plant gathering—for example in Finland commercial gatherers tend to be older, less well-educated and more often retired than the general population [17].

2.4. Market

2.4.1. Competition

The gathering of specific wild plant species by farmers can compete with cultivation of the same plant species, gathering of other wild plant species as compensation, or gathering the same species by other actors. Wild plants are taken into cultivation and domesticated when there is increasing demand, concerns about overharvesting [8,34] or low natural availability [14]. In the long term, the availability of cultivated plant species can reduce the commercialisation of wild plant species. Wild plant species can also be substituted with other wild plant species. For example in Barcelona, Spain,

more saffron milk caps are sold when oyster mushrooms increase in price, and vice versa, whereas demand for porcini mushrooms remains relatively independent of saffron milk caps price fluctuations, probably because of the distinct reputation porcini mushrooms have [35]. Market competition can also manifest itself in the displacement of microenterprises and family businesses by larger business actors. The professional organisation of value chains around the gathering of mushrooms in eastern Europe or herbs in southeast Europe, for example, may lead to barely profitable income margins when gathering the same plant species in other parts of Europe.

2.4.2. Value Chain Types

Wild plants are commercialised through different types of value chains. These range from farms and microenterprises, which commercialise wild plants at a local level, to large-scale gathering by thousands of gatherers for international companies. Farming families commercialising wild plants have been found to mainly pick the plant species themselves, process them and commercialise the resulting products directly to consumers as complements to their existing product ranges [7]. The availability of direct marketing structures is an important precondition here. For large-scale gathering, farmers or gatherers, regional collectors, intermediaries, processors and transporters may be involved in the value chains. The presence and professional organisation of intermediaries and trade are crucial since in many cases plant materials can perish rapidly [36]. A relatively small diversity of plant species is usually gathered and commercialised along such value chains [8,37].

2.4.3. Demand

Demand for wild plant species is strongly linked to societal trends and cultural preferences. While the demand for ingredients for medicinal products remains relatively predictable, trends involving wild foods and cosmetics based on wild plants in particular can appear and vanish quickly [27]. In recent years, wild foods and health products have become fashionable in European countries. This trend is represented by the widely available offer of foraging courses, workshops, tours, books and brochures about wild plant uses, or media coverage [38], and has been accompanied by increasing demand for traditional and innovative wild plant products. While this trend has contributed to the rediscovery of traditional products, including juniper beer or alcohol made from dog rose, hawthorn or sloes in Poland [15,39], for example, it conversely has not halted the gradual disappearance of the use of wild greens in Poland or the substitution of wild plant species by domesticated plant species [40]. Concurrently with niche markets, there is strong demand for some wild plant products on a large-scale international level as well. For example, the Chinese pharmaceutical market demands large quantities of wild blueberries owing to their beneficial health properties [37], and German and US-based businesses have a great demand for medicinal and aromatic plant species from Albania [8]. In Italy, porcini mushrooms have become a food representing the cultural heritage of Italian cuisine, but are mostly imported from northern Europe, eastern Europe and China [41]. The societal trends around wild plant species are thus dynamic and multidimensional, while in recent years a general trend towards wild plants has been identified.

2.4.4. Certification and Labelling

Numerous certification schemes are used to certify wild plants in accordance with social, environmental and economic criteria, including Fairtrade, the Forest Stewardship Council, Fairwild and Organic. Certification can improve market access and income for producers, enhance the sustainability of gathering and offer sustainable and more easily traceable value chains for consumers [27]. Certification has been suggested to be most useful in international markets where educated consumers demand sustainable products from distant producers [27]. Challenges around wild plant certification include the diversity of wild plants and their commercialized products, the large extent of gathering areas, ownership patterns in gathering areas, and limited consumer awareness

about the potential socio-environmental downsides of wild plant gathering and thus a limited market demand for gathered wild products [42].

2.5. Culture

2.5.1. Traditional and Local Knowledge

Throughout Europe, wild plant gathering is associated with local traditions in non-commercial gathering and related local knowledge but is also characterised by high regional and historical fluctuations. Very different plant species may be gathered in different regions, even when geographical characteristics are similar, and many wild plant uses tend to be temporary and linked to changing ways of living [38]. While socio-cultural and economic developments in Europe in recent decades have generally led to a decreasing diversity in wild plants used in households, the remaining traditions are an important factor in supporting commercialisation. Gathering and commercialisation of blueberries in Latvia [30] or mushrooms in Finland [17] and Italy [43], for example are rooted in these widespread and longstanding cultural practices and related local knowledge.

