sustainability

Article

Archaeological Science and Experimental Archaeology Can Inform Sustainable Innovative Craft

Veronica Testolini [1,*], Lenore Thompson [2] and Cristina Lemorini [1]

[1] Dipartimento di Scienze dell'Antichità, Sapienza University of Rome, Piazzale Aldo Moro 5, 00185 Roma, Italy
[2] Innovation Centre, University of Derby, Bridge Street, 37, Derby DE1 3LA, UK; l.thompson3@derby.ac.uk
* Correspondence: veronica.testolini@gmail.com

Abstract: This paper provides an example of how combining archaeological analysis of ancient materials with current technological needs can lead to new and innovative products designed to promote sustainability within the heritage craft sector. The project behind this paper, RecRAAFT, promoted activities where potters collaborated with archaeologists to create prototypes of sustainable ceramic objects. Potters applied ancient manufacturing techniques and work practices, following interpreted steps of past production methods. Artisans aimed to produce pieces that appeal to the public while reducing their reliance on the global supply chain, promoting a more sustainable consumer culture. Once these processes were understood, experimentation that incorporated public engagement activities allowed artisans to utilise their experimental craft practice to educate people about sustainable production and consumption. RecRAAFT worked to create synergistic relationships between artisans, researchers, and local communities to inspire sustainable design and to connect the public with their local heritage and each other. The aim is to inspire craft practitioners and the public to make responsible choices about their personal consumption, subsequently supporting a fairer economy and healthy craft working environment while also addressing issues related to the climate crisis and long-term purchasing sustainability.

Keywords: craft; ceramic technology; archaeological science; sustainable production; sustainable consumption; archaeometry; ceramic petrography; artisans; public engagement

Citation: Testolini, V.; Thompson, L.; Lemorini, C. Archaeological Science and Experimental Archaeology Can Inform Sustainable Innovative Craft. *Sustainability* **2023**, *15*, 14685. https://doi.org/10.3390/su152014685

Academic Editors: Francesca Di Turo and Giacomo Fiocco

Received: 2 August 2023
Revised: 6 September 2023
Accepted: 9 September 2023
Published: 10 October 2023

1. Introduction

Craft specialists can produce and repair longer-lasting products, as suggested by the European Green Deal. The unique products made by these specialists are also more likely to be re-used [1]. Yet, craft as a field of work has faced serious challenges following the proliferation of mass production and consumerism. However, craft has the potential to provide real insight into sustainable production and offer alternatives to industrial objects made in an unsustainable manner, addressing issues of raw material overexploitation and cheap labour. Artisans' associations are organising themselves to work together in an effort to safeguard their profession in terms of sharing space and other resources and to more effectively advertise their presence and their work [2]. According to the European Commission [3] as well as Italian national manufacturing associations [4], small and medium-sized enterprises (SMEs) are a solid base to build sustainable economic growth in Europe. This assessment is based also on the performance of such businesses during the 2008 economic crisis [5].

The subject of this research is heritage pottery and potters' small businesses. Ceramics are used by human populations around the world and have a long history of technological development in the archaeological record. Traditional ceramic products have largely succumbed to mass-produced throwaway objects distributed on a global scale. For example, it is normal to buy a cheap dining set made on the other side of the planet. However, the last 15 years have seen an increased demand for a wide range of craft items [6], from beer to furniture, and though this trend has been likened to the so-called 'hipster culture' [7,8] ([8] (p. 12)), it is encouraging to see a shift toward craft specialisms that can provide part of the answer to the climate crisis. New generations are keen to experience making and buying handmade items produced within a non-exploitative environment in line with the UN Sustainable Development Goals [9–11] ([10] (p. 4), [11] (p. 64)).

Archaeological science, ethnography, experimental archaeology, and public engagement are powerful tools to reinvigorate craft in the modern world. This paper explores how these methods can be combined and used as a tool to bring together modern artisans and ancient technologies to develop innovative techniques and products in sustainable ways. The current project focuses on ancient and traditional Italian techniques and was developed within the 'Reconstructing Recipes from Ancient Artefacts to develop Future Technologies' (RecRAAFT) project designed by Author 1.

At present, archaeologists who are using their research to support fair economic development are often left without cohesive guidelines [12] (p. 5), meaning that results have often had mixed success. This is despite the fact that reconstructing ancient technologies to benefit contemporary practices has been an academic topic of interest since the late 1950s in multiple manifestations of applied archaeology [13,14] ([13] (p. 228), [14] (p. 1)). For example, prehistoric Nabatean field systems were reconstructed in Israel's desert to assess how effective this ancient strategy could be at retaining soil moisture and managing surface runoff [15]. Reconstructions of ancient technologies have been used to inform the development of sustainable strategies in the concrete and masonry industries [16,17]. Experimental archaeology has been employed to tackle contemporary issues in building construction, such as energy saving [18] and creating architecture capable of withstanding climactic instability [19]. However, much of this knowledge has yet to move beyond poignant examples and develop into widespread modern adoption of the practices so that they become embedded systems. As such, this research acknowledges the weak connection between valuable archaeological contributions and issues of fair and green economic growth and wishes to contribute to the conversation aimed at changing this [20,21] ([20] (pp. 12–13) [21] (p. 30)).

This paper offers an example of applied archaeology addressing sustainability issues in the craft sector while also supporting and encouraging members of the public to make choices that positively benefit their communities on a broader scale [22] (p. 4). With this case study, we would like to show the active role of archaeological research in the heritage management sector. We acknowledge the potential for this approach to enhance cultural tourism as shown in similar archaeological settings [23]; however, we would like to stress that tourism is not the only sector that can benefit from the methodological framework that we are presenting. Additional sectors to consider include those linked to sustainability research related to construction, hydrology, and farming, as mentioned above.

