FUNDING PROGRAMME: PNCDI III / Programme 1: Developing the national research and development system
Subprogramme 1.2. Institutional Performance
Institutional Development Projects - Complex Projects carried out in RDI consortia
Domain– BIOECONOMY

PROJECT TITLE/ACRONYM:

Innovative technologies for reducing the negative impact of climate change in vegetable crops/LEGCLIM

- **Project no. 1 (Coordinator SCDL Buzău)** - Scientific substantiation regarding technologies for the maintenance and protection of vegetable crops in the context of current climate change /LEGSTITEH
- **Project no. 2 (Coordinator INCDTP Bucharest)** - Technology for protecting vegetable crops during extreme weather events, through the use of interactive, modulated systems/TEX4VEG

AGREEMENT NO.: 11PCCDI/2018, Complex project PN-III-P1-1.2-PCCDI-2017-0659

TOTAL PROJECT BUDGET: 5.287.500 LEI **BUDGET INCDTP:** 283.762 LEI

START DATE: *30.03.2018* **END DATE:** *31.07.2021*

WEBPAGE:

PARTNERS:

Staţiunea de Cercetare-Dezvoltare pentru Legumicultură – SCDL Buzău - Coordonator

Institutul Naţional de Cercetare-Dezvoltare pentru Maşini şi Instalaţii Destinate Agriculturii şi Industriei Alimentare – INMA Bucureşti

Institutul Naţional de Cercetare Dezvoltare pentru Textile şi Pielărie - INCDTP Bucureşti

Institutul Naţional de Cercetare-Dezvoltare pentru Protecţia Mediului – INCDPM Bucureşti

Institutul de Cercetare-Dezvoltare pentru Protecția Plantelor - ICDPP Bucureşti

Institutul de Cercetare – Dezvoltare pentru Industrializarea si Marketingul Produselor Horticole – HORTING Bucureşti

Staţiunea de Cercetare-Dezvoltare pentru Legumicultură - SCDL Bacău

GENERAL OBJECTIVES:

● Development of innovative technologies to reduce the negative impact of climate change for field-grown vegetable crops (peppers, beans, onions);
● Approval of a variety of water white onion, two varieties of peppers and a variety of field beans;
● Creation of an electric distributor for vegetable seeds.

COMPONENT PROJECTS/PHASES/ACTIVITIES:

● **Project no. 1:** Scientific substantiation of technologies for the maintenance and protection of vegetable crops in the context of climate change (LEGSTITEH)

- ✓ **<u>Project no. 1/Phase 2/3</u>:** Study on the impact of current climate change in the context of the cultivation of vegetable species: onions, beans and peppers

Activity 1-3 Study on the impact of current climate change on pepper cultivation; selection of stabilised pepper lines from the germplasm collection of SCDL Buzău, with a view to homologation in the context of the cultivation of vegetable species: onion, beans and pepper.
Activity 1-4: Disemination/Project presentation

● **Project no. 2:** Technology for protecting vegetable crops from extreme weather events, through the use of interactive, modulated systems (TEX4VEG)

- ✓ **<u>Project no. 2/Phase 1-2:</u>** Design of textile elements as components of groups of textile structures with a role in protecting vegetable crops (CL) from some extreme weather phenomena (FME).

Activity 1-5: The current state of leguminous crops in terms of risks that may occur as a result of FMEs and

conventional protection systems
Activity 1-6: The current state of the potential use of textile elements (2D, 3D) in agriculture and in particular in vegetable growing research directions
Activity 1-7: Design - Identification of sets of protection requirements for FME, by types of CL
Activity1-8: Design-Deceleration and translation of usage requirements from the user level into convergent domains, in order to obtain innovative protection systems at the FME.
Activity 1-9: Design of textile and non-textile elements - type, composition. Establishing the degree of achievement of use requirements at the raw material level - Justification of the selection of raw material/legume crops
Activity 1-10: Designing surfaces with performance characteristics and functionalities for usage requirements, through the use of specialised software
Activity 1-11: Development of a relational database with textile surfaces and potential areas of use for agriculture - CL
Activity1-12: Establishing the experimentation matrix in correlation with the CL type and aggressive factors associated with some FMEs

- ✓ **Project no. 2/Phase 3-1:** Design and production of experimental textile models with a protective role against the action of FMEs

Activity 3.06: Realisation of textile structure variants developed by using textile yarns/fibers with protection and/or monitoring functionalities
Activity 3.07: Laboratory testing of textile structures with a protective and/or monitoring role. Redesign of textile structures.
Activity 3.08: Design of innovative textile systems for protection and/or real-time, modulated monitoring; Procurement of raw materials.
Activity 3.09: Experimental model creation of innovative textile systems of defined CL type
Activity3.10: Experimentation under real conditions of use of selected/defined legume crops (CL)
Activity 3.11: Centralisation, systematisation and homogenisation of the experimental data obtained.
Activity 3.12: Communicating research results to potential users

- ✓ **Project no. 2/Phase 4:** Dissemination of the results obtained in the project. Participation in scientific events. Finalisation of technical documentation

Activity 4.2: Dissemination of the results obtained; Participation in scientific events.
Activity 4.3: Final technical documentation for the creation of functional, modulated textile systems that ensure real-time monitoring of legume crops (LC) in the event of extreme weather events (EWE) and the implementation technology.

