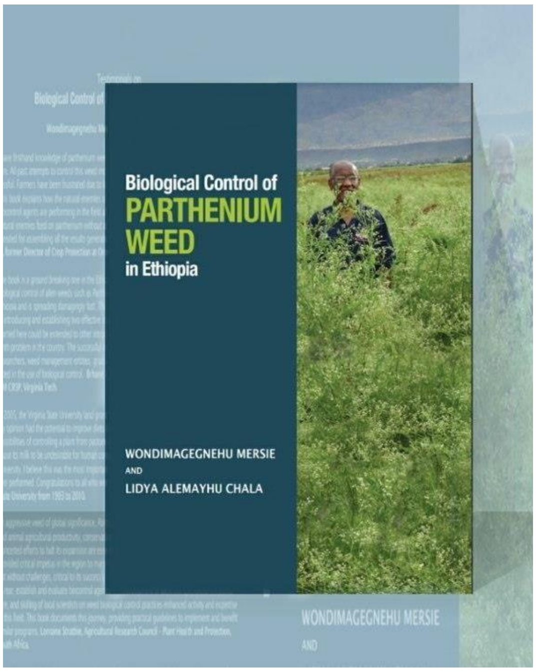



## Summary of the book

The invasive weed parthenium, known in Ethiopia as ‘kinche arem’ in Amharic, or ‘farmasissa’ (meaning ‘sign-away your land’) in Afan Oromiffa, continues to adversely affect agriculture by reducing yields of major food crops such teff (*Eragrostis tef* (Zucc) Trotter) and sorghum (*Sorghum bicolor* L.). Parthenium also displaces valuable species in pasture lands, thereby negatively impacting livestock production.

In the absence of grass, livestock are forced to forage on parthenium, as it is the only green plant in the field during the dry period in many areas. Cows that feed on parthenium produce tainted milk that fetches a lower price in the market. In addition, the tainted milk is rejected by children, and locals believe that it has negative health effects on babies. The weed’s ability to release allelopathic compounds enables it to displace native plants, thereby threatening biodiversity. It is common to find dense, monospecific stands of parthenium in fields in Ethiopia as it has spread to all corners of the country since its introduction, believed to have occurred in the late 1970s.

To tackle the damage caused by parthenium weed, a project entitled “Biological Control of the Invasive Weed *Parthenium hysterophorus* in East Africa” was initiated in 2005 and ran until 2022. The project was led by Wondimagegnehu Mersie at Virginia State University, USA and funded by the U.S. Agency for International Development (USAID), through the IPM Innovation Lab Office at Virginia Tech. The goal of the Project was to introduce, evaluate, rear and release natural enemies of parthenium in Ethiopia, and later on, in Uganda and Kenya. Two natural enemies of parthenium, the leaf-feeding beetle, *Zygogramma bicolorata* and the stem-boring weevil, *Listronotus setosipennis* were introduced into Ethiopia and field-released after their host-specificity was determined under quarantine conditions and approved by relevant governing authorities. These two biocontrol agents have now established in various regions of Ethiopia.

The research-based information generated by the above project was collated in a recently published book, entitled "Biological Control of Parthenium Weed in Ethiopia". The book authored by Wondimagegnehu Mersie and Lidya Alemayhu Chala documents the opportunities, challenges and accomplishments of the Parthenium Project. It is comprised of 13 chapters, with text, photos and illustrations. The introduction and second chapter summarize the available scientific information on the biology of parthenium weed as well as its distribution in Ethiopia. This is followed with a discussion on the impact of parthenium weed on crops, livestock, human health as well as on the environment. Chapter 4, deals with current management of the weed. In chapter 5, the biological control of parthenium is discussed in detail. In this chapter the authors describe the steps followed in introducing, rearing and releasing the natural enemies of parthenium in Ethiopia with diagrams and photos. On chapter 6, results of host range tests conducted on the leaf-feeding beetle, *Zygogramma bicolorata* and the stem-boring weevil, *Listronotus setosipennis* before they were released is presented. The steps taken and facilities used to mass rear the two bioagents are explained in chapter 7. In chapter 8, the release of the two biocontrol agents in different regions of Ethiopia is discussed. On chapters 9 and 10, data on the establishment of Z. *bicolorata* and L. *setospennis*, respectively are presented. The unusually high incidence of the winter rust (*Puccinia abrupta* var. *partheniicola*) in Ethiopia during the 2021 is explained on chapter 11. The authors conclude the book by summarizing the accomplishments of the Parthenium Project in chapter 12, and finally, in chapter 13, by acknowledging the support provided to the project by individuals and institutions.

This book provides a useful resource for classroom teaching and the field management of parthenium weed. The book may also serve as a model to develop biological control measures for other invasive plant species in Ethiopia and elsewhere. For further information and to order the book, contact Wondimagegnehu Mersie at mersiew@gmail.com

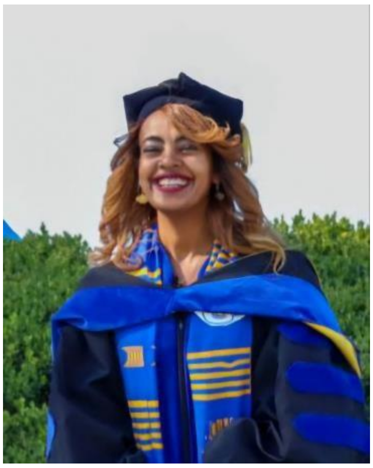
## About The Authors

### Dr. Wondimagegnehu Mersie

Dr. Wondimagegnehu Mersie received his B.S. in Plant Science from Alemaya College of Agriculture and Mechanical Arts, Ethiopia, his M.S. in Crop Protection from Reading University in the United Kingdom and his Ph.D. In Plant Physiology/Weed Science from Virginia Tech, in the United States. He did his post-doc at the University of Florida until 1988 when he joined Virginia State University (VSU) as an Assistant Professor and later served as Associate Dean and Director of Agricultural Research. At VSU, he secured many grants and conducted research on the fate of pesticides in soils. Dr. Mersie has published extensively on fate of herbicide in the environment and biological control of parthenium (*Parthenium hysterophorus*).

