Journal of Sustainability Science and Management
Volume 18 Number 11, November 2023: 111-120
eISSN: 2672-7226

ADAPTATION OF THE THEORY OF CHANGE IN THE PROCESSING OF GLUTINOUS MAIZE

NURBAYA BUSTHANUL[1]*, M. SALEH S. ALI[1], MASYHUR SYAFIUDDIN[2], HANIZA NABILA LASMAYADEWI[1], NABILAH RAHMAWATI[1], SITI HARDIYANTI SYAM[1] AND ASMIATY SAHUR[3]

[1]Department of Agricultural Socio-Economic, Faculty of Agriculture, Hasanuddin University, 90245 Makassar, Indonesia. [2]Department of Soil Science, Faculty of Agriculture, Hasanuddin University, 90245 Makassar, Indonesia. [3]Department of Agronomy, Faculty of Agriculture, Hasanuddin University, 90245 Makassar, Indonesia.

**Corresponding author: n.busthanul0963@gmail.com*
Submitted final draft: 30 July 2023 *Accepted: 30 August 2023* http://doi.org/10.46754/jssm.2023.11.008

Abstract: This study aims to plan a programme as a solution to the problems that exist in the processing of glutinous maize in Saile Hamlet by adapting the Theory of Change (ToC) method. This study uses a descriptive qualitative approach. A qualitative analysis is used to describe programmes to overcome problems in the processing of glutinous maize. The findings reveal that those solutions to the problems identified by adapting the ToC method are: (i) Farming assistance by agricultural extension agents using a modern system; (ii) implementation of counselling or routine discussions and practice trials of glutinous corn processing; (iii) making proposals to attract investors; (iv) implementation of marketing and financial management system training.

Keywords: Agriculture, glutinous maize, Theory of Change.

Introduction

Maize is an important food crop and one of the main agricultural commodities in many countries, including Indonesia. Maize plays a strategic role in food security and the sustainability of agricultural systems. However, maize productivity often suffers from low yields, high production costs and the risk of losses due to pests and diseases. Increasing maize productivity is an essential goal in facing food security challenges and increasing farmers' income. Applying the theory of change to achieving these goals, has shown promising results. The theory of change is a systematic approach that aims to identify, plan, and implement changes in a system, in this case, the maize farming system. The theory of change provides a structured framework for analysing barriers, opportunities, and solutions that can be applied to improve maize productivity.

Increasing agricultural productivity to achieve sustainable yield improvements and involve improvements in agricultural technology and management including improved groundwater and post-harvest management are or should be a priority (Al-Haboby *et al*., 2016). In farming, farmers as the main actors in agricultural development (Damanik, 2020) are certainly faced with various problems, ranging from finding superior seeds to processing and marketing. These problems need to be considered and solutions are found for the development of their farming business. Farmers' problems are often encountered in finding quality seeds, purchasing fertilisers, vitamins and pesticides, cultivation problems in areas that are still hoeing, crop failure due to pests and plant diseases, limited agricultural tools, limited knowledge, skills, and understanding of farmers about farming (Awwaliyah *et al.,* 2020).

Most of Indonesia's corn, some 48.4%, can be eaten, some 38.3% is used as feed, 1.2% is used as seed corn and 6.2% is used as industrial processing material. In addition to fruit, stems and leaves of the plants can be used as organic fertilisers such as animal feed or compost (Nasrullah *et al*. 2020). One variety of corn, such as glutinous maize, is often found in Saile Hamlet, Catalysing District, Gowa Regency,

Indonesia. Glutinous maize is a food crop that is quite high in volume in Saile Hamlet, and although this commodity is included in the farmer's side business, the results are quite profitable. The local glutinous maize also fetches higher prices in the local market as compared with the regular. high yield or hybrid maize variants (Abonmai *et al*., 2019). But of course there are challenges in trying to cultivate glutinous maize.

The challenge faced related to corn production is the area of farmland. Another challenge is that the price of hybrid seeds is still relatively low, causing the use of hybrid corn seeds to be limited, this also causes the low quality of corn produced, so there is a high risk of crop failure. This is in line with the orientation of the development of agricultural commodities, including corn, which cannot be separated from the industrialisation process, which means that the sales orientation of corn agricultural products must be of added value to producers. Corn marketing orientation is not only intended as a primary product, but in the future the marketing of results must be in the form of processed products (Kementrian Pertanian, 2019).

