

## **Wild harvested nuts and berries in times of new pests, diseases and climate change**

**Round 2 Interregional Workshop of the Wild nuts and berries iNet**

**12-14, June, Palencia, Spain (& fieldtrips)**



1. AGENDA .....	<b>1</b>
2. iNet THEMES AND KNOWLEDGE GAPS.....	<b>4</b>
3. ATTENDEES .....	<b>4</b>
4. WORKSHOP .....	<b>5</b>
4.1. Presentations .....	<b>5</b>
4.2. Work group sessions .....	<b>8</b>
4.3. Field trips.....	<b>10</b>
5. CONCLUSIONS .....	<b>11</b>
<b>References</b> .....	<b>12</b>

## 1. AGENDA

The scoping seminar of the Wild nuts and berries iNet put forward priorities themes to focus INCREDIBLE actions. One of the topics highlighted was the “Long-term resource availability in a context of climate change”. Wild nuts and berries are facing several challenges that threaten the evenness of their provision. Namely climate change and different exotic pests and diseases are of paramount relevance for the successful management of these products. The workshop aimed to provide helpful insights for both public and private stakeholders about the current situation, the effect of climate change, the damages caused by biotic agents and how to combat them.

The Workshop brought together researchers, forest managers, Government representatives, private forest owners, representatives of the sector and entrepreneurs that participated actively in the debates and round tables.

**Addressed to:** Public and private stakeholders from value chains of wild nuts and berries.

**Venue:** University of Valladolid, Campus ‘La Yutera’, Palencia (Spain)

**Language:** English, Spanish (simultaneous translation)

Table 1. Programme of the Interregional workshop

DAY 1	
11:00	<b>Register of participants</b>
12:00	Opening <b><u>Presentation of Thematic Network INCREDIBLE</u></b> Objectives and agenda of the network and of the workshop
12:15	<b><u>Knowledge Repository for Non-Wood Forest Products: Overview and design concepts</u></b> Dr. María Pasalodos, INIA
12:30	<b><u>Predicted impact of climate change on growth and production of Mediterranean stone pine</u></b> Dr. Marta Pardos, INIA
12:45	<b><u>Current situation and perspectives of the pine nut value chain in Andalucía</u></b> Da. Rocío Perea, Santiago Perea S.L.
13:00	<b><u>Challenges and threats for the Mediterranean pine nut value chain</u></b> Da. Amelia Pastor, Soc. Coop. PiñonSol
13:15	<b>Pine nut supply under the decline of the wild harvested production</b> Plenary session / Round Table: sharing European experiences
14:00	<b>Lunch</b>
15:30	<b><u>Research on the western conifer seed bug <i>Leptoglossus occidentalis</i> carried out at the</u></b>