Local knowledge is repeatedly perceived as a precondition for commercial gathering [6]. The white truffle harvesters in Piedmont, Italy, for example, rely on a complex web of local and scientific ecological knowledge about gathering locations and the training of and interaction with truffle dogs. The little interest shown by younger generations in learning truffle hunting is challenging the transmission of local knowledge and the continuity of the activity [18]. Even when commercial gathering targets wild plant species that have not previously been harvested in a particular region, general knowledge about gathering tends to be an important precondition. This was the case in Finland, for example, where several mushroom species were gathered for non-commercial use, but porcini mushrooms were ignored. An entrepreneur then built upon local people's prior knowledge and practices of mushroom gathering, and set up an export-oriented value chain of porcini mushrooms after training local gatherers to identify and harvest porcini [17]. Meanwhile, in eastern Albania, several plant species have been gathered for decades for commercialisation only, while different plant species are gathered for non-commercial use [44].

2.5.2. Attitudes

Attitudes towards wild plant gathering also influence their commercialisation. Wild plant gathering has made a transition from gathering out of necessity due to scarcity of food to gathering for the fun of it. This trend also extends to commercial gathering. In Austria, a project that commercialises herbal tea blends based on wild plant species emphasises that wild plant gathering and the consumption of the tea enhances understanding of the cycles of nature and connectedness with nature. Many people participate because of the pleasure of the activity and they also highlight the health benefits of wild gathered tea blends in preventing and treating diseases [9].

Finally, the attitude of local residents to commercial gathering can influence commercialisation. For many plant species commercial and non-commercial interests overlap and no strict boundaries can be drawn between commercial and non-commercial gathering since one and the same person may dedicate time and effort to both [6]. Commercial harvesting may be perceived as destructive and unsustainable and taking plant resources away from harvesting grounds usually accessed by local people [24,33].

2.6. Interactions between Factors

The factors identified above interact not only within but also between factor categories. Examples of interactions within categories are the availability of traditional and local knowledge influencing attitudes towards wild plant gathering and commercialisation (culture category) or plant availability being influenced by climate, land use and management, and gathering practices (ecosystem category). Examples of interactions between categories include the availability of certain value chain types and

a certain level of demand (market category) influencing the potential for income (socio-economic category) attainable from wild plant commercialisation. Similarly, food safety regulations influence the conditions under which certain wild plant products may be commercialised (policies category) and consequently the continuous knowledge and practice of wild plant gathering and use (culture category). Consideration of these interactions explains how the commercialisation of wild plant species is embedded in a dynamic system where a change in one central factor can have a considerable effect on the manifestation of other factors, and ultimately on the whole system of interrelating factors.

3. Methods

3.1. Field Site

Research was conducted in the Autonomous Province of South Tyrol (Alto Adige), situated in the northernmost part of Italy. The field site was selected because a reportedly vibrant association of organic farmers is dedicated to the gathering of wild plants and promotes their activities through festivals, local markets, shops, gastronomy and training courses.

South Tyrol is a mountainous province where more than three quarters of its area (79%) is higher than 1200 metres above sea level [45]. The use of the area is roughly equally divided between agriculture and forestry, with 44% of its surface being permanent pastures and grazing areas and 41% forests. Permanent crops, including fruit trees and vines, also have significant shares of land use (5%). About 1,185 farms have organic certification (5% of all farms) [46]. Tourism makes an important contribution to income creation, with more than 30 million overnight stays per year. Among the 500,000 inhabitants, about 70% belong to the German language group, 26% to the Italian language group and 5% to the Ladin language group [45].

In South Tyrol, commercial gatherers of wild plants for food or medicinal uses need to provide proof that they are qualified to do so. Such proof includes university degrees in pharmacy, biology or related subjects, a diploma in herbalism or training for at least 110 h at the regional Laimburg Research Centre. Only the gathering and commercialisation of fresh fruit, for example blackberries (*Rubus fruticosus* agg), blueberries (*Vaccinium myrtillus*) and strawberries (*Fragaria vesca*), are exempt. The processing of medicinal plants into products is also only permitted by people with a university degree in chemistry or pharmacy or a diploma in herbalism (Decree of the Governor, No. 6, 13.02.2013). Similarly, the gathering of mushrooms is restricted. For example, a person may only gather up to 2 kg on even days within the borders of his or her home municipality (Decree of the Governor, No 18, 19.06.1991). The sale of fresh mushrooms is restricted to licensed sellers who have passed an examination (Decree of the Governor, No. 621, 09.09.2005).