This project was designed to occur in stages. Following initial interviews, artisans interested in the research were approached to collaborate and co-design aspects of the project, addressing key concerns related to their professional, personal, and economic needs. Based on the desires of the ceramicists involved, experiments and analysis strategies were designed considering the needs of the potters while also including elements of public engagement. This paper is aimed at archaeologists, artisans, and operators in the heritage sectors; however, the multiple implications for heritage studies and community-based activities are complex. For this reason, a separate paper on aspects of public engagement and the preservation and promotion of tangible and non-tangible heritage within communities is in preparation.

This research employs ethnography and archaeological science, contributing to a larger body of work focused on creating a more sustainable future for all. The aim of this paper is to show that these disciplines can contribute to sustainability on a social level, addressing several United Nations Sustainable Development Goals. Significant attention is given to Responsible Production (n. 12), Good Health and Well-Being (n. 3), Decent Work and Economic Growth (n. 8), and Sustainable Cities and Communities (n. 11).

2. Materials and Methods

2.1. Utilising Ethnography to Co-Design Research Questions

Research questions were designed based on the artisans' needs. Ethnographic interviews were conducted with the participating ceramicists, identifying key questions from the craft partners. The responses focused on space to work, collaborative partners, raw materials to work with, and a curiosity about the performance of ancient techniques. Two ceramicists agreed to participate in further research. Federico Marri is a part-time potter who wants to expand his business [24]; he studied to be an archaeologist and currently works in cultural heritage management. Claudio Pisapia is a professional potter who specialises in high-quality ceramics, some of which are inspired by ancient production practices, including flutes modelled on archaeological artefacts [25]. Both potters expressed an interest in using local raw materials that could be identified in ancient clay recipes reconstructed through archaeological analysis. They were also very interested in working in an open-air space that would allow for an open, wood-fuelled pit fire. Building collaborative open-air spaces became very relevant for artisans after the COVID-19 pandemic and is seen as a way to future-proof businesses from being thrust into precarity due to similar unpredictable circumstances going forward.

2.2. Research on Clay Sources

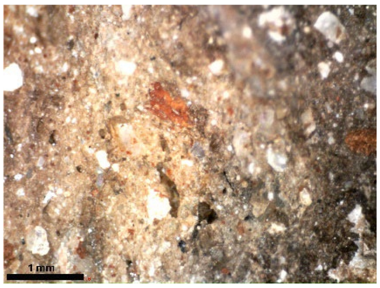
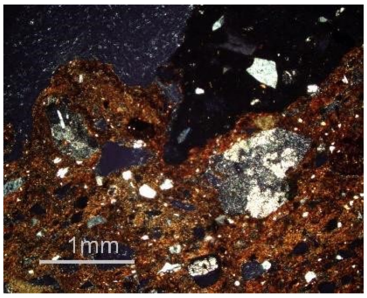
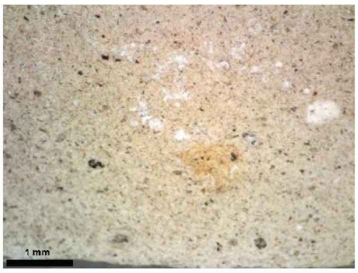
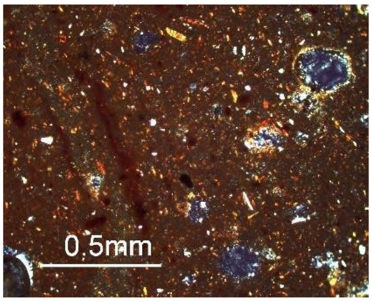
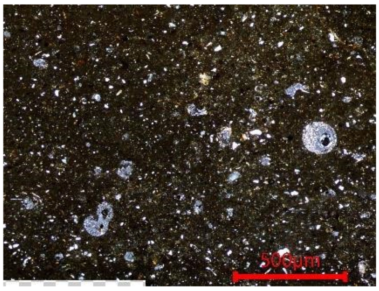
Archaeological research is effective in the identification of clays and clay sources used in past pottery production [26] (pp. 784–785). Rediscovering raw material sources can allow potters to effectively incorporate local materials into their work, facilitating the production of unique objects of high quality and longevity. The medieval city of Cencelle [27] was selected because the site, excavated by Sapienza University, has a documented kiln and a well-characterised ceramic assemblage, both dated to the thirteenth century [28] (p. 245), [29], [27] (p. 101). The site is in Allumiere, a volcanic area historically exploited for its rich raw materials, including its clay. Cencelle is positioned 80 km from the centre of Rome, where Marri practices his craft, and 100 km from Pisapia's studio in Grosseto. This location, near the potters' areas of work, is important as it fulfils their expressed desire to use materials that link their work to regional heritage and history.

A total of 24 samples were collected from Cencelle's thirteenth-century contexts and were analysed through thin sections inspected using a petrographic microscope. This method has an established precedent of effectively characterising raw material processing techniques and clay recipes [30–32]. One sample was taken from the kiln structure. All other samples were taken from the ceramic assemblage and were selected according to Macroscopic Fabrics (macroscopic appearance of their ceramic paste) and vessel function. These analyses were carried out at the Laboratory of Technological and Functional Analyses of Prehistoric Artefacts at Sapienza University (LTFAPA).

Two macroscopic Fabrics considered to be local to the Cencelle area became the main sampling target (Macro Fabrics I and III; Table 1). The macroscopic assessment of the local provenance was made based on the Fabric's frequency in the assemblage; Fabrics I and III occur in over 80% of samples [33].

After sampling, petrographic analysis in thin sections was performed to establish the composition of the local Fabric Groups. Petrographic Fabric Groups were established based on microstructure and mineralogical composition. A clay survey was conducted around the site of Cencelle. The survey was based on Petrographic Fabric components (matrix and inclusions) and on landscape information known from previous research [34–36]. The combination of these data led to the identification of potential clay sources on the geological map [37], and a consequent survey of the landscape allowed the collection of ceramic raw materials. The different clay raw materials collected during the survey around the site were dried, crushed, and sifted to a level of 5 mm, eliminating large inclusions. To test the clays' workability, plasticity, and ability to stay together without collapsing, pinched cups were formed, dried for 3 days, and fired at 970 °C in an electric kiln provided by a local potter in Rome.

