Evaluation of doctoral dissertation if Michal Piotr Gilewski (University of Warsaw)

Evaluator: Dr. Nicholas P. Dunning (Dept. of Geography & GIS, University of Cincinnati)

I have read through the entirety of Michal Gilewski's dissertation, "Relationships between pre-Columbian and Maya agriculture in the Southern Maya Area." This study has some significant limitations but I deem it to be passable for purposes of granting Mr. Gilewski a doctoral degree. Despite its limitations this study is a valuable contribution to the understanding of the Southern Maya area generally and the ancient agriculture of this region in particular.

According to Mr. Gilewski, his study sought to address two questions:

"1) Can the archaeological sources confirm that ethnohostoical and ethnographic descriptions are related with the prehispanic past indicating another dimension of cultural continuity between the Maya past and present?

2) How can archaeological remains be obtained or used to study ancient agriculture and to answer the first research problem?"

Mr. Gilewski reviews a large amount of ethnographic, ethnographic, archaeological, geoarchaeological, and environmental archaeological data for the Southern Maya area (Pacific Lowlands and Maya Highlands). He makes a more detailed review of work that has been done at the major Pacific slope site of Tak'alik Ab'aj, at which he also undertook field investigation in 2019.

I will address the data review first and the subsequently the field investigations.

Ethnohistoric data suggest that Maya agriculture on highly sloping terrain was negligible at the time of Spanish contact; rather, population and agriculture were concentrated on alluvial soils in valley bottoms. In particular, the *tablone* system that later came to dominate more elevated sloping land was a Colonial adaption (as the Spaniards appropriated the preferred valley-bottom land). This review also cited evidence that some pockets of specialist cultivation (e.g. cacao) likely existed at Contact.

The review of archaeological data is used to suggest that a greater variety of cultivation methods was used by the prehispanic Maya. In his review, Gilewski notes that terracing has been found in a few areas, but not all, and that little investigation of terrace systems in the highlands has taken place. However, at the end of this review Gilewski concludes (p. 119) that terracing was unimportant. The relatively recent passage of NASA's G-LiHT lidar over part of the highlands of Chiapas (the data/imagery is in the public domain) has revealed some areas of extensive terracing (see Golden et al. 2016). Elsewhere (p. 43), Gilewski posits that remote sensing is of very little use for investigating ancient agriculture in the Southern Maya area. However, that assessment seems to be based on a perusal of multi-spectral satellite imagery available on GoogleEarth. Indeed, such imagery shows little ancient landscape modification due to vegetative cover in some areas and Colonial and modern disturbance in others. On the other hand, lidar may be capable of revealing ancient agricultural infrastructure in these areas (such as the G-LiHT

swaths in Chiapas) and should be considered as a potentially valuable asset to landscape archaeology in the Southern Maya area – as it has been in many parts of the Maya Lowlands, even in areas with a palimpsest type landscape such as northern Yucatan (Hutson 2015). Yes, I am very much aware that currently lidar is a luxury tool – it is expensive and permits and access are not easy to obtain. However, it would be advisable to mention its potential as an archaeological method in the Southern Maya area.

Another place where updating would be useful in the review of ancient agriculture in the Highlands is the section on Kaminaljuyu (pp. 83-89). Dr. Barbara Arroyo has been conducting excavations and other studies of that urban centers canal system (probably used for irrigation). I believe some of this work has been presented (and possibly published) in such forums as the *Simposio de Investigaciones Arqueológicas en Guatemala* series.

P. 70. Gilewski notes that his original goal was to conduct a more comprehensive study of ancient agriculture around Tak'alik Ab'aj including a combination of paleoethnobotanical and geoarchaeological methods, but that logistical problems made some of the proposed work unfeasible (a problem characteristic of quite a few dissertation projects in archaeology where resources are often scarce). Gilewski resourcefully was able to draw on previous paleoethnobotanical work at the site and include the results of those studies in his analysis. Gilewski's own fieldwork results in the collection of soil samples via excavations and augering. The principal laboratory method used to study these samples was the standard Loss-on-Ignition (LOI) test to determine the organic matter (OM) content of soil and sediment. While this test can be used as a useful proxy for organic enrichment in some archaeological contexts, it is not definitive – though Gilewski makes a reasonable argument for its utility in this regard at Tak'alik Ab'aj. It is unfortunate that carbon isotope analysis or other geochemical assays, including phosphate testing could not be used to augment the LOI testing because additional proxies could have helped demonstrate the agricultural nature of the tested soils.