3.2. Literature Review

The conceptual framework for this study was derived from a review of the body of literature about the commercialisation of wild plants, including mushrooms. The review included studies conducted in Europe and the United States. The Web of Knowledge and Scopus were used as scientific databases and combinations of the following keywords applied: berr*, commerc*, edible, gather*, herb*, plant*, mushroom, fungi, market*, ntfp, non-timber forest products, wild. The body of literature is rather fragmented and therefore references of published papers were frequently checked to ensure that publications were included from the diverse fields of research interested in wild plant commercialisation, including economics, ethnobotany, forestry, politics, rural development and sociology.

3.3. Sample

The population of interest in this study were members of the *Vereinigung Südtiroler Kräutermanbauer* (*Associazione Coltivatori Sudtirolesi Piante Officinali*)—an association of organic herb farmers [47], who are dedicated to the cultivation, wild gathering and processing of herbs and the promotion of

their activities. Most of the herbs (*Kräuter*) cultivated and gathered by the farmers were indeed herbaceous plant species, while their use of the term also extended to plant parts from shrubs and trees (see Supplementary Materials, Table S1). The association had 21 members when the field research was conducted in spring 2018. All the farmers were certified for the whole of their farms in accordance with European organic farming regulations (EC) No 834/2007, (EC) No 889/2008, and amendments, including the clauses on wild plant gathering.

The chair of the association was contacted first to introduce the project subject matter and enquire about the association's interest in participating. After receiving a positive reply, all the members were contacted by e-mail—and in the event of no-reply by telephone—to introduce the project and enquire whether wild plants were gathered on their farm for commercial use. On all the farms where wild plants were gathered, the person with the most knowledge about the gathering, use and commercialisation of wild plants was identified through self-identification or recommendation by family members, and then asked whether he or she would be willing to be interviewed for the present study. Fifteen of the 21 members of the association reported that they gathered wild plant species for self-consumption or commercial use, and all but one out of the fifteen farmers agreed to be interviewed ($n = 14$).

3.4. Data Collection

The second author of this study interviewed the organic herb growers in semi-structured interviews [48] on their farmsteads. An interview guide was used to ensure that core information was gained from all respondents. We structured the interview guide into three overarching themes: (i) the relevance of wild plant gathering for the farm and household, (ii) the historical evolution of wild plant commercialisation on the farm and factors influencing the historical evolution of wild plant commercialisation there, (iii) the advantages and disadvantages of different marketing channels and of organic certification of wild plants. Every topic was broached with a narrative question and then followed up with more specific sub-questions. All the interviews were audio recorded.

Thus, the interview guide was not structured along the factors of the conceptual framework, and no checks were undertaken with the respondents to identify whether every factor in the conceptual framework was relevant to their specific case.

3.5. Data Analysis

The semi-structured interviews were transcribed first and then analysed using the content structuring type of qualitative content analysis following Mayring [49]. This procedure for qualitative data analysis involves deductive coding followed by extracting and summarizing coded material. We used a qualitative data analysis software to code the transcribed text deductively and applied a coding guideline that included the factor categories and factors of our conceptual framework. Subsequently, the coded text elements were exported to a spreadsheet. We finally summarized the coded text, which involved the paraphrasing of coded text elements, the generalization of paraphrases, the reduction of content and the collation and testing of summaries [49]. We finally classified the resulting summaries as supporting or limiting wild plant commercialisation, based on how they were perceived by the farmers.

4. Results

4.1. Ecosystem

4.1.1. Availability

The farmers mentioned that plant species widely available in the wild were likely to be gathered there and not cultivated, for example raspberry leaves (*Rubus* sp.), linden flowers (*Tilia* sp.) and elderberry (*Sambucus* sp.). They also mentioned that they adapted the gathering volumes to the

changing availability of plant species; thus, in years when certain plant species are less available, they adapt their harvesting volumes accordingly.

4.1.2. Climate

Farmers were divided on their perception of the influence of climate on the availability of wild plant species. While some said that plant availability remained the same, others had noticed changes. For example, the altitude at which comfrey (*Symphytum* sp.) grows was said to have. Furthermore, other plants, which were not identified by name, could no longer be found in some places, where they used to grow, due to changing climatic conditions.

4.1.3. Land Use and Management

The farms of all the interviewed respondents had organic certification and they perceived the organic management of their land as supporting wild plant commercialisation because it enhanced or maintained the diversity of wild plant species growing there. Furthermore, continuing use of cow pastures supported the availability of plant species that depend on trampled areas and limited natural reforestation. In turn, reduced use of cow pastures extended the time for the growth and flowering of plant species, which also supported wild plant species. Several activities limiting plant diversity were related to intensification in agriculture, including fertilisation of pastures, elimination of landscape elements such as stone walls, use of machinery instead of scythes for mowing, and the elimination of intermediate hosts of pathogens, especially hawthorn, which is a carrier of fire blight.