	<a href="#"><u>iuFOR Forest Pest Laboratory</u></a> Prof. Juan Pajares / Laura Ponce
<b>16:00</b>	<a href="#"><u>Clonal variation in susceptibility to <i>Leptoglossus occidentalis</i> in grafted plantations</u></a> Dr. Raul de la Mata (IRTA)
<b>16:15</b>	<a href="#"><u>Current situation of <i>Leptoglossus occidentalis</i> in Turkey</u></a> Dr. Kahraman Ipekdağ. Ahi Evran University, Turkey
<b>16:45</b>	<b>Coffee break</b>
<b>17:15</b>	<b>Assessment of the impact of <i>Leptoglossus occidentalis</i> in pine nut supply</b> Group work Plenary session
<b>17:45</b>	<b>Pest management tools to fight <i>Leptoglossus occidentalis</i> in Mediterranean stone pine</b> Plenary session
<b>DAY 2</b>	
<b>9:00</b>	<b>The Innovation network on Wild nuts &amp; berries within the Thematic Network INCREDIBLE</b> Objectives and agenda of the day
<b>9:15</b>	<a href="#"><u>Current challenges for Mediterranean non wood forest product (NWFP) sectors by new pests and diseases</u></a> D. Álvaro Picardo, DG Medio Natural, Consejería de Fomento y Medio Ambiente, Junta de Castilla y León
<b>9:30</b>	<a href="#"><u>Chestnut production, the impact of the chestnut gall wasp and other pests and diseases</u></a> D. Roberto Rubio, CESEFOR
<b>9:45</b>	<a href="#"><u>Current situation and threats for the chestnut value chain in Spain</u></a> D. Pablo Linares, Director of Mesa del Castaño del Bierzo
<b>10:00</b>	<a href="#"><u>Incidence of blight canker in chestnut trees in Castille and Leon. Historical perspective and current situation</u></a> Dra. Paula Zamora, TRAGSA
<b>10:15</b>	<b>Discussion on the chestnut provision under current threats</b> Group work and Plenary session
<b>11:00</b>	<b>Coffee break</b>
<b>11:30</b>	<b>Impact of chestnut gall wasp, <i>Dryocosmus kuriphilus</i>, in Galicia</b> D. José J. Martel, Jefe de Salud y Vitalidad del Monte. Xunta de Galicia. Dirección Gral. De Planificación y Ordenación Forestal. Consellería de Medio Rural. Xunta de Galicia.
<b>11:45</b>	<a href="#"><u>Propagation of <i>Dryocosmus kuriphilus</i> and release of the parasitoid <i>Torymus sinensis</i> in Castille and Leon</u></a> D. Juan Carlos Domínguez, CSF de Calabazanos. Junta de Castilla y León

<b>12:00</b>	<a href="#"><u><b>Torymus sinensis, an effective parasitoid for fighting the chestnut gall wasp in France</b></u></a> Dr. Nicolas Borowiec, INRA (France)
<b>12:15</b>	<a href="#"><u><b>Classical biological control of <i>Dryocosmus kuriphilus</i> in Turkey</b></u></a> Dr. Kahraman Ipekdağ, Ahi Evran University, Turkey
<b>12:30</b>	<a href="#"><u><b>Biological control of <i>Dryocosmus kuriphilus</i> in Trás-os-Montes, Portugal</b></u></a> D. Albino Bento, Instituto Politécnico de Bragança (Portugal)
<b>12:45</b>	<b>Can the chestnut gall wasp be controlled by management?</b> Round Table: Sharing European experiences Group work
<b>13:30</b>	<b>Lunch</b>
<b>15:00</b>	<b>Can the chestnut gall wasp be controlled by management?</b> Conclusions
<b>15:30</b>	<a href="#"><u><b>Evaluation of the aptitude of the station for chestnut in Castilla y Leon under climate change scenario</b></u></a> Da. Rocío Gallego García, CESEFOR
<b>15:45</b>	<b>Edible non-wood forest products under a climate change scenario</b> Group work / Plenary / Round Table
<b>16:45</b>	<b>Knowledge contest on NWFP</b> Presentation of the innovation ideas / Winner election
<b>DAY 3</b>	
<b>8:00</b>	<b>Visit to different <i>Castanea sativa</i> stands in Aliste (Zamora)</b>
<b>13:30</b>	<b>Lunch in Alcañices</b>
<b>15:00</b>	<b>Closure of the meeting</b>
<b>16:15</b>	<b>Arrival to Zamora</b>
<b>17:30</b>	<b>Arrival to Valladolid</b>
<b>18:15</b>	<b>Arrival to Palencia</b>
<b>DAY 4</b>	
<b>Visit to different <i>Pinus pinea</i> forests and orchards in Quintanilla and Tordesillas (Valladolid)</b>	

## 2. iNet THEMES AND KNOWLEDGE GAPS

The Scoping Seminar of the iNet, held in June 2018 in Coruche (Portugal), entailed a good opportunity for identifying the priority themes to focus INCREDIBLE actions. Different topics were pointed out, namely processing quality, traceability, labels to minimize the black market. Among them, it arose one issue that needed urgent attention: pest and diseases are causing severe losses of chestnuts and pine nuts, jeopardizing the continuous supply of these products.