Based on research from Milyutkin *et al.* (2020), Chen and Gong (2021), Busthanul *et al*. (2020), and Ovharhe *et al.* (2021) It is known that there are several studies that seek to adapt the strategies or programmes that have been planned in order to overcome problems, especially in the agricultural sector. So, several efforts are planned to overcome the existing problems, but there is a need for adaptation. or adjustment of farmers in conducting the programme or strategy to be well-received and sustainable for the development of their farming business. There are three things that are different between this study and previous research, the first difference is in terms of the research location, which has different characteristics from that of the other research locations. Second, the difference is on the subjects of the research, in this study the research subjects were farmers in Saile Hamlet in Indonesia. The third difference is in the research method, most of the previous studies used a quantitative approach, this study uses a qualitative descriptive method and an adaptation of the Theory of Change (ToC).

Any challenge, obstacle, or problem must have a solution. One of the mechanisms used to overcome issues is by applying and or adapting the ToC method to ascertain the best possible solution that achieves all of the desired results. This theory will focus on mapping where problems have been identified, and then planning the steps required to achieve the expected goal. The workflow adaptation of the ToC method scheme is as Figure 1.

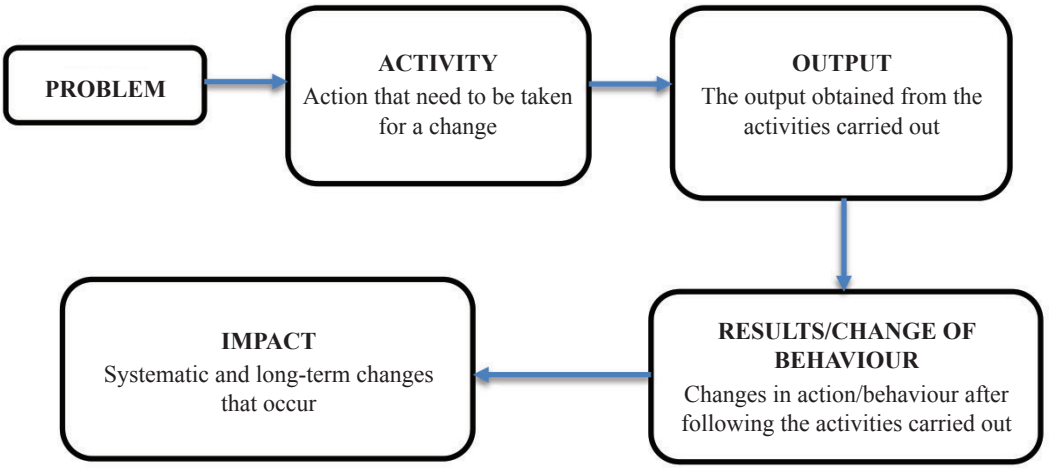

Figure 1: Theory of Change Method Scheme

This ToC links activity, outcome, and context. ToC is very useful in evaluating programmes that have three main components: objectives, settings of strategic plans, and desired changes, or problems, solutions, and desired changes. When setting up a change programme ToC, starts by asking: "What changes (long-term goals) would you like to make to this programme?" (Hamdy, 2019). the ToC was designed as a tool to help articulate underlying assumptions from the outset (Reinholz & Andrews, 2020).

Most of the farmers in Indonesia have difficulty understanding and solving their problems, most prefer direct assistance and refuse the best possible solution. Therefore, the ToC methodology can be applied to programme planning to change conditions and overcome problems faced by farmers in corn processing. The purpose of this study is to analyse the solution to the problems in the processing of glutinous corn by adapting the ToC.

Research Method

The ToC method was applied to vary policy; a specific PPA policy instrument namely, Private Nature Reserves (PNRs) in the South African context for instance (Retief *et al*., 2022). The ToC explicitly outlines how to conduct a series of activities that will produce interim, intermediate or long-term outputs. It also attempts to determine the real factors that could have had an effect on the outcome (Yatirajula *et al*., 2022).

This research was conducted in Saile Hamlet, Pattallassang Subdistrict, Gowa Regency, South Sulawesi. The location was selected by purposive sampling. In this hamlet, most of the farmers grow glutinous maize in the dry season as a side business and the sellers of boiled glutinous corn buy a lot from the farmers. This research uses a qualitative approach.