Emphasis was placed on the limiting influence of driftage of pesticides used extensively, for example on fruit plantations in South Tyrol. Farmers highlighted that because of this driftage, commercial organic wild plant gathering was not possible in many regions of South Tyrol. In particular, the farmers located close to the valley floor could not gather wild plants on the land surrounding their farmsteads, but had to switch to remote areas, for example high up in the mountains or deep in the forests. However, even then, farmers could not be certain that the gathered plant materials were not contaminated with pesticides since winds can carry pesticides considerable distances.

4.1.4. Gathering Practices

Gathering activities were not perceived to greatly influence wild plant availability. A farmer highlighted that sustainability of gathering activities was in the farmers' interest because they depend on the continuous availability of plant species for their businesses, and thus, they gather without damaging plant populations. Another confirmed that the regulations were strict enough to prevent overharvesting, while increased gathering activities to some extent now limited plant availability. Another farmer again highlighted that the growth of some plant species was boosted by gathering, for example mint (*Mentha* sp.) and masterwort (*Peucedanum ostruthium*).

4.2. Policies

4.2.1. Access to Resources

Access to gathering sites was also an issue of concern to farmers. Permits need to be obtained to gather from public or private land, if the land was not owned by the farmers themselves. However, these permits were hard to obtain, since at issuance, landowners need to comply with the prohibition on certain products in organic farming, and most landowners are unwilling to accept this restriction of their management options. The farmers therefore tended to restrict their gathering activities to the gathering sites they owned. This not only eliminated the burden of obtaining gathering permits, but also had the advantage that the farmers could control the management of the gathering sites themselves. The farmers preferred gathering sites at high altitudes, since contamination by people or traffic is limited. Farmers mentioned the advantages of having gathering sites at different levels of altitude since this increased resilience against unfavourable weather, for example late frosts.

Conservation policies prohibit the gathering of protected wild plant species and commercial gathering in protected areas. The farmers worked around these restrictions by applying for exceptional permission to gather protected plant species with relatively large areas of distribution, such as alpenrose (*Rhododendron* sp.), and through cultivation, such as of arnica (*Arnica* sp.), gentian (*Gentiana* sp.), and edelweiß (*Leontopodium alpinum*).

4.2.2. Food Safety Regulations

The farmers were aware of food safety requirements in South Tyrol, but some admitted a degree of uncertainty when it came to details. They also accepted that the compulsory training was a requirement for wild plant commercialisation, although some highlighted that the need to outsource the processing of medicinal plants to pharmacies limited marketing opportunities since recipes needed to be adapted to the pharmacists' capabilities.

4.2.3. Support Measures

Although the compulsory course at the regional professional school was perceived occasionally as limiting the commercialisation of wild plant species, they also highlighted the support they gained from the course and teaching staff for example with product development.

4.3. Socio-Economic

4.3.1. Income

This study was interested in organic farmers who rely on the cultivation, wild gathering and processing of herbs for direct marketing as their main business activities. Wild plant gathering was attractive for these producers, since it increased the volume of the plants they produce and the diversity of plant species available for their products. In terms of production volume and product variety, it also increased farmers' income. The increase in volume was especially relevant for those farmers who had limited acreage available to cultivate plant species. Product diversification was relevant for all farmers, but especially so for those living at high altitudes with a limited diversity of plant species for cultivation. Wild plant commercialisation was also perceived as useful to generating income in winter when other business activities on the farm were dormant.

4.3.2. Labour

The farmers perceived wild plant gathering and processing as a time-consuming activity that required labour. In addition, for several plant species, timing is important due to short flowering and maturity periods or changing weather conditions that impair gathering, and plant species have to be harvested in a short time span. This may need several gatherers at a particular time. Also, farmers may encourage wild plant species in their habitats through weeding to maintain or increase their availability, which again needs labour. However, farmers perceived wild plant gathering to be less time consuming than cultivation since no work investment was needed for cultivating and tending plant species and wild plant species could mostly be harvested simply. Plant parts that are quickly gathered, for example birch leaves (*Betula* sp.) and stinging nettles (*Urtica* sp.), were therefore favoured over plant species that are time-consuming to gather, for example barberry (*Berberis* sp.). Other species may not even be gathered on demand since they are not widely available and are hard to supply to consumers at affordable rates.