According to the Scoping Seminar conclusions, the knowledge gaps that need to be fulfilled were:

- Chestnut: Biology and effective integrated pest management practices for the chestnut gall wasp, *Dryocosmus kuriphilus*.
- Pine nuts: Biology and effective integrated pest management for the Western conifer seed bug, *Leptoglossus occidentalis*, and other cone pests (*Dioryctria* sp., *Pissodes validirostris*).
- Ongoing climate changes and scenarios for forest ecosystems and production.

Thus, the second round interregional workshop aimed at share the available knowledge and recent results on these topics. To comply with this objective different experts were invited to present their experiences and research lines.

## 3. ATTENDEES

The Workshop was attended by 43 participants (12F:31M gender balance): 36 Spanish, 5 Turkish, 1 Portuguese and 1 French. The attendance varied depending on the session. There were 17 speakers from Spain, France, Turkey and Portugal.

The first day was focused on pine nuts, with 6 speakers from Spain (5) and Turkey (1) and 35 attendees. The second day the presentations were centred on the chestnut sector, with 8 speakers from Spain (5), Turkey (1), France (1) and Portugal (1) and 24 attendees. The field trip was joined by 14 attendees.

In the case of pine nut sector, the participants in the workshop covered all the different actors from the pine nut value chain: forest administration, private owners of stone pine forests, pine nuts processors and researchers. As expected, the attendance was mainly regional, which is reasonably due to the importance of the sector in the region of Castilla y León. However, researchers and stakeholders from whole Spain and one even from Turkey presented their results on the topic.

In contrast, the chestnut sector was not so widely represented. Beside the speakers, the attendees were researchers from the university and representatives from the forest administration. The lower participation of the chestnut sector may be due to: (i) the fact that the chestnut sector organises regularly their own meetings, the sector being highly consolidated; (ii) *Dryocosmus sinensis* is not considered as fatal as *Leptoglossus occidentalis* has proved to be for the pine nut sector; (iii) chestnut production is an secondary source of incomes, not the basic livelihood for chestnut growers.



## 4. WORKSHOP

The workshop included three types of activities: (i) oral presentations, (ii) group work and discussion and (iii) field trips. During the first and second days, oral presentations and group work and discussions were held. The third day was devoted to the field trip visiting Aliste, a region of Zamora province with increasing planting area of *Castanea sativa*. An additional field trip was organised the fourth day to stone pine forests in the Valladolid province on demand of participants.

### 4.1. Presentations

The workshop was focused on two main products, chestnuts and pine nuts, not only for their economic relevance but also due to the important threats that both products are facing in terms of climate change effects and the appearance of exotic pests and diseases. 16 speakers were invited to give a talk about the different topics that needed to be covered:

- (i) state of the art of the pine nut and chestnut value chains;
- (ii) effect of climate change on these productions; (iii) main pest and diseases affecting and the potential solution to these threats.

The first day started with an introduction of the Thematic Network INCREDIBLE and its Wild Nuts and Berries iNet, by the iNet coordinator Sven Mutke. The importance of participation in the innovation process was highlighted during the presentation.

The first talk centred on pine nut sector was given by Dr Marta Pardos, whose group is working on the impacts of climate change on stone pine growth and yield in the Northern Plateau (Castilla y León), the area where the species reaches its maximum production in Spain. Their results showed that climate change is not a predicted threat anymore, but it has already become a real problem at present (Pardos et al 2019). Due to the rise in temperatures and the decrease of rainfall, stone pine shows a loss of growth, regeneration and cone productivity that might lead to the displacement by other species better adapted to the new conditions.

