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Article

Innovations in Tomato and Carrot Processing to Increase the Economic Value of Horticultural Products at SMKN 1 Lembah Gumanti

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Abstract

This community service activity aims to enhance the knowledge and skills of students at SMKN 1 Lembah Gumanti, Alahan Panjang, Solok Regency, in processing local horticultural crops into value-added food products. The activity was held on July 4, 2026, with a focus on innovative methods for processing tomatoes into tomato sauce and carrots into carrot crackers. The training method employs a participatory approach through lectures, demonstrations, hands-on practice, discussions, and Q&A sessions. The tomato sauce production process includes washing, boiling, peeling, pureeing, cooking until thickened, flavor adjustment, cooling, and packaging. Meanwhile, the process of making carrot crackers includes ingredient preparation, dough preparation and shaping, steaming, cooling, slicing, sun-drying, frying, and packaging. In addition to technical processing skills, participants were introduced to the principles of hygiene and sanitation, quality control, packaging, labeling, storage, and opportunities for product development as a business based on local commodities. The results of the activity show that hands-on processing practices can provide participants with direct experience in diversifying horticultural products while helping them understand the interrelationship between food processing, quality control, and entrepreneurial opportunities. This activity can serve as a means of learning food processing skills and introducing the concept of increasing the value-added of horticultural commodities in a vocational education setting.Further quantitative evaluation is needed to more objectively measure participants' increased knowledge and skills, as well as the economic potential of the products.

INTRODUCTION

The horticulture sector is a vital component of agricultural development because it plays a role in food security, meeting nutritional needs, and increasing community income. Horticultural commodities are generally perishable and tend to deteriorate in quality if not handled properly and promptly. Therefore, processing agricultural produce into value-added food products is one alternative that can be pursued to expand the utilization of these commodities, reduce potential yield losses, and increase the economic value of agricultural products. (FAO, n.d.)

Lembah Gumanti Subdistrict, Solok Regency, West Sumatra, is one region with significant potential for horticultural commodity development. The availability of various types of vegetables in the region offers opportunities for development not only as fresh produce but also as raw materials for processed food products. Tomatoes and carrots are promising commodities for product diversification

because they can be processed into various food forms with distinct characteristics, uses, and market value. The development of processed products based on local commodities can also be part of efforts to introduce the concept of adding value to agricultural products to the younger generation. (FAO, n.d.)

Tomatoes are a horticultural commodity with a relatively high water content, making them prone to quality deterioration after harvest. Ripe tomatoes can be used as raw materials for various processed products, one of which is tomato sauce. The processing can transform the characteristics of fresh tomatoes into a more practical product with a different form and use. In this activity, tomato sauce is made using ripe red tomatoes with the addition of garlic, chili peppers, sugar, cooking oil, and salt. The processing stages include boiling, peeling, pureeing, cooking until thickened, taste testing, cooling, and packaging. (Beaulah et al., 2025; Tomas et al., 2017)

In addition to tomatoes, carrots are a horticultural commodity with the potential to be developed into value-added food products. One form of diversification that can be pursued is processing carrots into crackers. This product is made using carrots combined with tapioca flour and wheat flour. The processing steps include dough preparation, shaping, steaming, cooling, slicing, sun-drying, frying, and airtight packaging. This process results in a product with characteristics distinct from fresh carrots, particularly in terms of shape, texture, and method of consumption. (Sharma et al., 2012; Ahammed et al., 2024)

The development of processed horticultural products requires not only skills in the production process but also an understanding of hygiene and sanitation, quality control, packaging, labeling, and storage. The resulting food products must be handled with attention to the cleanliness of ingredients and equipment, as well as the use of appropriate packaging. In the processing of tomato sauce, for example, the use of clean, dry, food-grade containers and cold storage are essential because the product is made without added preservatives. Meanwhile, airtight packaging for carrot chips is necessary to help preserve the product's characteristics after processing. (Codex Alimentarius Commission, 2023)