NOVELTY ELEMENTS:

The arrangement of textile membranes at the maximum vegetable growth level is carried out without support systems or by using support systems of adjustable heights, to adapt to the requirements of use. Depending on the aggressive factors, the same membrane can be used at various levels, independently, or in combination with another membrane. The type of structure used to make the membranes is warp-knitted fabric or knit, at high and medium levels. To ensure mulching at ground level, biodegradable fibers are mainly used. At the laboratory research level, the creation of seed support systems is considered, in order to obtain seedlings, with dimensions below 100cm2. The seedling supports are deposited together with the seedling, and the membrane contains nutrients or other substances, which, eliminated over time, inhibit the proliferation of some pests. Biodegradation will be considered sufficiently advanced until the next placed crop.

EXPECTED EXPLOITABLE RESULTS:

3 scientific studies
1 promotion of the project results on the INCDTP website online and in the media
1 requirements sheet
1 functional relationship logic diagram
1 project; 1 report;
1 sequential project of the textile system
1 IT system
1 IT product - experimentation matrix
2 variants of experimental model of textile structures for monitoring
1 cumulative evaluation report

1 innovative modulated textile system
1 experimental model
1 experimentation report
1 selective evaluation report
1 communication
1 ISI article
1 BDI paper;
1 round table with all collaborators to present the final results of the project
1 Powerpoint presentation
1 poster presenting the final results
1 technical documentation of the realisation (in collaboration with all partners)

OBTAINED RESULTS:

1 Study on shading methods and prevention of physiological disorders and mulching of pepper crops in the context of current climate change.
1 Study on the current status of leguminous crops in terms of risks that may occur as a result of FME and conventional protection systems
1 Study on the current state of play regarding the potential use of textile elements (2D, 3D) in agriculture and in particular in vegetable growing research directions
1 functional requirements sheet in relation to the planting schemes for the 3 vegetables studied: onion, beans, peppers (indicative model)
1 functional relationship logic diagram
Textile system sequential projects
1 cumulative assessment report-raw materials
1 sequential project of the textile system
1 structure BD
1 logical diagram of archiving and data relationship
1 BD support
1 convergent experimentation matrix.
1 experimental model - textile structure for managing extreme climatic phenomena which has as an interactivity element PCMs embedded in various textile fibers and which ensures the management of extreme climatic phenomena, at the level of legume crops in spaces, closed or not
1 experimental model - textile structure, component part of a textile system of the type of modulated, flexible architectural element, with a textile membrane with a role in protecting legume crops. The structure is the layered composite that attaches to the work gloves commonly used in agriculture, with a role in reducing the accumulation of electrostatic charge during the manipulation of textile structures that cover legume crops.
1 cumulative evaluation report following the testing of textile structures
1 project of an innovative modulated textile system, containing flexible mesh and a textile-type membrane, modulated, demountable.
1 experimental model based on a covering membrane and a non-textile support and anchoring system
1 experimentation report carried out by the project partners, assuming the cultivation of 3 crops in a classic system and in a system with a mesh-type covering membrane.
1 selective evaluation report (in collaboration with all project partners) in vivo of the experimental models carried out, containing organised information from the level of the crops and the harvesting stage.
1 'Idea envelope' submitted to OSIM containing the sketches of the innovative modulated system
1 Final technical documentation of the architectural element textile system with a covering membrane. The documentation was developed in collaboration with the partners of the LEGCLIM project

DISSEMINATION, PATENT APPLICATIONS, AWARDS:

- **WoS published papers:**

1. Manea, V., Toader, A. C., Burnichi, F., Staicu, B. G., Toma, D. M., Dorogan, A., Sarbu, T. 2022. Vegetable culture vs. climate change Innovative solutions Part 2. Research on the influence of shadow with different textile materials of Rubiniu onion plants (Allium cepa). Industria Textila, 73(3), 339-344. WOS:000848102700015
2. Muscalu A., Tudora C., Cota C., Gyorgy Z., Burnichi F., Birsan M., Climate changes and methods to protect vegetable crops, Proceedings International Symposium 9th International Conference on thermal, 2020