Afterwards, representatives of the pine nuts industry exposed their vision on the current situation. Rocio Perea (Santiago Perea S.L.) and Amelia Pastor (Piñonsol Coop) explained the problems the sector is facing and needs to solve, namely the loss of productivity due to climate change, but very especially due to the remarkable losses caused by the seed pest *Leptoglossus occidentalis*. Moreover, they identified the main topics needed to be assessed in order to achieve a better support for the sector (Pastor 2019; Perea 2019):

- (i) Product differentiation. There are pine seeds from other, Asiatic species that compete in the market with Mediterranean pine nuts without a correct, clear differentiation in terms of labelling.
- (ii) Lack of control in pine nut provision. An important proportion of pine nuts are illegally harvested and traded.

After lunchtime, Prof. Juan Pajares opened the section devoted to pest and diseases affecting stone pine, with a special focus on *Leptoglossus occidentalis*, an exotic bug that is causing a serious damage in pine nut production. Prof. Pajares presented different ongoing studies at the iuFOR Forest Pest Laboratory (University of Valladolid) regarding *Leptoglossus occidentalis*. Their results confirmed that this bug produces high damage to nut production and also that the pest is very active due to the favourable climatic conditions in the Northern Plateau (Ponce and Pajares 2019). Moreover, Prof. Pajares showed some promising research lines that are being developed in the laboratory,

- (i) an aggregative pheromone for *Leptoglossus occidentalis* has been detected and
- (ii) two native egg parasitoids (*Ooencyrtus spec.*) causing moderate but relevant levels of parasitism to *Leptoglossus occidentalis* have been found in field surveys in inner Spain.

An approach to quantitative genetics was shown by Dr. Raul de la Mata that illustrated the research studies carried out in the IRTA research centre Torre Marimon. Clonal variation in stone pine is tested for susceptibility to *Leptoglossus*, having identified already some clones that perform better. The field work is really interesting, since some trees are excluded completely from being attacked by *Leptoglossus occidentalis* using cages. From the research experiences that IRTA is carrying out it can be concluded that (Mata et al. 2019):

- (i) First year conelets production is a good proxy for coming cone yield,
- (ii) also conelets losses during cone development significantly determines final cone yield,
- (iii) selection for clones can be recommended combining increased conelets production and decreased conelets losses.

Dr Ipekdal, Ahi Evran University Kirshehir presented different ongoing research initiatives developed since 2019 in Turkey related to the research and control of *Leptoglossus occidentalis*. The studies included different approaches to combat *Leptoglossus occidentalis*, such as

- (i) the biological control of *L. occidentalis* focused on the effects of *Ooencyrtus ptyocampae* and *Beauveria bassiana*;
- (ii) thermal traps against *L. occidentalis* and determination of their efficiency;
- (iii) chemical strategies against *L. occidentalis* that could be used in stone pine orchards;
- (iv) determination of the effects of *L. occidentalis* on other *Pinus* species in the Eastern Mediterranean Region of Turkey.

Álvaro Picardo, from the Regional Government of Castilla y León, gave a framework presentation on the current challenges for Mediterranean NWFP sectors by new pests and diseases (Picardo 2019). The importance of cooperation, coordination, innovation and research, pillars of the INCREDible Nets, was highlighted. Álvaro Picardo also pointed the attention on the new regulation launched by the EU Commission: the EU Plant Health Regime, based on the International Plant Protection Convention (FAO) and now regulated by Regulation (EU) 2016/2031 Enforcing EU rules for the AgriFood chain. The Regulation will enter into force on December 14, 2019. It establishes common rules for EU official controls to ensure that the existing regulation is correctly applied, strengthening the principle of risk-based controls when importing plants from other countries. It is important that this type of Regulation was launched since the main introduction pathway for pests is through plant importation.

In the session of the second day, devoted to chestnut, Roberto Rubio (CESEFOR), illustrated the economic losses caused by wall wasp in Bierzo, a region where chestnut production is of great importance. The features estimated that losses by gall wasp in Bierzo can have an impact close to 20 million € per year (Rubio 2019). It is necessary to act intensively through the biological control by *Torymus sinensis* parasitoids, but also to continue with the change in the productive model through the aggrupation of producers, i.e. sector structuring. It is necessary to minimize the economic impact that this pest is causing by valuing and commercializing products with high added value.



