



The NATO Science for Peace and Security Programme

### SECURITY RELEVANCE/IMPACT

The need for land for food production and other renewable products from agriculture and forestry is increasing because of population growth and development. Food security can be enhanced through improvements in soil quality on marginal and contaminated lands. There are many locations where land contaminated by past military and mining activities may be restored to productive use by establishing miscanthus or switchgrass. Renewable energy, reduced greenhouse gas emissions, soil quality improvement, and reduced health risks are the environmental security issues associated with this project plan. The economic value of this new science and technology may exceed one billion Euros when it is fully implemented.

### PROJECT IMPACT

This project will have significant value to society by developing an inexpensive process to improve soil quality at sites contaminated by past military activities. Miscanthus produces very large quantities of biomass that can be used for bioenergy, forage for cattle, or other uses. The new technology will enable end-users to establish miscanthus on contaminated lands, to improve the soil quality of the land, and to produce a marketable product. There will be economic value to society because of the value of the miscanthus and because the land will increase in value as soil quality improves because of phytoremediation. The new technology will have value in all parts of the world because there are many locations where soil quality improvement can be achieved with this new technology. Information on this new technology will be distributed world wide through presentations at International Phytotechnology Society meetings, the project Internet site, and end-user training sessions and distribution of an end-user guide. An edited book «Phytotechnology with Biomass Production» will also be used for distribution of the new technology.

## NATO Science for Peace and Security Program Multy-Year Project G4687 "PHYTOTECHNOLOGY FOR CLEANING MILITARY SITES"



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NATO Science sponsors publication for Peace and Security Program, Project G4687





## NATO SPS MYR Project G4687 "PHYTOTECHNOLOGY FOR CLEANING MILITARY CITES"

Project is granted as **Multy-Year Research Project**  
by **NATO Science for Peace and Security Program (SPS)**.

**Beginning of the project: April 28, 2016**

**End of the project: April 27, 2018**

### Leaders:

- Jan Evangelista Purkyne University, Usti nad Labem, Czech Republic, *NATO Country Director (NDP) professor **Valentina Pidlisnyuk***;
- National University of Life and Environmental Sciences, Kyiv, Ukraine, *Partner Country Director (PPD) assoc.professor **Tatyana Stefanovska***.

### Participants:

- Kansas State University, Manhattan, Kansas, USA, *Co-Director professor **Larry Erickson***;
- Kansas State University, Manhattan, Kansas, USA, *Co-Director professor **Lawrence Davis***;
- Kansas Agricultural Experimental Station, Kansas, USA, *Co-Director assoc.professor **Ganga Hettiarachchi***;
- National University "Lvivska Polytechnika", Lviv, Ukraine, *Co-Director assoc.professor **Pavlo Shapoval***;
- Institute of Plant Biology and Biotechnology, Almatu, Kazakhstan, *Co-Director professor **Asil Nurzhanova***.

### Liasoning institutions:

- University of Zagreb, Croatia, *representative researcher assoc. professor **Zeljka Zgorolec***;
- Wroclaw University of Life Sciences, Poland, *professor **Jacek Twardowsky***;
- University of Warmia and Mazury in Olsztyn, Poland, *representative resercher PhD **Andrzej Skwiercz***.

### End-users:

- Kamenetz-Podilsky city council, Khmel'nitska oblast, Ukraine, *representative – **Valeryi Klimenko**, Advisor*;
- Slovak Environmental Agency, Department of Analysis, Environmental Impact Assessment and Environmental Services, *representative – **Katarina Paluchova**, PhD*;
- Agricultural Faculty, Kansas State University, Kansas, USA, *representative – **Kraig Roozeboom**, PhD*;
- Private enterprise "Ecological Engineering", Almatu, Kazakhstan, *representative – **Olimbek Ackhan**, Head of the Board*;
- EPA National Project: Technical assistance to marginal lands, Regions 5,6,7, and 8, *representative – **Leven Blasé**, PhD*.

### PROJECT GOALS

The **primary goal of this research** is to improve environmental security by developing methods to produce biomass in large quantities on contaminated military lands such that the two goals of biomass production and soil improvement are accomplished effectively and efficiently. The security issues arising from environmental and resource constraints are addressed through soil quality improvement and better use of contaminated military lands.

### DELIVERABLES

The **results of the research** and new technology developed will be implemented for improving soil quality at contaminated military sites while producing a useful product that greatly reduces the cost of remediation. The new information will be made available through workshop in Ukraine and training in Czech Republic as well as an online 3-day seminar in the US that will be video recorded for worldwide distribution using the Internet. An edited book «Phytotechnology with Biomass Production» will be prepared and published. Three or more manuscripts will

be developed and submitted for publication in peer reviewed international journals. User guides will be developed in English, Ukrainian and Czech languages, and end-user training will be delivered in Ukraine.

Training in the use of new analytical equipment will enhance the ability of young researchers to conduct research and be provided in Czech Republic. Seven or more advanced degree students will be graduated with expertise to further advance this new field of phytoremediation with biomass production.

### END USERS

**Military contaminated field sites** have been identified for developing and implementation of new phytotechnology. The sites are located in Ukraine, Czech Republic, Slovakia, Kazakhstan and the US. The sites in Ukraine include sites with metals on city public land in Kamenetz-Podilsky, Ukraine and the side located at the Eastern Ukraine at village Kurakhovo, contaminated after on-going military operation there. Other sites include contaminated land with metals and organic pollutants after former soviet union airfare bases in Mimon, Czech Republic and Sliac, Slovakia, a site in Bachbakti, near Almaty, Kazakhstan and a site at Fort Riley, Kansas, USA that is about 15 km from K-State, USA. The developed phytotechnology will be tested at the selected military contaminated sites and implemented

at the site in Ukraine, Czech Republic and the US.

The results will be disseminated in a different ways: by training provided in Ukraine for end-users from Ukraine, by end user guide in print form and on the Internet; by videos from workshop «Phytotechnology with Biomass Production» that will describe the processes of site assessment, selecting soil amendments, establishment of miscanthus, agronomic management, and harvest available on the Internet and by edited book, «Phytotechnology with Biomass Production». New phytotechnology will be presented at professional meetings and to end user audiences including Kansas Agricultural Extension Service events, Ukrainian local governmental officials meetings, brownfields meeting and professional events.