In the context of vocational education, agricultural product processing skills are relevant to efforts to enhance students' competencies through practice-based learning. Vocational High Schools (SMK) play a role in equipping students with skills that can be applied in the workplace or developed as entrepreneurial activities. Introducing food processing technologies based on local raw materials can serve as a means to link technical skills with an understanding of product quality and business opportunities. Students can gain hands-on experience ranging from raw material selection, processing, and packaging to an introduction to the basic aspects of product marketing. (Hariyanto et al., 2023; Noviyanti et al., 2024)

Key issues addressed in this community service initiative include the suboptimal utilization of horticultural commodities in the form of value-added processed products, as well as the need to strengthen students' skills in transforming local food ingredients into products with development potential. These conditions highlight the importance of knowledge and skill transfer activities that not only focus on the product manufacturing process but also introduce the basic principles of ingredient handling, quality, food safety, packaging, and entrepreneurial opportunities. (FAO, n.d.; Codex Alimentarius Commission, 2023)

As part of the university's contribution to supporting the development of skills among the community and students, a team of faculty members from the Faculty of Agricultural Technology at Andalas University conducted a community service activity at SMKN 1 Lembah Gumanti on July 4, 2026. The activity focused on the topic "Innovations in Tomato and Carrot Processing to Increase the Economic Value of Horticultural Products," with Rahmi Awalina, S.TP., MP, serving as team leader. The activity was designed as a hands-on workshop on processing tomatoes into sauce and carrots into crackers, allowing students to gain direct experience in transforming horticultural commodities into food products with different forms and uses.

This community service activity aimed to enhance the knowledge and skills of students at SMKN 1 Lembah Gumanti in processing horticultural commodities—particularly tomatoes and carrots—into value-added food products. In addition to technical processing skills, this activity is designed to introduce the application of hygiene and sanitation practices, packaging, labeling, basic quality control, and the potential for product development as part of entrepreneurship based on local agricultural products. Thus, the activity is expected to provide practical experience to students while encouraging the utilization of local horticultural potential through food product innovation. (Hariyanto et al., 2023)

METHOD

Ingredients and Equipment

The ingredients used in making tomato sauce consist of 500 g of ripe red tomatoes, 10 g of garlic powder or 25–30 g of fresh garlic, 15 g of chili powder or 60 g of curly red chili peppers, 12 g of granulated sugar, 15 mL of cooking oil, and ½ teaspoon of salt.

The ingredients used to make carrot crackers include 150 g of carrots, 250 g of tapioca flour, 50 g of all-purpose flour, 8 g of Royco, 20 g of garlic, ½ teaspoon of flavor enhancer, ½ teaspoon of salt, 200 mL of water, and cooking oil as needed.

The equipment used to make tomato sauce includes a pot, stove, knife, mixing bowl, blender or food processor, nonstick skillet, spatula or wooden spoon, and food-grade bottles or jars. The equipment used to make carrot crackers includes a knife, cutting board, mixing bowl, blender or food chopper, pot or frying pan, spatula, steamer, cylindrical mold, baking sheet or bamboo tray, slicing knife, and an airtight container.

Methods and Implementation Steps

The community service activity was carried out at SMKN 1 Lembah Gumanti using a participatory approach that directly involved participants in every stage of the activity. Implementation methods included presenting materials, demonstrations, hands-on processing, discussions and Q&A sessions, as well as product handling and packaging. This approach was used to provide participants with both conceptual understanding and practical experience in transforming local horticultural commodities into value-added food products.

In the initial stage, participants received an explanation regarding the potential of tomatoes and carrots as raw materials for processed food products, basic processing principles, hygiene and sanitation, quality control, packaging, and opportunities for product development as part of entrepreneurship activities. Next, the implementation team demonstrated the processes for making tomato sauce and carrot crackers, followed by hands-on practice by the participants.

Tomato Sauce Processing

The tomato sauce-making process begins with sorting and washing the tomatoes to ensure the raw materials used are fresh, ripe, and undamaged. A cross-shaped incision is made at the bottom of each tomato, after which the tomatoes are blanched for 2–3 minutes. After blanching, the tomato skins are peeled off and the hard parts are removed. The tomatoes are then pureed together with garlic, chili peppers, granulated sugar, cooking oil, and salt until a homogeneous mixture is obtained.