Pablo Linares, director of *Mesa del Castaño del Bierzo* (“Chestnut Round Table”, a regional sectorial organization) pointed out the current situation and main threats that the sector is facing (Linares 2019). The current situation is characterized by

- (i) a high demand of chestnut in the market,
- (ii) a decrease in production,
- (iii) dominance of minifundism.

Among the threats the following ones can be noted

- (i) *Dryocosmus kuriphilus* and other pests and diseases such as *Phytophthora cinnamomi* (dieback, *tinta*), *Cryphonectria parasitica* (blight, *chancro*), *Cydia splendana* and *Xyleborus dispar*;
- (ii) climate change;
- (iii) low productivity;
- (iv) low expertise of chestnut growers.

Centring on pests and diseases affecting chestnut stands, Paula Zamora from the Forest Health Centre Calabazanos (Junta Castilla y León) gave her vision on the current situation of Chestnut blight caused by the fungus *Cryphonectria parasitica*, and its control mechanism, highlighting the use of hypovirulent *Cryphonectria parasitica* strains thanks to dsRNA mycovirus inoculation. This type of treatment is being successfully applied in the region.

Jose Martel, from the Galician Regional Government, provided information on the situation in Galicia where *Dryocosmus kuriphilus* have been already spread throughout the region. In Galicia the releases of *Torymus sinensis* are declared experimental, but the amount of individuals released is of importance, in order to check whether the parasitoid is capable to control the pest.

Juan Carlos Dominguez, representative of the regional government of Castilla y León, also exposed the situation on the controlled releases of *Torymus sinensis* in this region. He pointed out the importance of following strict rules where *Torymus* would be released:

- (i) do not use insecticide within 100 meters of the release site, especially in spring or the beginning of summer,
- (ii) avoid pruning since the time of pruning until mid-November,
- (iii) pruning slash will not be removed until two springs after, with the aim of letting time to all *Torymus* to be released from the galls.

A different point of view in the cycle of presentations about *Torymus sinensis* as a biological control tool against *Dryocosmus* was given by Dr Nicolas Borowiec from INRA. In France, gall wasp is not considered a problem anymore, once it has been controlled using classical integrated biological control, namely *Torymus sinensis*. Nowadays, the pest is controlled but some steps have been given to achieve this result. In France, after the first detection of *Dryocosmus* in 2010, a National Committee for the control of this pest was organized to coordinate the fight against it. The objectives aimed by this Committee were:

- (i) to develop biological control using *Torymus sinensis*
- (ii) screening of varieties susceptibility of *Dryocosmus kuriphilus*,
- (iii) assessment and monitoring of yield losses, in order that the chestnut growers would obtain financial compensations.

The results of the initiative were:

- (i) Creation of the National Federation of chestnut producers

- (ii) Quick development of *Torymus sinensis* releases in France
- (iii) Substantial financial supports for biological control in France (for experimental releases and for upscaling) 2011-2018.
- (iv) Financial compensations of yield losses.
- (v) Wide establishment of *Torymus sinensis* and efficient control of *Dryocosmus kuriphilus* in France.
- (vi) High intrinsic abilities of *Torymus sinensis* to efficiently establish and disperse.
- (vii) Need to have a frame large and long enough to assess the intentional and unintentional effect of Classical integrated biological control.

In Turkey, the releases started in 2015 and since then, they have been continuing with the research, including a FAO project, Dr Ipekdağ informed.