Table 1. Descriptions and pictures of the ceramic Macroscopic Fabric I with the corresponding Petrographic Fabric 3, as well as Macroscopic Fabric III with corresponding Petrographic Fabrics 1 and 2.

Macroscopic Fabric	Photomicrograph (Thin Section)	Petrographic Description
I  Macroscopic Fabric I has a pink-to-black appearance macroscopically and corresponds to Petrographic Fabric 3.		Petrographic Fabric 3 is red-to-black in thin sections (crossed polars). This is a coarse fabric with inclusions from 0.5 to 3 mm. The clay matrix contains frequent quartz feldspars, the inclusions over 0.5 mm consist of frequent trachyte, and some tuff and volcanic glass.
III Macroscopic Fabric III has a pink-to-white appearance macroscopically and corresponds to Petrographic Fabrics 1 and 2. 		Petrographic Fabric 1 is deep red in thin section (crossed polars). This is a fine fabric containing frequent mica in the clay matrix, especially biotite, and a few microfossils. The inclusions larger than 0.4 mm are rare large k-feldspars and intermediate to acid volcanic rocks. Clay stripes are evident, possibly due to clay mixing.
		Petrographic Fabric 2 is grey/green in thin sections (crossed polars). This is also a fine fabric, containing frequent feldspars and microfossils, micrite, and some mica. There are no inclusions larger than 0.4 mm.

Experimental activity further clarified which clay recipes were employed by the ancient potters. The modelling of vessels using the clay from Cencelle was undertaken by the participating potters, Federico Marri and Claudio Pisapia, at their own workshops. For the purpose of this research, no instruction or limitation regarding clay mixing techniques was placed on the ceramicists involved, as this is a matter of skill and depends on the product that the artisan wants to produce.

2.3. Collaborative Experimentation

Four days of collaborative experimentation incorporating co-working methods between the two potters was arranged at the archaeological park of Rocca San Silvestro (Figure 1), part of Parchi Val Di Cornia. This venue operates as a heritage site open to the public and has infrastructure in place to host experimental archaeological activities (Figure 1A–D) [38]. The event was advertised to the public, and any park attendees who wished to take part were invited to work with the potters.

Figure 1. (**A**): View of the archaeological site of San Silvestro with the experimental facility under the castle. (**B**): Potters explaining their craft to the public. (**C**): Potters engaging with the park's staff. (**D**): Potters and archaeologist setting up the experimental firing.

The team decided to carry out the ceramic firing experiment using a pit fire. This decision is based on assessments made by Author 1 that the Medieval cooking pots from Cencelle were often fired in direct contact with the flames. Due to the uncontrolled atmosphere of an open fire, a variation in colours may be achieved across the same piece. This type of wood firing, although unpredictable, gives an interesting finish to the pottery, which appealed to the collaborating artisans. Based on their experience in firing pottery in this way with wood, the potters estimated that a temperature of 900 °C needed to be reached and maintained for a soaking time of at least 15 min. The temperature achieved using hardwood was monitored using three thermocouples placed in different parts of the fire (see Supplementary Material). The firewood was sourced locally to the heritage park, employing a local logger and charcoal maker. The pottery created by the collaborating potters were fired together with the pottery created by the members of the public who attended the experiment.

3. Results

3.1. Thin Sections Analysis

Petrographic analysis (see Table 1) highlights the presence of three possible clay recipes, which for the purpose of this paper are named Petrographic Fabrics 1, 2, and 3 (Table 1). This analysis did not exactly pinpoint clay types and related deposits. However, the identified fabrics are possibly the results of the mixing of two clays with different compositions, one of which contained volcanic inclusions. Clay mixing is evident in several samples, and for this reason, the fabrics and clay types do not necessarily match, though the different elements combined in the fabrics are indicative of five clay deposits in the vicinity of Cencelle (Figure 2).

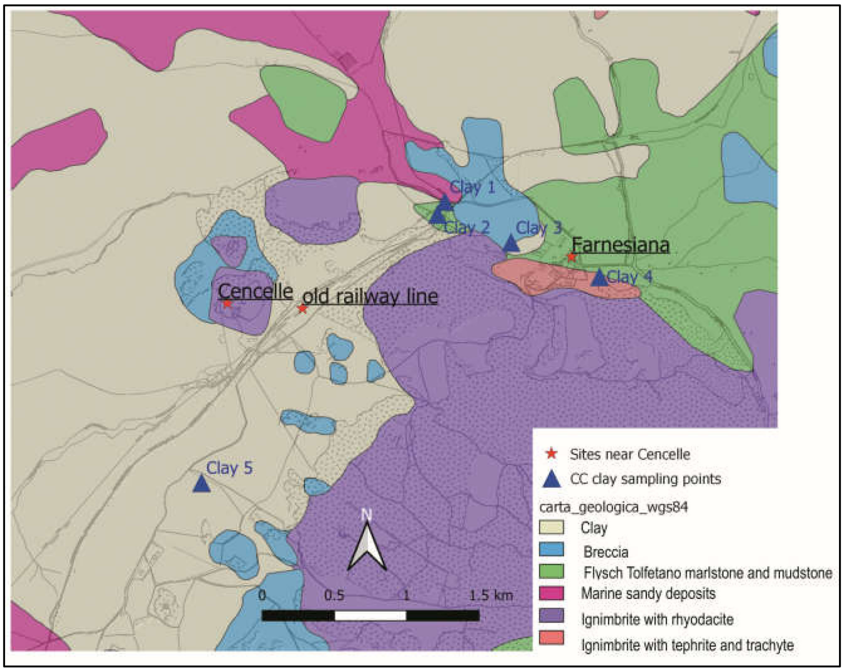


Figure 2. Map of the clay sampling locations, made with the data available at https://geoportale.regione.lazio.it/layers/geonode:carta_geologica_wgs84 accessed on 10 September 2023. Licensed under BY 4.0 (CC).