He also served as the principal investigator (PI) of a project on parthenium from 2005 to 2022. The Parthenium Project was part of the Feed the Future Innovation Lab for Integrated Pest Management, housed at Virginia Tech and funded by the United States Agency for International Development (USAID) under cooperative agreement No. AID OAA-L-15-00001. The research-based information presented in this book was generated by this project, which was conducted over seventeen years.

**Dr. Lidya Alemayhu Chala**



Dr. Lidya Alemayhu Chala received her B.Sc. in Plant Science and her M.Sc. in Entomology, both from Hawassa University, Ethiopia. After graduating with her M.Sc., Ms. Chala worked at the Ethiopian Institute of Agricultural Research (EIAR) where she was assigned to the Ambo Plant Protection Research Center. While at Ambo, she conducted the host-range trial for the stem-boring weevil *Listronotus setosipennis* when it was first introduced to quarantine as a potential biocontrol agent for parthenium.

She was also involved in the mass rearing of the leaf-feeding beetle *Zygogramma bicolorata*, as well as *L. setosipennis*, field releases of these biological agents, and monitored their establishment in Ethiopia. She has published research that focused on biological control of parthenium. In 2019, Ms. Chala received another M.Sc. in field and vegetable crops from The Hebrew University of Jerusalem, Israel. She received her Ph.D. in Urban Forestry and Natural Resources from Southern University and A&M College in the United States.

**Testimonials**

**<u>Biological Control of Parthenium Weed in Ethiopia By Wondimagegnehu Mersie and Lidya Alemayhu Chala</u>**

## <u>Samuel Assefa</u>

## former Director of Crop Protection at Oromia Bureau of Agriculture and Natural Resources


"I have firsthand knowledge of parthenium weed including its devastating impact on Ethiopia's agriculture. All past attempts to control this weed including the campaign to manually remove it were unsuccessful. Farmers have been frustrated due to lack of effective control methods against parthenium. This book explains how the natural enemies of parthenium were introduced to Ethiopia and how these biocontrol agents are performing in the field after their release. It is now evident to everyone that the natural enemies feed on parthenium without affecting other plant species. The authors should be commended for assembling all the results generated by the Parthenium Project in one book. "

## <u>Brhane Gebrekidan</u>

## former Chief of Party, AMAREW Project, IPM CRSP, Virginia Tech

"The book is a groundbreaking one in the Ethiopian context in that it successfully demonstrates that biological control of alien weeds such as Parthenium is possible. Parthenium has slowly creeped into Ethiopia and is spreading damagingly fast. The authors describe well the procedure they have followed in introducing and establishing two effective insect species for the control of parthenium. The lessons learned here could be extended to other introduced noxious weeds such as the notorious water hyacinth problem in the country. The successful experience described in the book should be valuable to researchers, weed management entities, graduate students in universities, and other stakeholders interested in the use of biological control."

**<u>Eddie N. Moore, Jr.</u>**

**President of Virginia State University from 1993 to 2010**


"In 2005, the Virginia State University land grant mission was selected to lead a research grant that in my opinion had the potential to improve diets of Ethiopians. The grant was awarded to research the possibilities of controlling a plant from pasture lands. This plant, parthenium when consumed by a cow cause its milk to be undesirable for human consumption. In my opinion based on my 17 years at the University, I believe this was the most important research that agriculture and land grant department ever performed. Congratulations to all who were involved. "

**<u>Lorraine Strathie</u>**

**Agricultural Research Council – Plant Health and Protection, South Africa.**

"An aggressive weed of global significance, Parthenium hysterophorus is severely detrimental to crop and animal agricultural productivity, conservation of flora and fauna, and human and animal health. Concerted efforts to halt its expansion are essential. To this end, the Parthenium Project in Ethiopia provided critical impetus in the region to manage this weed using biological control methods. Although not without challenges, critical to its success were international and local collaboration and dedication to rear, establish and evaluate biocontrol agents. The development of basic but specialized infrastructure, and skilling of local scientists on weed biological control practices enhanced activity and expertise in this field. This book documents this journey, providing practical guidelines to implement and benefit similar programs."

**<u>Tamado Tana</u>**

**former Professor of Agronomy at Haramaya University, Ethiopia.**


"The book covers the biology, ecology, and impact of parthenium weed, the history and progress of biological control in Ethiopia, the challenges and opportunities of introducing and establishing biological agents for managing the weed. The book is a useful resource for researchers, development workers, policymakers, and students who are interested in learning more about parthenium weed and its biological control. The book is also evidence of the successful collaboration and partnership among various stakeholders who contributed to the Parthenium Project. "