In Portugal, a National Commission for fighting wall gasp has been created. Since 2014, different studies have been carried out trying to identify native parasitoids for *Dryocosmus kuriphilus*, similar to the initiatives in Spain

Rocio Gallego from CESFOR, finally, got back to abiotic stressors, presenting simulations of possible evolutions of chestnut stands under different climate change scenarios. One of the scenarios depicts the evolution of climate under the current growth conditions. The second scenario represents a world that grows at a slower pace, in a more sustainable way. Results from the simulations are preliminary but they show that in 2100 the suitable area for growing *Castanea sativa* under scenario 1 will diminish drastically and the potentiality of the land will be minimum. Under scenario 2, the situation is better, with a low reduction in the suitable area for *Castanea sativa*, and potentialities ranging from medium to minimum.

#### 4.2. Work group sessions

Different work group sessions were held during the workshop, focused on chestnut and pine nuts respectively. After discussing the topics exposed along the different presentations, the audience was asked to write down a headline of the day describing the future evolution of these products. The schedule was similar for both days. Below there is a compilation of the different headlines that the participants proposed for each session.

##### Stone pine headlines

“Sustainability of natural stands” / “**Adaptive management** of stone pine stands” / “It is necessary to carry out more research focused on **natural regeneration**” / “It is necessary to **invest more resources** in the forest to keep it providing wealth” / “Need for more resources from the Administration” / “There have always been changes and maybe now with **greater speed** you have to adapt”

“**Leptoglossus occidentalis** is the reason of pine nuts yield loss” / “*Leptoglossus occidentalis* is harmful for stone pine and it is necessary to **find a solution urgently**” / “There is already a consensus about the existence of the problem and there is a strong will to solve it” / “There are currently **no tools for the control of *Leptoglossus occidentalis*, much more research is required**” / “There are possibilities for improvement in the fight of *Leptoglossus*, but it is not expected to be rapid or extensive” / “Numerous initiatives have been started to solve problems, but they are not going fast enough.” / “Things have been done, progress has been made, the line of work is good. The problem is that the road is slow and success is not sure: Would the results be accelerated with more funding and coordination?” / “Need for more research” / “**Coordination between**

research studies” / “Europe-wise collaboration is needed (so much work to do!)” / “To find a solution against *Leptoglossus occidentalis* there must be international cooperation” / “Possibilities of **biological control for *Leptoglossus***” / “Deep evaluation of biocontrol methods (pheromones, native parasitoids...)” “The urgency in the search for a solution does not have to lead us to let ourselves be led by siren songs either” / “Accelerate research on *Leptoglossus* as much as possible. **Time runs against us**” / “There is no solution for *Leptoglossus* in natural stands: economic losses, job losses, value losses”

“There is no clear forest policy that alleviates the reduction of pine nuts” / “The Administration has to be more agile in stopping pests” / “**Stone pine producers need support** during the process [of *Leptoglossus* control]” / “Pest shock plan needed” / “Acceleration in solving the problem” / “**The processing sector must join the forest owners**, and address the problem as an industrial crisis, with the competent agencies”

“Climate change forecasts an **increase in aridity** and degradation of growth conditions for stone pine.”

“Stone pine forest stands are in serious danger for persistence” / “**Traditional pine nuts production in natural forests is compromised** in its current format” / “Pine nut production in the mid-term may be based in **grafted plantations of high productivity**” / “The selection of more **resistant clones less susceptible to *Leptoglossus occidentalis***, could be a powerful tool in the management of the pest in the long term” / “If the solution to production is the change of productive model towards plantations, do provide all available information, planting modes, treatments, management and others...” / “Grafted plantations are still an utopic solution: there is still no access to scions or grafted treelets from nurseries, nor any support action”

“Include political institutions in a “**National Committee**” that **gathers all actors** to be sure that the regulation is close in respect of grower view, technical institute, research institutes” / “Need to **articulate a sector support policy**” / “If there is no economic value there is nothing: has it been quantified?” / “**True cooperation between all the agents in the sector is needed**”

“The possible income from pine nut is better than any agricultural crop (almond, pistachio)” / “The productive sector of the pine nut is **key to contribute against rural flight**”

“It is necessary to standardize the **product regulations** in order avoid unfair competition. Spanish industry should be allowed to buy cones in Turkey if the Turkish can buy them in Spain”