P. 70. For future reference, eDNA analysis holds a promising future for shedding additional light on ancient land use including agriculture because it can demonstrate what plant tissue comprised soil OM (e.g., see Lentz et al. 2022)

P. 180. It seems that flotation was a problematic method at Tak'alik Ab'aj and relatively few carbonized plant remains were recovered by previous researchers. One possible maize seed is mentioned; a photo of that seed would be useful to include.

The mineralization of some plant remains is highly interesting.

P. 208. Gilewski's review of the pollen data obtained in earlier studies has two small problems:

-- the presence of Typha would require more prolonged inundation for colonization to proceed; a single tropical storm or other rainfall event would not trigger such colonization – a more prolonged change in local drainage would be necessary.

-- Amaranth pollen does not necessarily indicate the presence of a cultivar species; this genus includes many dozens of species, most of which are not cultivars. In Mesoamerica, many such wild species are *r*-selected succession species (aka "weeds") that routinely show up in fallow

fields. Hence it is a useful indicator of a landscape with vegetation that has been disturbed, including in places where other plants are being or have been recently cultivated.

P. 252: these graphs of OM content strongly resemble those of the vertical distribution of C isotopes – suggesting that the two patterns would perhaps follow one another if isotopic analyses had been done on these soils.

P. 271: the suggestion is made that future studies include detailed ethnohistoric and ethnographic information for comparison with archaeological data. I agree, but must note that archaeological investigations sometimes take place in contexts where landscapes have been abandoned for centuries or where one cultural group has been supplanted by another making such comparisons unproductive.

P. 272. I agree that understanding agriculture within a broader cultural and behavioral context is essential if we are to progress beyond what are sometimes just lists of crops, techniques, etc. A good example of this can be found in some of the work of Bill Hanks (e.g. Hanks 1990) who looks at the ways in which behavior has become embedded in language (Yukatek Maya), including human-land and human-nature interactions. Extending such analyses to archaeology is more challenging but nevertheless should be attempted. I like Gilewski's attempt to relate the plant imagery on the sculpture at Tak'alik Ab'aj and other Southern area sites to understanding human-nature interaction, including agriculture.

In sum, this dissertation is a useful contribution to Maya studies and anthropological archaeology, though not without flaws. If revision is a possibility, please see some of the suggestions above. If I am being asked to vote on whether this dissertation is passable, I vote to Pass.

Golden, Charles, Timothy Murtha, Bruce Cook, Derek S. Shaffer,Whittaker Schroder, Elijah J. Hermitt, Omar Alcover Firpi, Andrew K. Scherer. 2016. Reanalyzing Environmental Lidar Data for Archaeology: Mesoamerican Applications and Implications. *Journal of Archaeological Science: Reports*. 6, 293-308.

Hanks, William F. 1990. *Referential Practice: Language and Lived Space among the Maya*. University of Chicago Press.

Hutson, Scott R. 2015. Adapting LiDAR data for regional variation in the tropics: a case study from the Northern Maya Lowlands. *Journal of Archaeological Science Reports* 4:252-263.

Lentz, D., T. Hamilton, N. P. Dunning, J. G Jones, K. Reese-Taylor, A.Anaya Hernández, D. Walker, E. Tepe, C. Carr, J. Brewer, T. Ruhl, S. Meyers, M. Vazquez, A.Golden, and A.Weiss. 2022. Paleoecological Studies at the Ancient Maya Center of Yaxnohcah using Analyses of Pollen, Environmental DNA and Plant Macroremains. *Frontiers in Ecology and Evolution* 10. doi: 10.3389/fevo.2022.868033.