Data collection in the form of primary data was collected by direct observation of the research subjects, and by conducting open interviews with informants based on the research tools provided. Primary data is collected, while undertaking experiments in experimental research for the specific purposes of a research project (Papachroni & Lochrie, 2015), but, primary data in the case of descriptive type research and surveys (including sample surveys or census surveys), are obtained either by means of observation or via direct communication with respondents in one form or another (Mazhar *et al*., 2021). Secondary data is data that is collected by someone other than the researcher and usually for another purpose. Using secondary sources research authors may draw data from government documents, scientific papers, statistical databases and other resources (Panchenko & Samovilova, 2020).

A total of five informants were used in this study. Informants in this study include (a) key informants, namely the Head of the Farmer's Group in Saile Hamlet. The head of the farmer's group is a key informant because he is the main source of primary information; (b) ordinary informants, in this case members of the corn farmer group in Saile Hamlet; and (c) additional informants, namely agricultural workers in Panaikang Village. Agricultural extension workers can provide additional or supporting information that can complement the data in this study.

Results and Discussions

Solving problems or minimising losses due to problems naturally requires strategic planning and effort. A programme planning mechanism for problem solving can be obtained by applying the ToC method. This is often developed at the planning stage. It focuses on where, after identifying a problem, a planned activity is needed to achieve an expected goal. The ToC method usually results in a framework displayed in Figure 2.

From the resulting Theory of Change (ToC) framework, five general problems were identified in the post-harvest handling and

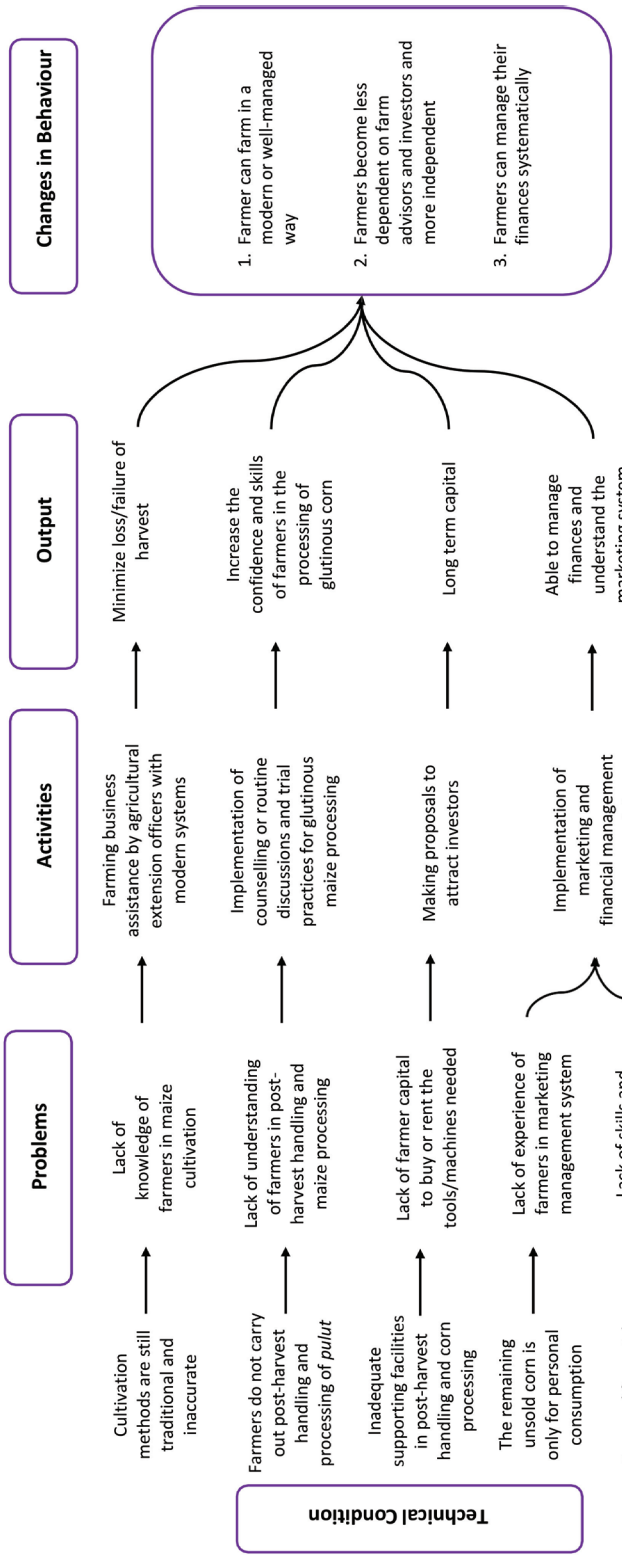

Figure 2: The Theory of Change Method Result Framework

processing of glutinous maize in the Saile Hamlet based on the technical conditions of the research location:

1. The cultivation methods used by farmers in Saile Hamlet are inefficient, so, farmers often experience considerable losses caused by several factors including the unavailability of quality seeds, having inappropriate tillage, paying less attention to the nutrient content of the soil, using inappropriate fertilisers, having insufficient plant spacing, flooding and pest attacks also affect the growth of *pulut* corn plants. Under these circumstances, it can be concluded that the first problem is a lack of knowledge on the proper methods for *pulut* corn cultivation.
2. Farmers do not perform post-harvest handling and processing of *pulut* corn. Farmers in Saile Hamlet only sell fresh *pulut* corn to traders citing less than optimal post-harvest handling. Farmers also do not process the *pulut* corn into new products to save on labour, time and cut costs. Under these conditions, it can be concluded that the second problem is the lack of farmer's understanding of post-harvest handling and processing of *pulut* corn.
3. Supporting facilities for post-harvest handling and processing of *pulut* corn in Saile Hamlet are inadequate. There are several obstacles to post-harvest handling and processing of *pulut* corn faced by the farmers that are the large capital/cost for the tools and machinery needed, so post-harvest handling is not optimal. The required machinery, such as a maize seed dryer, maize sheller, maize grinder, packaging equipment and other tools are not owned by the farmers and are not available in the hamlet, it costs more to rent or buy the equipment required. Post-harvest handling and processing of maize can be done conventionally or without the use of modern machinery but requires more labour and takes more time. Therefore, modern equipment is needed to adequately manage the post-harvest handling and processing of *pulut* corn. With the technical conditions, it can be concluded that the third problem is the lack of capital for farmers to buy or rent the required tools and machinery.
4. Generally speaking, the marketing network of farmers in Saile Hamlet is still very small, because there is only one trader. The unsold corn remaining is also not a small amount, it can range between at least 1,000 (one thousand) corn cobs and 4,000 (four thousand) corn cobs. However, the remaining maize is not properly utilised by the farmers, they do not process it into new food products, nor try to sell the full harvest. The remaining unsold maize is kept for personal consumption. In this instance, it is clear that the fourth problem is farmers' lack of experience with marketing.
5. Farmers' finances are also not well managed. So, the income and expenses are not clear, and the profit or loss from the sale of corn each harvest is not known. Finances for personal needs and farming are combined. As such it can be concluded that the fifth problem is the farmer's lack of financial management skills.

Programme Planning

Making the programme planning by adapting the ToC method based on the five problems; so that it can achieve change (the long-term goal) by planning activities and programmes that will help us achieve that change. Therefore, in this study, we will adapt the ToC method (Figure 2) which is described below the programme plan as a solution for the desired change.

Farming Business Assistance by Agricultural Extension Officers with Modern Systems

The modern system in question combines management science, including the ability to plan, direct, control, assemble and use all available resources to produce a product that benefits farmers. If agribusiness management is a procurement, sales and marketing activity,

then agribusiness management must also be considered. These farming businesses are prone to losses and need a more organised farming plan to implement or maintain. In this case, farmers cannot do it alone, and of course, the role of an agricultural advisor is needed. Based on research from Raidimi and Kabiti, (2019), agricultural extension links farmers to information and knowledge sources for adaptation to climate change and risk hedging. Moreover, extension services can aid farmers decision-making on viable livestock and crop diversification options to follow.

Planning includes land management, seed selection, and maintenance to prevent pests and disease. Therefore, advisory workers should be informed about proper cultivation methods, and be able to explain how to cultivate the proper corn growing conditions as well as the proper use of vitamins and pesticides in appropriate quantities to maximise yields. In addition, we will provide direct on-site (soil) support in activities such as land management, planting, irrigation, pest and diseases control and harvesting.