3.2. Clay Survey

The five potential clay sources identified are in the 'Farnesiana' area, known to be the location of one of the stone quarries that supplied Cencelle [35] (pp. 97–98). Based on this knowledge, a walking survey started at the site of Farnesiana (Figure 2) and moved west, stopping at points identified as geologically compatible with the characterised volcanic Petrographic Fabrics 1 and 3 (Table 1). Four red clays with volcanic inclusions were collected (Clays 1, 2, 3, 4; Figure 3). The targeted bibliographical search also identified a kaolin clay deposit (white clay) consistent with archaeological samples (Petrographic Fabric 2; Table 1) on the hill named Ripa Majala in front of Cencelle [39] (p. 45), [40] (p. 37), [36] (pp. 59–66). This clay was not registered on the geological map, but the evidence obtained from the literature led to a deposit of white kaolinitic Clay 5 (Figure 3).

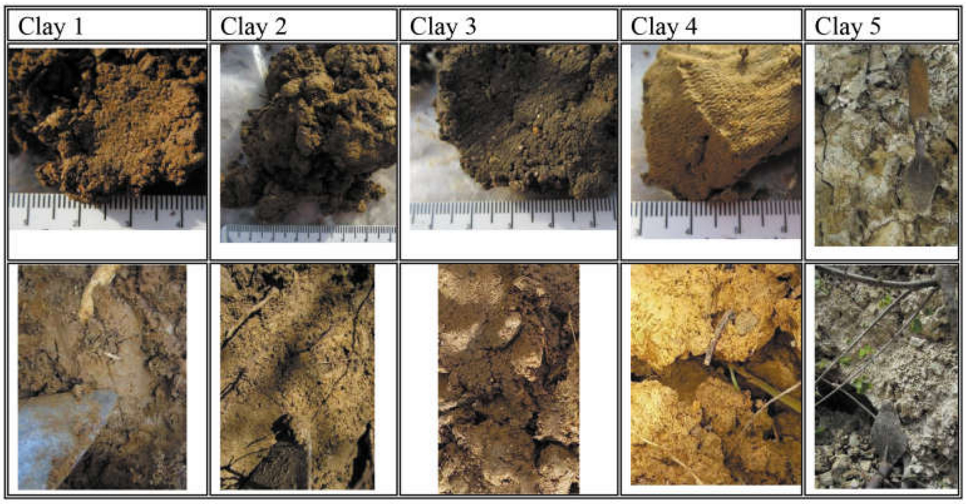


Figure 3. Photos of the 5 different clay types dug from the deposits around Cencelle. The pictures show the colour and texture of the clay on the day of the retrieval. Photos were taken with natural light on the day to allow for a better visual comparison.

3.3. Experimental Work in the Laboratory

Clays 1, 2, 3, 4, and 5 were modelled into five small cups or 'pinch pots' and fired using an electric kiln:

- The test cup made of Clay 2 disintegrated due to spalling after the firing and, therefore, was excluded from the experiment.
- Clay 4 performed best in this experiment, leading to further material collection from this geological deposit.

The three red (1, 3, 4; Figure 3) and one white clay types (5; Figure 3) were brought to the potters, who then shaped a variety of vessels. Information about clay processing detected in artefacts from Cencelle and samples showing visible clay mixing were provided to the potters to enhance their knowledge of the materials' qualities and performance.

3.4. Preparation of the Clay and Vessels Modelling by the Artisans

Pisapia prepared the clay in water without further sieving. He produced the following:

- One tall vessel (A; Figure 4) mixing Clays 1, 3, and 4.
- One small open bowl (B; Figure 4) mixing Clays 4 (red clay) and 5 (white clay).
- A small jug (C; Figure 4) using only Clay 4.
- A carinated small bowl (D; Figure 4) using only Clay 4.
- An open shape bowl (E; Figure 4) using only Clay 4.

Figure 4. Photo of the vessels as they were placed in the pit prior to firing. The letters refer to the names given to each pot for this research. The right side of the pit fire was reserved for the pottery made by the park's visitors.

The carinated small bowl (D) made with Clay 4 cracked during drying (Table 2) and was repaired for firing.

Marri processed the clay further with a 0.1 mm sieve and prepared it in water to make two small bowls:

- The first bowl (F; Figure 4) was composed of 50% white Clay 5 and 50% red Clay 4, with an added mixture of sand from a nearby volcanic lake and commercial chamotte.
- The second vessel (G; Figure 4) was made with 100% white Clay 5 with a further addition of the same mixture of sand and chamotte used in bowl F.

Both bowls dried completely without cracking (Table 2).

Table 2. Summary of successful and failed vessels.

Vessel	Shape	Type of Clay	Inclusions mm	Drying	Firing
A	Tall vessel	1, 3, 4	Natural inclusions sieved to 0.5	yes	yes
B	Small open bowl	4, 5	Natural inclusions sieved to 0.5	yes	yes
C	Small jug	4	Natural inclusions sieved to 0.5	yes	no
D	Carinated bowl	4	Natural inclusions sieved to 0.5	no	no
E	Open shape bowl	4	Natural inclusions sieved to 0.5	yes	yes
F	Open shape bowl	4, 5	Addition of lake sand and chamotte (10%) sieved to 0.1	yes	no
G	Small closed vessel	5	Addition of lake sand and chamotte (10%) sieved to 0.1	yes	yes

3.5. Firing and Prototypes Obtained

The fire pit measured 1.5 m in diameter and 30 cm in depth and was lined with local un-sieved clay from within the Archaeological Park. A fire was set within the pit a day prior to the experiment to dry the clay lining. On the day of the experiment, a fire was started to create a bed of hot embers prior to introducing unfired pottery to the pit (see Supplementary Material). As the embers were created, the unfired pottery was placed around the pit (Figure 1D), warming the clay before firing (see [41]). The clay objects were progressively moved closer as they became acclimatised to the heat (Table 3).