The mixture is then simmered over low heat for 10–15 minutes, stirring periodically, until the sauce thickens to the desired consistency. Once the cooking process is complete, a taste test is conducted to ensure the product's flavor profile meets expectations. The sauce is then cooled before being transferred into clean, dry, food-grade bottles or jars.

Quality control in tomato sauce production is carried out from the raw material selection stage through packaging. The tomatoes used must be ripe, fresh, and free of rot. During the cooking process, the mixture is stirred periodically, and cooking continues until the desired thickness is achieved. Packaging containers must be clean and dry to minimize the risk of contamination. Since the product is made without added preservatives, it is recommended that packaged sauce be stored in the refrigerator. For household use, the product should be consumed within 3–5 days.

Carrot Cracker Production

The production of carrot crackers begins with peeling and washing the carrots, which are then pureed with garlic and flavor enhancers. The mixture is then cooked until the desired consistency is achieved, after which tapioca starch and wheat flour are added according to the recipe. The dough is kneaded until it is evenly mixed and can be shaped.

The homogeneous dough is then shaped into cylinders using a mold. The dough is then steamed for 45–60 minutes until cooked through. After steaming, the dough is cooled and stored in the refrigerator overnight to facilitate slicing. Once the dough has firmed up sufficiently, it is sliced to a thickness of about 1–2 mm. The cracker slices are sun-dried until completely dry to reduce moisture content before frying.

The dried crackers are then fried until they puff up and are fully cooked, after which they are drained and cooled to room temperature. Once cooled, the product is packaged in airtight containers or packaging to help maintain crispness and protect the product from environmental humidity.

Overall, the series of activities was designed to integrate technical food processing skills with aspects of quality control and product development. Participants were not only involved in the product manufacturing process but were also provided with an understanding of the importance of raw material selection, hygiene during production, packaging, storage, and the potential for developing horticultural products as economically valuable food items.

RESULT AND DISCUSSION

The community service activity resulted in two processed products based on local horticultural commodities: tomato sauce and carrot crackers. Both products demonstrate the application of agricultural product diversification through changes in the form, characteristics, and use of raw materials to create value-added food products. Tomato sauce is produced through a combination of boiling, pureeing, and cooking until the desired consistency is achieved, while carrot crackers are produced through the stages of mixing and shaping the dough, steaming, slicing, drying, and frying. (FAO, n.d.; Beaulah et al., 2025)

The selection of these two products provides processing experience with distinct process characteristics. In tomato sauce, the processing is more focused on establishing the product's texture and consistency, whereas in carrot crackers, the reduction of moisture content is a critical step in achieving the desired product characteristics. These differences provide participants with the opportunity to understand that each commodity and product type requires different processing treatments. (Page et al., 2012; Ahammed et al., 2024)

Tomato Sauce Processing Results

Making tomato sauce is one of the main activities because it uses ripe tomatoes as the primary ingredient and involves relatively simple processing steps that are easy to introduce to students. The process begins by boiling the tomatoes for 2–3 minutes. This step facilitates the peeling process, making it easier to puree the tomatoes. The tomatoes are then pureed with additional ingredients and cooked for 10–15 minutes until a thicker consistency is achieved. (Page et al., 2012; Colle et al., 2013)

This series of processes demonstrates changes in the characteristics of the raw materials during processing. Blanching provides initial heat treatment and facilitates skin separation, while the pureeing process results in a more uniform particle size. Furthermore, cooking causes water loss and produces a thicker product consistency. Thus, the practical activity not only provides skills in following processing procedures but also introduces participants to the relationship between process treatments and the characteristics of the final product. (Page et al., 2012; Tomas et al., 2017)

Hygiene and quality control are key considerations during the tomato sauce production process. Selecting ripe, fresh, and unspoiled tomatoes is a crucial initial step in producing a high-quality product. The cleanliness of equipment and packaging containers must also be maintained to minimize the risk of product contamination. After the cooking process is complete, the sauce is cooled before being packaged in clean, dry, food-grade containers. (Codex Alimentarius Commission, 2023)