4.4. Market

4.4.1. Competition

The cultivation of plant species may compete with wild plant gathering. Supporting factors for wild plant gathering, however, included the facts that wild plant species may contain unique product

qualities and tastes, certain wild plant species are difficult to cultivate, for example, arnica (*Arnica* sp.), or that other wild plant species may easily become weeds in the years after cultivation and therefore the farmers preferred not to introduce them in fields, for example horsetail (*Equisetum* sp.). Wild plant gathering and cultivation may also be done side by side for individual plant species, and some farmers cultivated and gathered raspberries (*Rubus* sp.) and stinging nettles (*Urtica* sp.) for example.

The farmers tended to commercialise their products in local niche markets, and market competition with other actors was less of an issue. However, they did report an increasing number of producers offering similar products and the need for product innovations.

4.4.2. Value Chain Types

In this study, the producers were organic farmers who, in their main business activities, relied on producing and processing of herbs for direct marketing. The availability of direct marketing structures was a supporting factor for wild plant commercialisation. Direct marketing also added value to products and allowed personal contact to be established with customers. Several farmers offered opportunities on their farms to experience herb production and processing for educational purposes. Products were sold directly in farm shops, farmers' markets, Christmas markets, their own webshops, or in shipments to regular customers or to restaurants and hotels. The farmers also reported selling through local delicatessens or handicraft and organic shops, with one selling essential oils through wholesalers, as well.

4.4.3. Demand

The farmers reported a growing demand for wild plant products, which they linked to a general societal trend for healthy nutrition and lifestyles. Wild plant products have a pristine and healthy image, which is further enhanced by organic certification of the products. The farmers also perceived that consumers were now more interested in origins and production conditions—local wild plant gathering is therefore considered favourably over internationally traded plant species of uncertain origin and production. The farmers mentioned that while in the past primarily tourists were interested in wild plant products, there was now a demand for their products from local people and hotels.

The trend for wild plant products is also linked with increasing opportunities for learning about wild plant species, their health properties and uses. Books, talks, walks and courses are offered and increase consumer knowledge of wild plant uses, which again supports the demand for wild plant products in general. In some cases, there was consumer demand for very specific plant species that may be gathered on demand, such as Iceland moss (*Cetraria islandica*). Product innovations are considered, such as wild-only herbal tea blends, and selected restaurants demand local wild plant species and may even use wild plants as promotional tools, such as wild plant weeks or wild plant-based multi-course dinners.

4.4.4. Certification and Labelling

Organic certification was perceived to support wild plant commercialisation when organic certification inspired trust in the environmental sustainability of production processes and the safety of the final products—both steadily rising concerns among organic consumers. Regarding wild plant gathering, organic consumers value natural resources not being overexploited and the products not having pesticide residues. Rigid organic controls were therefore perceived to be important in maintaining trust in the organic label, even though the time required to document gathering activities and prepare and take part in controls is challenging. However, a comparison of amounts gathered and gathering dates between years also provided learning opportunities for farmers. Besides these supporting factors, demand for organic products is also a societal trend, with health-conscious consumers in particular buying organic wild plant species.

In contrast, organic certification was perceived to limit wild plant commercialisation when customers perceived wild plants to be pristine and natural per se and were unaware of the additional

value of organic certification. Furthermore, reports of fraud in the organic market and uncertainty about the contamination of products with pesticide drift were infrequently mentioned as limiting factors.

Wild plants are processed into single-plant products, for example essential oils or tea, or mixed with other cultivated and wild plant species. The origin of wild plant resources is rarely printed on labels, although consumers are reported to be increasingly interested in origins.

4.5. Culture

4.5.1. Traditional and Local Knowledge

The farmers perceived wild plant gathering as a longstanding activity and tradition in the area. They explained that wild plant gathering was part of their childhood, when wild plants were included in dishes and used to treat wounds and illnesses. They also remembered frequently taking wild plants home when hiking in the mountains. However, some remembered the pressure and their personal unwillingness to participate in wild plant gathering as children. The family is a principal source of knowledge. Other sources are a longstanding personal interest in wild plants and self-study, learning from books and literature, or participating in formal courses. The farmers mentioned that they had a reasonable level of knowledge about wild plants before participating in the compulsory course. This course was then used to refine, increase and deepen their knowledge. They believed that wild plant gathering is an excellent way to connect with nature and enhanced the meaning and enjoyment of life. They therefore enjoyed passing on their knowledge about wild plants to interested children and adults, and offered courses, talks and guided walks.