Table 3. Stages of the firing experiment.

Firing Times	Activity	Fire Temperatures (°C)
9–10:40 a.m.	A bed of embers was created by steadily burning wood. Unfired pottery was placed at 1 to 1.5 m from the fire and steadily moved closer over time to protect the pots from thermal shock.	850
10:40–11:04 a.m.	Half of the pit base was lined with terra cotta roof tiles. The unfired pottery crafted by the potters was placed strategically in the pit fire embers. The pottery crafted by the public was placed on the terra cotta tiles to reduce the risk of heat shock.	600 in embers 320 on terra cotta tiles
11:04–11:20 a.m.	Wood and straw were placed over the pottery to create a reducing atmosphere.	573
11:21 a.m.	Fire pit started.	642
11:41 a.m.	Continually feeding the fire pit	706
11:56 a.m.	Continually feeding the fire pit.	750
12:00 a.m.	Continually feeding the fire pit.	901
12:13 a.m.	Continually feeding the fire pit.	910
12:42 p.m.	Last load of wood added to the fire pit.	908
13:00 p.m.	Began to allow the fire pit to burn down.	900
13: 20 p.m.	Fire burning down.	844
13:41 p.m.	Fire burned out, red-hot embers remain.	736
14:47 p.m.	Allowing fire pit to cool before fired ceramics are removed from the pit. Ashes stirred to speed cooling	570
16:10	Pottery removed from the cooled embers.	170

Once the clay objects were loaded into the pit, logs of hardwood were used to create a cover for the pottery and build the fire. Straw was initially used to create a layer between the pottery and the wood, allowing a hot fire to start quickly (Supplementary Material). The potters worked with the archaeologists to reach a temperature of over 900 °C and maintained it for an hour before allowing the fire to naturally burn down to embers. Once the temperature had cooled to below 200 °C, the embers were stirred to encourage cooling, and the fired ceramic objects were removed from the pit (Table 3).

The firing was successful for pots A, B, E, and G. Vessel C lost its outer layer, Vessel D split in half, and Vessel F cracked (Figure 5). These results highlight the benefit of clay mixing (Figure 5, Vessel A). Red Clay 4, when used alone, had problems with both drying and firing (Table 2). White kaolinitic Clay 5, although difficult to work, performed well in this experiment (Table 2 and Figure 5, Vessels B, G). Kaolinitic clay is not common in Italy, and Marri is very interested in reusing small quantities of this material in the future, providing the permission to continue collecting the clay is given by the landowners.

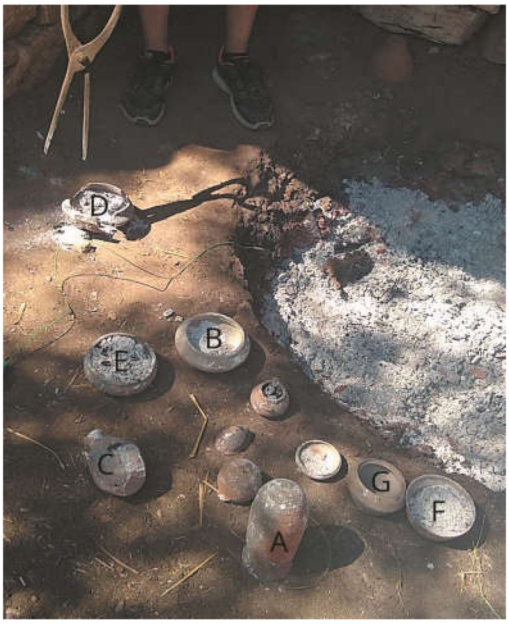


Figure 5. Vessels extracted from the pit, post firing. Vessel C lost its outer layer, Vessel D failed, and Vessel F cracked; the rest of the vessels survived the firing.

4. Discussion

Except for the written work of Piccolpasso (as cited in [42]), potters and writers from the Italian peninsula have largely focused on the surface finishing of vessels rather than the clay recipes used to craft them. For this reason, specific information about raw material procurement and recipes are extremely rare and valuable for potters. Marri expressed his interest in continuing to employ archaeological methodologies trialled in this research and gather information on raw materials which might otherwise be lost to time. Pisapia stated that a strength of his business is his ability to employ different techniques in his craft practice, which allows him to produce a wide range of products to sell. For these reasons, Pisapia maintains his own experimental workshop, and researching new raw materials and steps of production is very important for the economic stability of his business.

Commercially available clay is often not from Italy and is very 'purified'; this means that artisanal products may be quite homogenous if the potter does not create an outstanding original new shape design themselves. Another issue with this 'purified' clay is that it does not survive a firing in direct contact with flames, in contrast with the clay raw materials sourced for this research, which demonstrated a more robust nature when fired during this experiment. To withstand direct flames, commercial clays need to be tempered with coarse sand or organic matter. The addition of material to clay where the inclusions have been removed industrially exposes the paradox of utilising industrially processed material, where it is thought to be more convenient to remove inclusions and then add them if needed rather than leaving the natural inclusions in the clay in the first place. Acknowledging controversial steps in the supply chain is important to achieve a more responsible production process.

Both potters acknowledged the importance of using industrial raw materials for the repeatability of clay performance when crafting specific items and for making large quantities of objects. However, they do not see why artisans should not use both natural and industrial clays, with the possibility of mixing them. A landowner around Farnesiana, who consented to material procurement for this research, has expressed his interest in collaborating with the potters and making some of the clay from his property available to collect twice a year in 5 to 10 kg batches.

The vessels produced by the potters at this stage are ornamental; however, the same raw materials could be employed for utilitarian vessels, such as cooking pots. The production of vessels for consumption by the public usually requires the application of glazes, which adds costs to vessel production and means that the vessels need to be tested for their chemical composition to meet commercial standards. For this reason, utilitarian vessels were not produced for this pilot project. The production of utilitarian vessels could be the next step in the development of this project.