Implementation of Counselling Programmes or Routine Discussions and Trial Practices for Glutinous Maize Processing

The problem of farmers' lack of understanding about post-harvest handling (Qur'ania *et al*., 2019) and the processing of corn still requires the role of agricultural extension workers. Thus, this programme aims to increase the confidence and skills of farmers in processing glutinous maize. The farmer's understanding is related to the farmer's trust. Farmer confidence increases when farmers understand. Self-confidence is a strong desire to plan a business, develop a business, or solve a problem. According to a study by Mulyaningsih *et al*. (2018), Farmers' trust can be built through the role of agricultural extension workers, who regularly meet with farmers to guide them and seek to provide additional methods and knowledge. Thus, increasing farmers' trust cannot be separated from the role of assistants as motivators for farmers. Farm advisors can influence and change farmer behaviour if they believe what they say reflects reality and can be of benefit to farmers, and the quality of extension in the field can build Farmers' Trust. The quality of extension in the field can build Farmers' Trust. Service quality is known by comparing farmers' satisfaction with the services received against what they expect (Andikarya, 2021).

Interviews with farmers revealed that many were familiar with methods passed down from generation to generation and were afraid of the risk of introducing new methods. This is in accordance with the statement of Mulyaningsih (2018) which states that the problems and risks of perceived business losses can weaken the minds and creativity of farmers in developing their businesses. Therefore, farmers need to be empowered through support so that they can control their farming business.

Making Proposals to Attract Investors

Lack of supporting facilities is not the main problem, but it is important because it facilitates the handling and processing of post-harvest corn, including saving farmers energy and time. Therefore, a support scheme for farmers in making proposals to attract investors can help farmers obtain long-term capital. In addition, the proposal will seek partners or collaborate with institutions/companies to provide tools and materials to farmers, from post-harvest handling to processing and manufacturing various new food products that can be sold.

The proposals that will be made are proposals for funding submissions and programme application proposals. This proposal is made for approval with financial support, approval or sponsorship. This application is a document that contains an action plan and a cost plan (proposal for funding application) written in a coherent and detailed systematic manner. The elements of the proposal consist of the title of the proposal, the background, the aims and objectives, the organisational structure of the farmer group, the problems faced, the business strengths, weaknesses, opportunities and threats analysis (SWOT), the vision and mission, and

an overview of the business implementation, product design and cost estimates required, and conclusion. A SWOT analysis is widely known to facilitate the formation of organisational or personal strategy by assessing internal and external elements, the analysis is not exhaustive and it has its criticisms (Teoli *et al*., 2019).

Machines needed in post-harvest handling such as corn sheller machines, corn kernel drying machines and corn kernel grinding machines. Other tools needed in the process of processing corn into a new food product such as stoves, blenders, frying pans, steam pots, scales, measuring cups, knives, moulds and others depending on the product you want to make. Furthermore, tools for product packaging such as press tools, scales, plastic packaging, packaging boxes, and also labels.

Implementation of Marketing and Financial Management System Training

Of course, this programme is expected to address farmers' lack of experience in marketing management systems and farmers' lack of skills and understanding of financial management. Efforts or actions that can be taken are to help farmers manage simple finances so that they are able to calculate the profit from each sale (income). Expertise in bookkeeping can also be used to attract investors because potential investors invest in a group or someone who is good at owning and managing company finances.

In the marketing system, from training on packaging processes to branding processed products, and then supporting farmers by selling their products through online sales systems or sales systems in partnership with urban stores. Marketing management is important to do to overcome problems in the downstream farming subsystem. As explained by Putri (2017) in her book, marketing develops products that satisfy consumer wants, sets attractive prices, facilitates product distribution, and promotes products effectively, done to attract potential buyers by retaining consumers/customers. With the existence of marketing management, it is hoped that it can increase income and the development of glutinous maize farming in Saile Hamlet.

Long-Term Outcomes and Impacts

Based on the planned programme, it can be assumed that the output produced will help farmers increase the profits from glutinous maize farming if all parties involved, especially the farmers, can successfully implement the programme. There is also a need for further extensive and ongoing scientific research into aspects not covered by this study, so that future programmes and feasibility studies, can be the result. The expected outcomes of the planned programme are as follows:

1. Agricultural assistance provided by agricultural extension workers with modern systems is of course planned with the hope of minimising the level of losses and crop failures from the glutinous maize farming business in the Saile Hamlet.
2. With the aim of increasing the understanding, trust, and skills of farmers in the processing of glutinous maize, the existing programme planning is to conduct regular discussions and consultations, as well as trials of processing agricultural products into processed food.
3. Making a proposal to attract an investor as an effort to obtain long-term capital that can assist farmers in facilitating the tools/machines needed in the post-harvest handling and processing of corn husks.
4. Conduct training on marketing management systems and financial management systems with the aim of providing additional lessons and experiences for the development of their farming business. Farmers are expected to be able to manage their finances and better understand the market.