Post-processing handling is also a critical aspect of ensuring food safety. The tomato sauce produced in this activity contains no preservatives; therefore, refrigeration is recommended for storage. The activity guidelines also emphasize that shelf life at room temperature cannot be determined solely based on practical experience, as it requires further testing that includes, among other factors, formulation, acidity level, sterilization process, and product stability. Therefore, this activity underscores the importance of distinguishing between product processing experience and the scientific validation of shelf life. (Codex Alimentarius Commission, 2023)

From a product development perspective, tomato sauce offers opportunities for packaging in various forms suited to the product's characteristics, such as 100 mL or 250 mL bottles, food-grade plastic jars, or stand-up pouches with lids. These packages can be equipped with labels containing basic product information, including the product name, ingredients, net weight, production date, best-by date, and the seller's identification and contact information. Introducing aspects of packaging and labeling provides participants with insight into the fact that food product development for commercial purposes

does not end at the production stage but also includes presenting product information to consumers. (Codex Alimentarius Commission, 2023).



Figure 1. Processing tomatoes into sauce

Carrot Crackers: Processing Results

The second product produced during the activity was carrot crackers. This product represents a form of diversification that transforms carrots into a food product with characteristics different from those of the raw material. The manufacturing process includes grinding the ingredients, mixing and shaping the dough, steaming, cooling, slicing, drying, frying, and packaging. (Ahammed et al., 2024)

The slicing and drying stages require special attention because they affect the characteristics of the crackers after frying. Slices approximately 1–2 mm thick help produce a relatively uniform product size. Furthermore, the cracker slices must be dried until completely dry before frying. Products that still contain a relatively high moisture content may result in crackers that do not puff up properly or lose their crispness after frying. Therefore, drying is a critical quality control point in the carrot cracker production process. (Ahammed et al., 2024)

After frying, the crackers must be cooled before packaging. The cooling stage aims to prevent water vapor from becoming trapped inside the packaging, which could affect the product's crispness. Airtight packaging is then used to help protect the crackers from environmental humidity. Thus, participants gained an understanding that product quality is determined not only by the processing steps but also by post-production handling. (Codex Alimentarius Commission, 2023; Ahammed et al., 2024)

The implementation of the activity demonstrated that the processing of tomatoes and carrots can serve as a learning medium that integrates technical skills with aspects of quality control and entrepreneurship. Participants were not only introduced to methods for producing processed goods but also to the importance of selecting raw materials, maintaining hygiene during production, packaging, labeling, and product storage. (Hariyanto et al., 2023; Noviyanti et al., 2024)

From an entrepreneurial perspective, transforming horticultural raw materials into processed products illustrates the process of creating added value. Tomatoes, which are typically marketed as fresh produce, can be processed into sauce, while carrots can be turned into crackers. These transformations result in products with different forms, characteristics, and consumption methods compared to the original raw materials. This can serve as a simple example for students regarding the concept of product diversification and the utilization of local raw material potential as the foundation for business development. (FAO, n.d.; Hariyanto et al., 2023)

An introduction to packaging and labeling is also a crucial component of entrepreneurship education. Food products intended for the market require packaging that aligns with the product's characteristics and provides adequate information for consumers. In the context of this activity, students were introduced to the fact that product identity, composition, net weight, production date, best-by date, and producer information are key details to consider in food product development. (Codex Alimentarius Commission, 2023)

Overall, this community service activity provided hands-on experience in processing two horticultural commodities into value-added food products. The activity also demonstrated that simple processing technologies can serve as a means to introduce the concept of agricultural product downstream processing to students. The integration of processing practices, quality control, packaging, and entrepreneurship education provided participants with the opportunity to understand the stages of product development more comprehensively. (FAO, n.d.; Hariyanto et al., 2023)

Nevertheless, the hands-on practice provided participants with direct experience in processing horticultural raw materials into food products with distinct characteristics. The results of the activity indicate that a practical approach can be used to introduce the interconnections between the utilization of local commodities, food processing technology, quality control, packaging, and product development opportunities. Quantitative evaluation through knowledge and skill assessment tools, product acceptance tests, and economic analysis can be considered in follow-up activities to obtain more measurable impact metrics. (Hariyanto et al., 2023)



Figure 2. Group Photo with Students from SMKN 1 Lembah Gumanti

CONCLUSION

The community service activity held at SMKN 1 Lembah Gumanti on July 4, 2026, provided participants with practical experience in diversifying horticultural products by processing tomatoes into tomato sauce and carrots into carrot crackers. These two products demonstrate that local horticultural commodities can be developed into food products with different forms, characteristics, and uses, thereby offering the potential for added value compared to their fresh counterparts.