The location for the firing experiment met the needs of the artisans. Rocca San Silvestro's experimental area can be a facility for small craft businesses that have limited capacity to collaborate and experiment with others. The archaeological park can accommodate multiple artisans working at the same time, enabling collaborations and the sharing of methodologies, ideas, materials, and costs to promote a diverse craft economy focused on sustainable production. The location further promotes engagement from larger numbers of the public, which offers the park an economic incentive to host future events. Additionally, situating the event in a significant heritage site (Figure 3A) provided the experiment with a social-cultural relevance that aided in contextualising messages of sustainable consumer choices to the public. A full report about the design of the wider engagement activities and the feedback from the public will be the topic of the paper in preparation focused on these heritage management aspects.

The open working platform allows artisans the space to connect with local communities and establish which products could be commercially viable and desirable to broad demographics. Such craft products will not only target the upper middle class, as Campbel's research concluded in 2005 [43]. This project suggests that craft items can be a universally appreciated purchase that goes beyond the accepted social and cultural taste systems, such as the trickle-down effect in fashion [44,45] ([44] (p. 240)). Utilising local raw materials like the clay used in this project and promoting co-working spaces reduces material and production costs, and these cost benefits can be passed down to consumers.

Additionally, local SMEs can also benefit from this work. The logger, Mr. Simonetti, has taken care of the local forest for over 30 years and runs a family business that respects and maintains the local landscape. His engagement in the project created a valuable link between the site and local businesses; this provides a strong example of how the park can be the catalyst of such collaborations and further help the local community. The central role of heritage parks in the creation of a community-based economy is showcased in other contexts around the world [46].

It has been demonstrated that small businesses and self-employed individuals can enhance their well-being and enjoy economic benefits thanks to co-working [47,48]. The same model can apply to artisans who want to share a workshop space, allowing them to share the cost of infrastructure and other bills while also exchanging ideas and practices. In addition to these benefits, tailored policies that support the long-term innovation and investments of SMEs could boost artisan businesses and promote the success of this model further [49].

The artisans and the customers benefit as their reliance on the global supply chain is decreased. This promotes a healthier environment and standard of living, attracting people to more sustainable choices. In this instance, this is true in terms of the locally sourced raw materials and the subsequent availability of robust, unique, and fairly priced locally produced ceramic objects.

This pilot project aimed to show that it is possible to produce ceramics inspired by ancient practices that have the potential to become mainstream purchases for an average individual. Such objects can constitute an alternative to industrial items produced on a mass scale that appeal to the public due to their low price. Historic and cultural contexts offer artisanal objects an additional inherent value that will appeal to the public, promoting a consumer culture that appreciates unique objects and encourages longer-term use and reuse. A consumer culture based on the understanding and appreciation of not only the final goods but also the processes required to craft them can discourage throwaway purchases.

This project does not argue that one single pot produced using Medieval methods releases less carbon into the atmosphere than an industrial one (even though this scientific calculation would be of interest in a separate project). The aim of this experimental approach to production is to build a community of artisans and customers that produce and consume on a smaller scale, giving a fair value to work, time, and final objects.

Reconstructing ancient technologies to inform modern businesses has been successful in other fields [50], which demonstrates the feasibility of this approach and the possibility of its application in other contexts. The impact is a.m.plified if the local community is an active participant in building a new network of craft businesses. For these reasons, working with a heritage park is a great start and could provide a base to grow a more sustainable community. Overall, this project would like to showcase that the application of this method can be beneficial for sustainable development if it follows a design agreed upon with the different partners involved.

Supplementary Materials: The following supporting information can be downloaded at https://www.mdpi.com/article/10.3390/su152014685/s1. Video S1: placing the firewood, Video S2: starting the fire, Video S3: extracting vessels, Video S4: firing, as well as additional photos of the experiment.

Author Contributions: Conceptualization, V.T. and L.T.; methodology, V.T., L.T. and C.L.; petrographic analysis, V.T.; survey investigation, V.T.; resources, V.T., L.T. and C.L.; data curation, V.T. and L.T.; writing—original draft preparation, V.T. and L.T.; writing—review and editing, V.T., L.T. and C.L.; visualization, V.T. and L.T.; supervision, C.L.; project administration, V.T. and C.L.; funding acquisition, V.T. and C.L. All authors have read and agreed to the published version of the manuscript.

Funding: This research and the APC were funded by the University of Rome Sapienza (Crossref Funder ID 501100004271) within the Sapienza Seal of Excellence Scheme, grant number 501100004271.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Informed consent was obtained from all subjects involved in this study.

Data Availability Statement: The data presented in this study are openly available in IRIS Sapienza at https://iris.uniroma1.it/handle/11573/1685564 accessed on 10 September 2023, reference number [a0d8896c-8d2d-41fa-89fe-5593e40ed49c].