## Chestnut Headlines

“**Gall wasp** is rapidly expanding its range” / “*Phytophthora* species are locally damaging and its control is very difficult” / “***Cryphonectria parasitica*** blight is abundant in Turkey and management against it is not sufficient enough” / Also *Cossus cossus* is abundant in Turkey and its control is difficult / “Try to find eco-friendly **solution for other pests** (*Cydia splendana*, *Curculionidae*, *Cryphonectria parasitica*...) to increase the productivity/competitiveness of European producers” / “**What remains to be done? Find specimens of *Castanea sativa* resistant to diseases and pests** by promoting resistant genotypes or with biostimulants” / “Dwarfed varieties suitable for greenhouse breeding could be an option? Otherwise chestnut will suffer from many threats”

“**Control of chestnut gall wasp will be achieved in a lot of areas within the 10 next years** (either by releases or by natural dispersal). It won’t be a serious threat anymore.” / “2025 chestnut sector. There will be blight and wasp damage but controlled at an acceptable level. Perhaps another

plague or disease has entered by then” / “New possible pests or diseases might compromise the existence of *Castanea sativa*”

#### 4.3. Field trip day 1

During the field trip, different chestnut stands in the Aliste region near the Portuguese border were visited (municipalities of Trabazos and Alcañices). Chestnut growers explained within their new established, highly productive stands the best management practices. For instance, leaving a short grass cover is better than ploughing the land. Chestnut groves are grafted and present chestnut production of very good quality from the 14<sup>th</sup> year. The distance among trees varied between 10x10 and 12x12 meters. Though private owners get every year returns from chestnut production, it makes not their main livelihood, but supplement their portfolio of activities and incomes.



Figure 1. Chestnut stand in the municipality of Trabazos (Castille y León)



Figure 2. Grafted chestnut



Figure 3. Chestnut affected with blight and treated with hypovirulent strain

#### 4.4. Field trip day 2

An additional day was devoted to demonstration tour to stone pine forest stands and grafted plantations in the province Valladolid.

The cone yield loss due to *Leptoglossus*, an observed increasing aridity and the lack of natural regeneration in many natural and mixed stone pine forest are difficulties that might question future cone production as NWFP from forests, and even persistence of these forests, especially



on karstic shallow limestone sites like the *Carrascal* forest visited in Quintanilla. In contrast, open-grown grafted orchard plantations such as the visited experimental plots in Tordesillas, established in sand depositions on the lower terrace of the Douro River with access to groundwater layers, might allow an intensive management for cone production, including integrated pest management.



Figure 4. Stome pine forest field trip to forests and orchards.

## 5. CONCLUSIONS

Major conclusions derived from the interregional workshop are:

- Stone pine stands in Northern Plateau are suffering already the effects of climate change towards aridity, though in a lesser degree than the sympatric maritime pine:
  - Decay, loss of natural recruitment, loss of growth and cone productivity;
  - Displacement by better adapted species, such as juniper in limestone, or putatively even *Stipa* grass replacing stone pine as the last persisting tree species on inland dunes, where the latter pine is displacing currently maritime pine.
- Stone pine management in Northern Plateau cannot continue its *Business as usual* while conditions are changing.
- *Leptoglossus occidentalis* is an important pest reducing cone and seed yield, jeopardising the persistence of the sector, both cone pickers and processing industry, putting at risk several hundred employments in the region.
- So far, no effective solutions are available to control the prevalence of *Leptoglossus occidentalis*. Though experimental spraying with pesticides is currently studied-done, biologic control should be
- In the chestnut sector, the situation is less critic. Although climatic conditions would affect this species, its situation on higher altitudes means that the effects are still not that clear.
- In some upland regions like Aliste, new chestnut orchards are expanding. Common commercialisation of demanded varieties allows for targeting the fresh chestnut market, with higher benefits than sale as commodity to processing industry.
- The chestnut gall wasp *Dryocosmus kuriphilus* entails an important threat for production, and it has already widely spread over Spain and Portugal.
- *Torymus sinensis* has proved to be an effective parasitoid for controlling *Dryocosmus kuriphilus*. Successful cases as the French experience, where *Torymus sinensis* controlled *Dryocosmus kuriphilus*, led to be optimistic in this respect.