The activity also integrated technical food processing skills with aspects of hygiene and sanitation, quality control, packaging, labeling, storage, and an introduction to entrepreneurial opportunities. Through demonstrations and hands-on practice, participants gained an understanding of the basic stages of processing and the factors that must be considered to produce products with the desired characteristics.

This activity demonstrates that simple processing based on local horticultural commodities can serve as a medium for skill development while introducing concepts of economic value enhancement and entrepreneurship within the vocational education setting. Further evaluation using quantitative instruments—such as pre- and post-activity assessments of knowledge and skills, product acceptance tests, and analyses of costs and economic value potential—is necessary to measure the activity's impact more objectively.

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REFERENCES

Coelho, M. C., Rodrigues, A. S., Teixeira, J. A., & Pintado, M. E. (2023). Integral valorisation of tomato by-products towards bioactive compounds recovery: Human health benefits. Food Chemistry, 410, 135319.

Food and Agriculture Organization of the United Nations (FAO). (n.d.). On-farm postharvest and value addition. Sustainable Agricultural Mechanization.

Ahammed, S., et al. (2024). A comprehensive review on carrot (Daucus carota L.): The effect of different drying methods on nutritional properties and its processing as value-added foods. Sustainable Food Technology, 2(3), 667–688. https://doi.org/10.1039/D3FB00162H

Beaulah, A., Rajadurai, K. R., Anitha, T., Rajangam, J., & Maanchi, S. (2025). Postharvest handling and value added products of tomato to enhance the profitability of farmers. FAO AGRIS.

Codex Alimentarius Commission. (2023). General principles of food hygiene (CXC 1-1969). FAO/WHO.

Colle, I. J. P., Lemmens, L., Van Buggenhout, S., Met, K., Van Loey, A. M., & Hendrickx, M. E. (2013). Processing tomato pulp in the presence of lipids: The impact on lycopene bioaccessibility. Food Research International, 51(1), 32–38. https://doi.org/10.1016/j.foodres.2012.11.024

Hariyanto, V. L., Hidayah, R., Pratama, G. N. I. P., & Syamsudin, R. N. (2023). Project-based learning at vocational schools: A case study of the implementation of entrepreneurship learning model. International Journal of Instruction, 16(3), 283–306.

Noviyanti, A. A., Saldi, Z. S., Prakasa, D. Y., Santana, F. C., & Akbar, M. F. S. (2024). Enhancing entrepreneurship project-based learning for vocational schools with human-centered design and 3D printing. SPEKTA (Jurnal Pengabdian Kepada Masyarakat: Teknologi dan Aplikasi), 5(2). https://doi.org/10.12928/spekta.v5i2.9432

Page, D., Van Stratum, E., Degrou, A., & Renard, C. M. G. C. (2012). Kinetics of temperature increase during tomato processing modulate the bioaccessibility of lycopene. Food Chemistry, 135(4), 2462–2469. https://doi.org/10.1016/j.foodchem.2012.06.028

Tomas, M., Beekwilder, J., Hall, R. D., Sagdic, O., Boyacioglu, D., & Capanoglu, E. (2017). Industrial processing versus home processing of tomato sauce: Effects on phenolics, flavonoids and in vitro bioaccessibility of antioxidants. Food Chemistry, 220, 51–58. https://doi.org/10.1016/j.foodchem.2016.09.201

Universitas Andalas, Fakultas Teknologi Pertanian. (2026a). Panduan pembuatan saos tomat dan kerupuk wortel. Pengabdian Kepada Masyarakat Mandiri Tim Dosen Fakultas Teknologi Pertanian, Universitas Andalas.

Universitas Andalas, Fakultas Teknologi Pertanian. (2026b). Surat izin kegiatan pengabdian kepada masyarakat mandiri: Inovasi pengolahan tomat dan wortel untuk meningkatkan nilai ekonomi produk hortikultura.

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