The long-term goal of programme planning is of course changing the behaviour of farmers slowly if the existing programme can be implemented consistently and sustainably. Expected behavioural changes are as follows:

1. Farmer's operations are modernised or well-managed.
2. Farmers become more independent, less dependent on farm advisors and investors. From the perspective of existing programmes, the role of agricultural extension workers is very important to support all aspects and sustainable programmes need investors.
3. Farmers can manage individual finances systematically.

The purpose of the preparation of this programme is to overcome the problems that exist in the corn pulping operations of Saile Hamlet, especially post-harvest processing and handling of glutinous maize. But apart from that, of course, it is also necessary to pay attention to the long-term positive impact of Saile Hamlet on agriculture and farmers.

This programme plan provides wider access to education and training for farmers. Thus, farmers can improve their knowledge and skills in agriculture, technology, farm business management, and understanding of sustainable agriculture principles. This education and training helps to educate farmers, making them more knowledgeable and adaptable to environmental and technological changes. More educated farmers will be able to implement best practices and face agricultural challenges in a more effective way.

The programme also focuses on enhancing farmers' self-reliance. This includes providing better access to resources and knowledge needed to manage their farming businesses independently. Farmers are encouraged to develop decision-making skills and plan their farming activities. In addition, self-reliance also includes strengthening farmer organisations, which enables them to play a role in negotiations with markets, financial institutions, and the government. Farmers can manage and develop their farming enterprises more efficiently and innovatively with enhanced self-reliance.

Furthermore, programme planning focuses on increasing agricultural productivity through modern technology, improved farming methods, and access to quality agricultural inputs, such as superior seeds and fertilisers. Farmers can overcome environmental challenges and better deal with pests, plant diseases, and climate change issues with improved knowledge and skills. All of this will contribute to higher and more stable crop yields over time, thus, achieving optimal yields for farmers and helping to feed the growing population.

In addition, the programme also aims to improve the welfare of farmers and their families. With increased productivity and yields, farmers' income increases. This programme's long-term impact is the improved living standard for maize farmers, especially in the Saile Hamlet. Increased income allows farmers to access better health and education services, increase access to infrastructure facilities and improve their quality of life. Thus, the farmer empowerment programme reduces poverty levels in rural areas and improves farmers' social and economic welfare.

Conclusion

The solutions to the problems identified by adapting the ToC method are various efforts or activities, namely: (i) Farming assistance by agricultural extension agents using a modern system; (ii) implementation of counselling or routine discussions and practice trials of glutinous corn processing; (iii) making proposals to attract investors; (iv) implementation of marketing and financial management training. The planning of the programme can run well if farmers are willing to commit and accept the changes that exist for the improvement and development of their farming business.

Acknowledgements

The author would like to express his gratitude to all parties who have helped and participated in this research. Especially to the Hasanuddin University, Faculty of Agriculture, and also

to the supervising lecturers who helped and guided me from the beginning through to the completion of this research.

References

Abonmai, T., Luikham, E., Kamwenu, K., & Giri, K. S. (2019). Influence of sowing time and integrated nitrogen management on growth and yield of local glutinous Maize (Zea mays L.). *International Journal of Current Microbiology and Applied Sciences* (IJCMAS)*, 8*(06), 2512–2518.

Al-Haboby, A., Breisinger, C., Debowicz, D., El-Hakim, A. H., Ferguson, J., Telleria, R., & Van Rheenen, T. (2016). The role of agriculture for economic development and gender in Iraq a computable general equilibrium model approach. *The Journal of Developing Areas*, 431–451.

Andikarya, O. (2021). Strategi pengembangan profesionalisme penyuluh dalam peningkatan mutu penyuluhan pertanian. *Composite: Jurnal Ilmu Pertanian*, *3*(2), 42–50.

Awwaliyah, N., Cikusin, Y., & Abidin, A. Z. (2020). Problematika petani dalam meningkatkan produktivitas pertanian. *Respon Publik*, *14*(4), 83–88.