4.5.2. Attitudes

Wild plants are perceived to have exceptional health benefits that can be used to prevent or treat illnesses and enhance longevity as health foods or medicine. In particular, the fact that wild plant species are neither domesticated nor cultivated, but submit to natural selection pressures and select their own location of growth, provides them with exceptional health benefits, in the farmers' opinion. When deciding on which wild plants to include in specific products, the farmers may consider not only the taste of herbal products but also their therapeutic effects.

The farmers also mentioned the connectedness with nature as a supporting factor for wild plant gathering. They enjoy being outside and walking through the woods and wild plant gathering is therefore also a way to reenergise as well as being a pleasurable activity. Some highlighted the importance of being in harmony with nature when gathering wild plants.

Table 1. Factors influencing wild plant commercialisation as perceived by organic farmers in South Tyrol ($n = 14$) and as suggested by previous literature.

Factor Category	Factor	Perceptions by Farmers		Previous Literature
		Supporting Commercialisation	Limiting Commercialisation	
Ecosystem	Plant availability	Plant resources abundantly available	Fluctuating availability of plant resources	Abundance of targeted wild plants is a precondition for commercialisation; fluctuating or decreasing availability limits commercialisation [14–18]
	Climate	n/a	n/a	Mushroom (and berry) populations are especially negatively affected by climate change [16,18–20]
	Land use and management	Organic farming positively relates to diversity of wild plant species available; continuing use of pastures supports the availability of certain plant species	Continuing use of pastures, fertilisation of pastures, elimination of landscape elements, mowing with machinery, elimination of intermediate hosts of pathogens all limit the diversity of plant species available; pesticide drift contaminates wild plant species gathered	Land use changes are among the greatest threats to the abundance and thus commercialisation of wild plant species; land management can support or limit commercialisation [8,11,18–23]
	Gathering practices	n/a	n/a	Unsustainable harvesting techniques can limit availability and thus commercialisation, especially of herbal wild plant species [8,20,24]
Policies	Access to resources	Ownership of gathering sites by farmers themselves; exceptional permits for gathering widely distributed protected plant species	Obtaining gathering permits from public and private landowners is laborious; prohibition of gathering protected species and gathering in protected areas	Obtaining continuous permission to access gathering locations for wild plant harvesting can be limiting; policies regulating access differ greatly between and within countries [3,25–27]
	Food safety regulations	n/a	Obligatory course at professional school required; prohibition of medicinal plant gathering;	Food safety policies regulating the sale of wild plants and the training needed for sellers limit commercialisation [28]
	Support measures	Obligatory course at regional professional school provides training	n/a	Political support measures to enhance wild plant commercialisation are on the edge of political sectors and difficult to access for entrepreneurs; individual countries provide training, subsidies or tax exemptions [1,2,17,29–31]
Socio-economic	Income	Increase in product quantity and quality through wild plant gathering increases income	n/a	Prospect of income may be a decisive factor for engaging in wild plant commercialisation, although for some gatherers idealistic reasons prevail [7,8,29,32]
	Labour	No work investment needed for cultivating and tending many wild plant species	Natural fostering is time consuming but needed for several wild plant species; need for several gatherers at particular times	Availability of labour is an important precondition for wild plant commercialisation [11,16,17,29,33]

Table 1. Cont.

Factor Category	Factor	Perceptions by Farmers		Previous Literature
		Supporting Commercialisation	Limiting Commercialisation	
Market	Competition	Wild plant species have unique product qualities and tastes compared to cultivated plant species; cultivation of some plant species difficult	Cultivation of some plant species easy; increasing competition because several producers offer similar products	Commercialisation of gathered wild plant species may compete with the commercialisation of cultivated plants of the same or similar species; competition may also occur between different kinds of value chains [8,14,34,35]
	Value chain type	Availability of direct marketing structures	n/a	Availability of value chains for large-scale gathering and direct marketing structures for farming families support wild plant commercialisation [7,8,36,37]
	Demand	Rising demand for wild plant products; trend for healthy and regional foods; increasing opportunities to learn about wild plant uses	n/a	Trend for wild plant products supports wild plant commercialisation, while such trends may appear and vanish quickly [8,15,27,37–41]
	Certification and labelling	Certification enhances trust in environmental sustainability of production processes and food safety; societal trend for certification	Certification needs bureaucratic efforts; lack of consumer awareness about additional value of organic certification; cases of fraud in organic market damage trust in organic label	Certification can improve market access and income for producers, enhance sustainability and offer better traceable value chains for consumers but may be challenging to achieve due to certification processes and requirements [27,42]
Culture	Traditional and local knowledge	Traditions for wild plant gathering available; opportunities for knowledge transmission and learning available;	n/a	Wild plant commercialisation is frequently rooted in cultural practices and related knowledge, which may support or limit wild plant commercialisation [6,17,18,30,38,43,44]
	Attitudes	appreciation of health benefits of wild plant species; appreciation of being outdoors and connected with nature when gathering	n/a	Perception among gatherers of wild plant gathering being a pleasurable activity and enhancing connectedness to nature may support wild plant commercialisation [6,9,24,33]

5. Discussion

The aim of this study was to understand the factors that influence the commercialisation of wild plants, including mushrooms, by organic farmers. First, a conceptual framework was developed that was then used to comprehensively investigate the supporting and limiting factors for the case study in South Tyrol. This section discusses these results in the context of previous literature (Table 1).