Acknowledgments: We would like to thank the Cencelle team for assisting the sampling process, Giorgia Annoscia, Flora Miele, and Giulia Previti. A great thank you goes to Vanessa Forte for her suggestions on the excavation of the pit fire, to Farò Arte craft association, and to Agriturismo la Farnesiana. We are grateful to Raika Cannone for firing the test cups in her kiln. The authors are also very grateful to Debora Brocchini and Silvia Guideri from Parchi Val Di Cornia and all the members of staff who supported the experimental activities. Thank you to the local firewood supplier, Simonetti. Thank you, Federico Marri and Claudio Pisapia, for all your time and skills offered to this project. Thank you, Alessio Pellegrini, for the reorganisation of the database archive. Thank you to Giulia Vollono for her kind help promoting our activities on social media and her work with the digital repository.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. European Commission. A European Green Deal. Available online: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en (accessed on 29 March 2022).
2. Heritage Craft Association Home. Available online: https://themakers.directory/ (accessed on 21 June 2023).
3. Directorate-General for Research and Innovation (European Commission); Freitas, H.; Pieper, H.; Cornieti, M.; Jacob, D.; Runnel, A.; Mysiak, J.; Murray, V.; Scicluna Bartoli, M.; van Ypersele, J.-P.; et al. *A Climate Resilient Europe: Prepare Europe for Climate Disruptions and Accelerate the Transformation to a Climate Resilient and Just Europe by 2030*; Publications Office of the European Union: Luxembourg, 2020; ISBN 978-92-76-21685-8.
4. Mazzocchi, S. *The Italian Economic Outlook 2020-21. How to Help the Resilience of the Economy and to Boost It after the Crisis?* Confindustria: Roma, Italy, 2020; pp. 3–7.
5. Pensa, C.; Traù, F. *L'articolazione Territoriale Della Manifattura Italiana. Sviluppo, Diffusione, Crisi, Resilienza*; Confindustria: Roma, Italy, 2019; pp. 3–30.
6. Suddaby, R.; Ganzin, M.; Minkus, A. Craft, Magic and the Re-Enchantment of the World. *Eur. Manag. J.* **2017**, *35*, 285–296. [CrossRef]
7. Coffman, M. Making Spirits in a Brewery. In *Handbook of Brewing*; Routledge Handbooks Online: Abingdon, UK, 2017; pp. 755–765. ISBN 978-1-4987-5191-9.
8. Krupets, Y.; Epanova, Y. Developing Craft Business in Russia: Capitals and Tactics of Young Cultural Entrepreneurs. *Cult. Trends* **2021**, *32*, 20–34. [CrossRef]
9. Fernandez, J. Clever by Architectural Digest. 19 February 2018. Available online: https://www.architecturaldigest.com/story/millennials-responsibly-sourced-sustainable-décor (accessed on 6 September 2023).
10. Fox Miller, C. The Contemporary Geographies of Craft-based Manufacturing. *Geogr. Compass* **2017**, *11*, e12311. [CrossRef]
11. Scott, M. 'Hipster Capitalism' in the Age of Austerity? Polanyi Meets Bourdieu's New Petite Bourgeoisie. *Cult. Sociol.* **2017**, *11*, 60–76. [CrossRef]
12. Gould, P.G. *Empowering Communities through Archaeology and Heritage: The Role of Local Governance in Economic Development*; Bloomsbury Academic: London, UK, 2018; ISBN 978-1-350-03623-9.
13. Downum, C.E.; Price, L.J. Applied Archaeology. *Hum. Organ.* **1999**, *58*, 226–239. [CrossRef]
14. Isendahl, C.; Stump, D. *The Oxford Handbook of Historical Ecology and Applied Archaeology*; Oxford University Press: Oxford, UK, 2019; ISBN 0-19-165334-9.
15. Evenari, M.; Shanan, L.; Tadmor, N. *The Negev: The Challenge of a Desert*, 1st ed.; Harvard University Press: Cambridge, MA, USA, 1971; ISBN 0-674-60672-8.
16. Cejuela, E.; Negro, V.; Del Campo, J.M.; Martín-Antón, M.; Esteban, M.D.; López-Gutiérrez, J.S. Recent History, Types, and Future of Modern Caisson Technology: The Way to More Sustainable Practices. *Sustainability* **2018**, *10*, 3839. [CrossRef]
17. Borri, A.; Castori, G.; Corradi, M. Strengthening of Thin Masonry Arches. *Key Eng. Mater.* **2015**, *624*, 51–58. [CrossRef]
18. Staeves, I. An Energy Saving House from 3400 Years Ago. *EXARC J.* **2016**. Available online: https://exarc.net/ark:/88735/10253 (accessed on 10 September 2023).
19. Clifford, B.; McGee, W.; Muhonen, M. Recovering Cannibalism in Architecture with a Return to Cyclopean Masonry. *Nexus Netw. J.* **2018**, *20*, 583–604. [CrossRef]
20. Cooper, J.; Duncan, L. Applied Archaeology in the a.m.ericas: Evaluating Archaeological Solutions to the Impacts of Global Environmental Change. In *The Oxford Handbook of Historical Ecology and Applied Archaeology*; Oxford Academic: Oxford, UK, 2016.
21. Harrison, R. Beyond "Natural" and "Cultural" Heritage: Toward an Ontological Politics of Heritage in the Age of Anthropocene. *Herit. Soc.* **2015**, *8*, 24–42. [CrossRef]
22. Borofsky, R.; Lauri, A.D. Public Anthropology in Changing Times. *Public Anthropol.* **2019**, *1*, 3–19. [CrossRef]
23. Matlovičová, K.; Husarova, M. Potential of the Heritage Marketing in Tourist Destination Development Čičva Castle Ruins Case Study. *Folia Geogr.* **2017**, *59*, 5.
24. Marri, F. Marri Profile. Available online: https://instagram.com/fedemarri?igshid=YmMyMTA2M2Y= (accessed on 24 July 2023).
25. Pisapia, C. Montis Pescalis Ceramics. Available online: https://www.italianpottery.it/ (accessed on 24 July 2023).
26. Michelaki, K.; Braun, G.V.; Hancock, R.G.V. Local Clay Sources as Histories of Human-Landscape Interactions: A Ceramic Taskscape Perspective. *J. Archaeol. Method Theory* **2015**, *22*, 783–827. [CrossRef]
27. Stasolla, F.R. *Leopoli-Cencelle: Il Quartiere Sud-Orientale/Francesca Romana Stasolla*; Introduzione di Letizia Erminia Pani e Contributi di Francois Bougard, Elisabetta de Minicis, Rossana Martorelli; Archeologia e Storia di Città di Fondazione Medievale 1; Fondazione Centro Italiano di Studi sull'Alto Medioevo: Spoleto, Italy, 2012; ISBN 978-88-7988-983-4.
28. Annoscia, G.M. La Ceramica. In *Leopoli Cencelle: Il Quartiere Sud-Orientale*; Centro Italiano di Studi Sull'alto Medioevo: Spoleto, Italy, 2012; pp. 245–252.
29. Cirelli, E. *La Ceramica di Cencelle Nel Medioevo: I Materiali Rinvenuti Negli Scavi Dell'École Française de Rome (Settore III, 1994-1999)*; Collection de l'École Française de Rome; L'École Française de Rome: Roma, Italy, 2017.
30. Burke, C.; Day, P.M. Strategies for Success: Early Helladic Pottery Production in Corinth, Greece. *Archaeol. Anthropol. Sci.* **2023**, *15*, 77. [CrossRef]
31. Hommel, P.; Day, P.M.; Jordan, P.; Müller, N.S.; Vetrov, V.M. Changing Clays: Raw Material Preferences in the 'Neolithic' Ceramic Assemblages of the Upper Vitim Basin. *Proc. Prehist. Soc.* **2017**, *83*, 137–153. [CrossRef]