- **BDI published papers:**

1. Cărpus E., Dorogan A., Grosu C., Stroe C, Sandu A., Burnichi F., Aspects regarding the eco-awareness of the role of agrotextile systems in the sustainable development of Romania. Annals of the University of Oradea Fascicle of Textiles, Leather Work, 20, pp.23-28, 2019.
2. Dorogan, A., Cărpus, E., Burnichi, F. and Petre, C., 2018. Agrotextiles-sustainable strategic development strategy of the converging economic sectors, International Symposium, ISB-INMA TEH' 2018, Agricultural and mechanical engineering, Bucharest, Romania, 1-3 November 2018, pp. 171-176 ref. 9.
3. Cărpus E., Dorogan A., Burnichi F., Agrotextile systems- strategic elements for sustainable development of the agriculture, ICAMS 2018, pp.307-311, 2018.
4. Grosu, C., Stroe, C., Sârbu, T., Burnichi, F., Muscalu, A. and Tudora, C., 2020. Design and creativity in the field of agro-textiles. Agriculture & Food, 8, pp.107-119.
5. Cărpus, E., Dorogan, A., Grosu, C., Stroe, C., Sârbu, T., Burnichi, F., Muscalu, A. and Tudora, C., 2020. Agro-textiles – the connection between science-sustainable development-environment. Agriculture and Food, 8(1), pp.99-106.
6. Călin, M., Dorogan, A., Eftalea, C., Cristea, T.O., Ambăruş, S., Brezeanu, C., Brezeanu, P.M., Iosob, G.A., Muscalu, P.S., Calara, M. and Bute, A., 2020. The influence of some cover materials on the chlorophyll and anthocyanin content of sweet pepper protected crops. Scientific Studies & Research. Series Biology/Studii şi Cercetări Ştiinţifice. Seria Biologie, 29(1).
7. Popescu S., Nitu A., Titisina M., Vintila M., Moise D., Preliminary results concerning the quality of processing by dehydration of the de Buzau Onion variety depending on storage conditions, Romanian Journal of Horticulture, revista a secţiei de Horticultură ASAS, 2021
8. Titisina M., Popescu S., Vapor C., Nitu A., Moise D., Researches regarding storage of the Onion Bulbs in differents microclimate conditions, vol. INMATEH Agricultural Engineering, 2021
9. Grosu, C., Stroe, C., Sârbu, T., Burnichi, F., Muscalu, A. and Tudora, C., 2020. Design and creativity in the field of agro-textiles. Agriculture & Food, 8, pp.107-119.
10. Cărpus, E., Dorogan, A., Grosu, C., Stroe, C., Sârbu, T., Burnichi, F., Muscalu, A. and Tudora, C., 2020. Agro-textiles – the connection between science-sustainable development-environment. Agriculture and Food, 8(1), pp.99-106.

- **Scientific communications:**

1. Cărpus E., Ghiţuleasa C., Dorogan A., Grosu C., Stroe C., Sandu A., Bulacu C., Potenţialul structurilor textile de a satisface cerinţe de utilizare netradiţional textile, mai exact în domenii tehnice-textile pentru agricultură, Seminar Planificare Strategică ASTRICO NORD-EST, Piatra Neamţ 2018
2. Cărpus E., Ghiţuleasa C., Dorogan A., Grosu C., Stroe C., Sandu A., Textile tehnice multifuncţionale, Simpozion & Parada de Modă pentru Dezvoltare Durabilă în Industria Textilă & Expoziţie de Articole Textile şi de Design Interior, Camera de Comerţ şi Industrie a României, Bucureşti.
3. Dorogan A., Burnichi F., Cărpus E., Constantin P., Agrotextile Systems-Strategic Development Elements for a Sustainable Agriculture, Poster presentation, ICAMS 2018.
4. Dorogan A., Cărpus E., Burnichi F., Constantin P., Agrotextiles sustainable strategic development strategy of the converging economic sectors/ Agrotextile strategie sustenabilă pentru sectoarele economice convergente, International Symposium ISB-INMA TEH Agricultural and Mechanical Engineering, Bucuresti.
5. Dorogan A., Cărpus E., Burnichi F., Tudora C., Vintila M., Călin M., LEGCLIM-contributii tehnice-inovative ale I.N.C.D. Textile şi Pielarie, lucrare prezentată la masa rotunda organizată în 21/04/2021 de coordinatorul proiectului pentru prezentarea rezultatelor finale ale proiectului.
6. Dorogan A., Burnichi F., Tudora C., Vintila M., Călin M., TEX4VEG – IPOTEZE vs. REZULTATE, poster prezentat în cadrul evenimentului din 21/04/2021
7. Cărpus E., Dorogan A., Agrotextilele - elemente complementare activităţilor agricole, Sesiunea anuala de comunicări ştiinţifice a Institutului de Cercetare-Dezvoltare pentru Protecţia Plantelor "Protecția plantelor, cercetare interdisciplinară în slujba dezvoltării durabile a agriculturii și protecției mediului", 2020, ISBN 978-973-668-533-0
8. Dorogan A., Cărpus E., Grosu C., Stroe C., Sârbu T., Agrotextilele-elemente inovatoare pentru o simbioză industrială, Program de popularizare a ştiinţei în domeniul textile
9. Grosu C., Stroe C., Sârbu T., Sisteme textile de recoltare pentru o agricultură sustenabilă, Program de popularizare a ştiinţei în domeniul textile
10. Cărpus E., Dorogan A., Agrotextilele - elemente complementare activităţilor Agricole, Sesiunea anuală de comunicări ştiinţifice a ICD Protecţia Plantelor.
11. Project presentation on the website INCDTP http://www.certex.ro/en/Proiecte/11PCCDI_2018.pdf
12. Project presentation in Industria Textilă Journal no. 5/2018

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