5.1. Supporting and Limiting Factors

Most of the limiting factors identified in South Tyrol were in line with those mentioned in earlier publications. Land transformation, changing livestock pressures, pollution [21], and access to gathering sites and resources [25], for example, have previously been found to be among the greatest threats to wild plant commercialisation. These kinds of limiting factors outweigh overharvesting or unsustainable gathering practices, although the latter are frequently major concerns of governing bodies [50]. Public bodies and landowners tend to adopt precautionary views and restrict gathering volumes and access to gathering sites [25]. These restrictions are intended to support the sustainability of non-commercial and commercial wild plant gathering and avoid the tragedy of the commons on public land [51], but actually rarely have a consistent strategy and tend to overregulate the sector [3].

This applies in a similar way to South Tyrol, where the farmers highlighted the limiting impact of intensification of agriculture and difficulties in accessing public and private land they did not own themselves for organic gathering, while unsustainable gathering was hardly mentioned as limiting factor. Relating to the intensification of agriculture, the contamination of wild plants with pesticides through driftage seemed to be especially severe in South Tyrol because of the high density of non-organic fruit trees and vines grown and the related intensive use of pesticides. Furthermore, the threshold of 0.01 mg/kg for pesticide residues in organic products is comparably restrictive in Italy (Nota Mipaaf 11.07.2011–n.13349). In terms of issues in accessing gathering locations, the respondents reported difficulties in accessing land for organic wild plant gathering and therefore mostly gathered on their own land. Access to commercial wild plant gathering is organised very differently throughout Europe, while the everyman's right in Nordic countries is often highlighted as exemplary for supporting wild plant commercialisation. Everyman's right grants access rights to forests for everyone who can then make both commercial and non-commercial use of the resources [52]. Finland can be seen as a role model for organic gathering, since, at 12 million hectares of almost exclusively public land, it hosts the world's largest area that is certified for organic wild berry harvesting [13].

The need for specific university degrees or the completion of extensive training before individuals are allowed to commercialise wild plants and process medicinal plant species also restricts access to wild plant commercialisation in South Tyrol. The extensive time and money needed to meet these requirements can present considerable obstacles for those wishing to engage in wild plant commercialisation, particularly since a lower income seems to be linked to wild plant commercialisation [29]. Further research is needed to clarify whether the benefits of these restrictions in terms of food safety and sustainable harvesting are worth the effort involved.

Consumers are reported to be largely unaware of the additional value of organic certification of wild plants—again, a limiting factor. Sustainability labels are useful precisely because consumers are given the conscious choice of buying products produced under sustainable conditions [27]. If consumers are not aware or informed about the additional value of organic certification, they are unable to make a conscious decision.

The supporting factors identified have been addressed less frequently in earlier research. The supportive character of the management techniques used in organic farming and the general trend among consumers for organic farming and wild plant species is, however, in line with the reported momentum for wild, regional and healthy foods [38]. Available targeted and easily accessible training also contribute to developing and steering the sector in South Tyrol, but this is rarely mentioned elsewhere. One exception is Finland, where large advisory and extension networks have been created to train gatherers in species identification and in the handling, processing and marketing of products [29].

Similarly, the availability of cultural practices was found to be supportive in South Tyrol but has rarely been studied in detail in terms of wild plant commercialisation. Organic herb farmers in South Tyrol usually rely on their family members as principal sources of knowledge and base their activities on traditional and local knowledge. Organic herb farmers perceived wild plant gathering as a pleasurable activity that enhances connectedness with nature and meaning in life. Similar positive attitudes towards wild plant gathering have been reported more frequently for non-commercial [53,54], rather than commercial gathering (exception: [9]).

For the respondents in the present study, the adaptability of wild plant commercialisation also tended to be a supportive factor. Wild plant commercialisation is a part of their farm business that is balanced with other farm activities, especially herb cultivation. This means wild plant commercialisation can be a central or peripheral activity, depending on farm characteristics such as acreage available for cultivation, the farm's altitude, cultivability of a smaller or wider range of plant species, or labour availability. For smaller farms, in particular, or those situated at higher altitudes, wild plant commercialisation may offset the restrictions around herb cultivation.