- Joint efforts need to be addressed in order to combat pest and diseases and to mitigate the effects of climate change.



## References

- Bento, A. (2019) Biological control of *Dryocosmus kuriphilus* in Tras-os-Montes, Portugal. Palencia, June 12/14 2019. H2020 project no.774632 RUR.
- Borowiec, N. (2019) Classical control against the chestnut Wall gasp: introduction and establishment of the exotic *Torymus sinensis* in France. Palencia, June 12/14 2019. H2020 project no.774632 RUR.
- De la Mata, R., Teixidó, A., Aletá, N. (2019) Clonal variation in susceptibility to *Leptoglossus occidentalis* in stone pine grafted plantations. Palencia, June 12/14 2019. H2020 project no.774632 RUR.
- Domínguez, J.C. (2019) Propagación de *Dryocosmus kuriphilus* y suelta del parasitoide *Torymus sinensis* en Castilla y León. Palencia, June 12/14 2019. H2020 project no.774632 RUR.
- Gallego García, R. (2019) Evaluation of the aptitude of the station for chestnut in Castilla y Leon under climate change scenario. Palencia, June 12/14 2019. H2020 project no.774632 RUR.
- Ipekda, K. (2019) An invasive agricultural and forest pest, Asian chestnut gall wasp, and its classical biological control in Turkey. Palencia, June 12/14 2019. H2020 project no.774632 RUR.
- Ipekda, K. (2019) Current situation of *Leptoglossus occidentalis* in Turkey. Palencia, June 12/14 2019. H2020 project no.774632 RUR.
- Linares, P. (2019) Situación actual y amenazas de la cadena de valor de la castaña en España. Palencia, June 12/14 2019. H2020 project no.774632 RUR.
- Martel, J.J. (2019) Impact of chestnut gall wasp, *Dryocosmus kuriphilus*, in Galicia. Portugal. Palencia, June 12/14 2019. H2020 project no.774632 RUR.
- Mutke, S. (2019). Red de innovación en frutos forestales. Proyecto Europeo INCREDIBLE: 2nd Interregional Workshop of the Resin iNet, Palencia, June 12/14 2019. H2020 project no.774632 RUR.
- Pajares, J., Ponce, L. (2019). *Leptoglossus occidentalis* at the iuFOR Forest Pest Laboratory. Palencia, June 12/14 2019. H2020 project no.774632 RUR.
- Pardos, M. (2019). Predicted impacts of climate change on growth and production of Mediterranean Stone pine. Proyecto Europeo INCREDIBLE: 2nd Interregional Workshop of the Resin iNet, Palencia, June 12/14 2019. H2020 project no.774632 RUR.
- Pastor, A. (2019) Retos y amenazas de la cadena de valor del pino piñonero mediterráneo. Palencia, June 12/14 2019. H2020 project no.774632 RUR.
- Perea, R. (2019). Pinares de Doñana, luces y sombras para una marca de piñón ecológico. Palencia, June 12/14 2019. H2020 project no.774632 RUR.
- Picardo, A. (2019) Current challenges for MEditerranean NWFP sectors by new pests and diseases. Palencia, June 12/14 2019. H2020 project no.774632 RUR.
- Rubio Gutierrez, R. (2019) El impacto de la avispa de castaño (*Dryocosmus kuriphilus*) en la producción de castaña. Palencia, June 12/14 2019. H2020 project no.774632 RUR.
- Zamora Brauweiler, P. (2019) El chancro del castaño en Castilla y León: Perspectiva histórica y situación actual. Palencia, June 12/14 2019. H2020 project no.774632 RUR.