32. Müller, N.S.; Kilikoglou, V.; Day, P.M. Home-Made Recipes: Tradition and Innovation in Bronze Age Cooking Pots from Akrotiri, Thera. In *Ceramics, Cuisine and Culture*; The Archaeology and Science of Kitchen Pottery in the Ancient Mediterranean World; Oxbow Books: Oxford, UK, 2015; pp. 37–48. ISBN 978-1-78297-947-0.
33. Previti, G. *La Ceramica Di Cencelle Come Strumento Di Indagine per La Ricostruzione Funzionale e Sociale Del Contesto Quotidiano Di Una Citta' Medievale*; Sapienza Universita' di Roma: Roma, Italy, 2022.
34. Annoscia, G.M.; Barone, N.; Gaudenzi Asinelli, M. Nuovi Dati Sulla Fornace Da Campana Di Leopoli-Cencelle. *Sci. Dell'antichità* **2014**, *20*, 303–320.
35. Pami Ermini, L. (Ed.) *Leopoli-Cencelle. Una Città di Fondazione Papale*; Palombi Editori: Roma, Italy, 1996; Volume 2, ISBN 978-88-7621-454-7.
36. Zifferero, A.; Staccioli, R.; Plescia, P.; Pistolese, A. Il Museo Civico Di Tolfa. Archeologia, Mineralogia e Natura. I Musei del Lazio e il Loro Territorio; Fratelli Palombi Editori: Rome, Italy, 2003; Volume 6.
37. Fattori, C. Carta Geologica 1:25.000, Regione Lazio—Geoportale.Regione.Lazio.it. Roma, Italy. Available online: https://geoportale.regione.lazio.it/layers/geonode:carta_geologica_wgs84/metadata_detail#license-more-above (accessed on 22 July 2023).
38. Guideri, S. *Rocca San Silvestro: Percorso Didattico*; Parchi val di Cornia: Piombino, Italy, 2001.
39. Di Carlo, M.; Di Giulio, N.; Franceschini, P.; Moretti, C.; Toretti, F. *La Societa' Dell'allume. Cultura Materiale, Economia e Territorio in Un Piccolo Borgo*; Officina Edizioni: Rome, Italy, 1984.
40. Di Domenico, D.; Angioni, S.; Tamagnini, F.; De Lungo, S.; Seri, E.; Toti, O. *I Monti della Tolfa nel Medioevo tra Incursioni Saracene, Attività Metallurgiche e Fondazioni di Abitati. Giornata di Studio*; Comune di Allumiere: Allumiere, Italy, 1999.
41. Amicone, S.; Forte, V.; Solard, B.; Berthold, C.; Memmesheimer, A.; Mirković-Marić, N. Playing with Fire: Exploring Ceramic Pyrotechnology in the Late Neolithic Balkans through an Archaeometric and Experimental Approach. *J. Archaeol. Sci. Rep.* **2021**, *37*, 102878. [CrossRef]
42. Piccolpasso, D.C. *Piccolpasso. Li tre Libri dell'Arte del Vasaio*; Conti, G., Ed.; All'Insegna del Giglio: Firenze, Italy, 1976; ISBN 978-88-7814-309-8.
43. Campbell, C. The Craft Consumer: Culture, Craft and Consumption in a Postmodern Society. *J. Consum. Cult.* **2005**, *5*, 23–42. [CrossRef]
44. Bourdieu, P. *La Distinction: Critique Sociale du Jugement*; Sens Commun; Éditions de Minuit: Paris, Italy, 1979; ISBN 978-2-7073-0275-5.
45. Frankel, D. *The Devil Wears Prada*; 20th Century Fox: Los Angeles, USA, 2006.
46. Sumarmi, S.; Arinta, D.; Suprianto, A.; Aliman, M. The Development of Ecotourism with Community-Based Tourism (CBT) in Clungup Mangrove Conservation (CMC) of Tiga Warna Beach for Sustainable Conservation. *Folia Geogr.* **2021**, *63*, 123–142.
47. Avdikos, V.; Merkel, J. Supporting Open, Shared and Collaborative Workspaces and Hubs: Recent Transformations and Policy Implications. *Urban Res. Pract.* **2020**, *13*, 348–357. [CrossRef]
48. Tiwari, A. Understanding the Shared Working Spaces: A Geography of Co-Working Supply in Delhi. *GeoJournal* **2023**, *88*, 3439–3453. [CrossRef] [PubMed]
49. Mi, Z.; Coffman, D. The Sharing Economy Promotes Sustainable Societies. *Nat. Commun.* **2019**, *10*, 1214. [CrossRef] [PubMed]
50. Ilieş, D.C.; Onet, A.; Sonko, S.M.; Ilieş, A.; Diombera, M.; Gaceu, O.; Baias, T.; Ilieş, M.; Berdenov, Z.; Herman, G.; et al. Air Quality in Cellars: A Case Study of Wine Cellar in Sălacea, Romania. *Folia Geogr.* **2020**, *62*, 158–173.