Furthermore, several factors in the conceptual framework were shown neither to support nor limit wild plant commercialisation in South Tyrol. This included the fluctuating availability of wild plant species, which is a frequent concern for commercial gatherers and processing companies who depend on the steady provision of products [16,17]. In contrast, the respondents in the present study spoke about their usual practice of adjusting gathering volumes to plant availability. This factor may be more relevant to highly specialised gatherers and processors who harvest and process large amounts of single plant species and cannot offset a year of poor availability of these species by gathering more of other species. Furthermore, organic farmers mostly gather herbal plant species and might be less affected by fluctuating availability since their availability is more stable than berries or mushrooms. Similarly, the organic herb farmers might have perceived the impact of climate as less important, because herbal plant species are less sensitive to unusual weather phenomena than berries and mushrooms.

Overharvesting was also not perceived to be limiting wild plant commercialisation in South Tyrol, although herbal plants are especially threatened by unsustainable harvesting techniques [20]. This perception may be caused by restrictive regulations for wild plant commercialisation and the obligatory training that commercial wild plant gatherers have to undergo, or by farmers mostly gathering on their own land where they might have an enhanced sense of caring and harvesting sustainably.

Competition between wild plant gathering and plant cultivation was also less of an issue since wild plant species are attributed unique product qualities and tastes that are lost through cultivation and domestication. Single plant species that are easy to cultivate, and in high demand, are cultivated on their own in addition to wild gathering, supporting the assumption that low or insufficient natural availability can lead to cultivation [14]. However, several targeted plant species are difficult to cultivate and their management in nature is currently the only option. Market competition with other producers offering similar products has been reported occasionally and a diversification in products made from wild plant species would open up new marketing possibilities. However, competition with larger business actors was not an issue. Short value chains with direct marketing were confirmed here as a successful way of supplying niche markets [51].

5.2. Conceptual Framework

This research developed and used a conceptual framework based on literature from Europe and the United States in order to understand the factors influencing wild plant commercialisation. How useful is this framework, though, for analysing wild plant commercialisation in other worldwide contexts? A comparison of the factors identified as potentially influential in the present framework with those identified in other world regions highlighted the finding that many factors overlapped. Such factors included income level, labour availability, access to information and markets, proximity to forests, legal restrictions, availability of infrastructure for transport, storing and processing [55–57], sustainability of harvesting activities [58] and characteristics of the targeted species such as regeneration

level, alternation of yield or perishability of the product [57]. Similar to the literature reviewed to create the conceptual framework in the present study, worldwide studies have tended to focus on certain factor categories while neglecting other factors as well as the overall picture. For example, many studies have focused on market-related and socio-economic aspects [55–57], governance [59] or ecological sustainability [21], while the influence of culture on wild plant commercialisation or comprehensive accounts of the factors that influence it have barely been considered. It is, therefore, believed that this conceptual framework could provide a basis for a comprehensive analysis of wild plant commercialisation in worldwide contexts as well. However, additional factors may be considered relevant for such endeavours.

6. Conclusions

The principal achievements of the present study are two-fold. First, a step has been taken towards understanding the comprehensive factors that influence wild plant commercialisation and a conceptual framework has been built that structures these factors. Future studies may build on this framework and enhance it with insights from the varied circumstances under which wild plants are commercialised in Europe and in similar contexts beyond. Second, supporting and limiting factors for wild plant commercialisation in South Tyrol have been identified based on the perceptions of organic herb farmers. Based on these insights, political support should include:

- promoting organic farming as measure to support wild plant gathering;
- limiting pesticide driftage;
- facilitating access to gathering sites and their organic certification;
- holding a review of legal restrictions;
- providing information to consumers about the additional value of organic certification of wild plants;
- continuing to provide easy access to training for producers;
- building on the trend for wild, regional and healthy foods;
- acknowledging cultural values in wild plant gathering;
- promoting the transmission of knowledge about wild plant gathering.
- supporting wild plant product development;

Realisation of these measures should unlock the much-heralded potential of wild plant commercialisation for rural development in South Tyrol and may also inspire policies beyond the region.

Supplementary Materials: The following are available online at <http://www.mdpi.com/2071-1050/11/7/2028/s1>, Table S1: Organic wild plant parts commercialised by members of the *Vereinigung Südtiroler Kräuternbauer* (*Associazione Coltivatori Sudtirolesi Pianta Officinali*).

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