Budi Rahayu. T. P. (2017). *Manajemen pemasaran.* Fakultas Peternakan, Universitas Udayana. https://simdos.unud.ac.id/uploads/file_pendidikan_1_dir/b58765ed9f677b462ec139088213ec99.pdf

Busthanul, N., Summase, I., Syafiuddin, M., Lumoindong, Y., Ali, M. S. S., Jamil, M. H., & Lukman, A. I. (2020). Adaptation strategies and social relations of highland farmer communities in Enrekang, South Sulawesi, Indonesia (case: Kaluppini Village). *IOP Conference Series: Earth and Environmental Science*, *575*(1), 12107.

Chen, S., & Gong, B. (2021). Response and adaptation of agriculture to climate change: Evidence from China. *Journal of Development Economics*, *148*, 102557.

Damanik, S. E. (2020). Agricultural ecology of irrigation systems and sustainable development in Simalungun region, Indonesia. *Utopía y Praxis Latinoamericana: Revista Internacional de Filosofía Iberoamericana y Teoría Social*, *1*, 272–281.

Hamdy, M. K. (2019). Theory of change and logical framework: A comparative measure for monitoring and evaluation practices. *EMPATI: Jurnal Ilmu Kesejahteraan Sosial*, *8*(1), 1–11.

Kementrian Pertanian. (2019). *Permasalahan, Tantangan dan Kebijakan Pembangunan Pertanian 2020-2021*.

Mazhar, S. A., Anjum, R., Anwar, A. I., & Khan, A. A. (2021). Methods of data collection: A fundamental tool of research. *Journal of Integrated Community Health (ISSN 2319-9113)*, *10*(1), 6–10.

Milyutkin, V., Sysoev, V., Trots, A., Guzhin, I., & Zhilzov, S. (2020). Technical and technological operations for the adaptation of agriculture to global warming conditions. *BIO Web of Conferences*, *17*, 75.

Mulyaningsih, A., Hubeis, A. V. S., Sadono, D., & Susanto, D. (2018). Partisipasi petani pada usahatani padi, jagung dan kedelai perspektif gender. *Jurnal Penyuluhan*, *14*(1), 145–158.

Nasrullah, N., Novita, A. D., & Yusmanizar, Y. (2020). Peningkatan keterampilan pengolahan penganan Jagung "*Pulut*" ibu-ibu petani Jagung di Kelurahan Manongkoki. *Warta LPM*, *23*(2), 141–150.

Ovharhe, O. J., Emaziye, P. O., Okpara, O., Agoda, S., & Benson, C. O. (2021). Strategies adopted by maize farmers to minimize post-harvest losses in Delta State, Nigeria. *International Journal of Agricultural Technology*, *17*(1), 237–256.

Panchenko, L., & Samovilova, N. (2020). Secondary data analysis in educational research: Opportunities for PhD students. *SHS Web of Conferences*, *75*, 4005.

Papachroni, A., & Lochrie, S. (2015). Case studies and data. In *Research Methods for Business & Management* (2nd ed., pp. 140–154). Oxford: Goodfellow Publisher Limited.

Qur'ania, A., Soemarno, S., & Afandhi, A. (2019). Prospective analysis of strategy for developing Local Salak production in Bilaporah Village, Madura Island. *The Indonesian Green Technology Journal*, *7*(3).

Raidimi, E. N., & Kabiti, H. M. (2019). A review of the role of agricultural extension and training in achieving sustainable food security: A case of South Africa. *South African Journal of Agricultural Extension*, *47*(3), 120–130.

Reinholz, D. L., & Andrews, T. C. (2020). Change theory and theory of change: What's the difference anyway? *International Journal of STEM Education*, *7*(1), 1–12.

Retief, F. P., Alberts, R. C., Roos, C., Cilliers, D. C., & Siebert, F. (2022). Identifying key risks to the performance of privately protected areas (PPAs) through theory of change (ToC). *Journal of Environmental Management*, *308*, 114575. https://doi.org/10.1016/j.jenvman.2022.114575

Teoli, D., Sanvictores, T., & An, J. (2019). SWOT analysis. In *StatPearls*. StatPearls Publishing.

Yatirajula, S. K., Kallakuri, S., Paslawar, S., Mukherjee, A., Khan, N. A., Thornicroft, G., & Maulik, P. K. (2022). Methodological adaptations to a theory of change model: Experiences from the ARTEMIS cluster randomized trial in India. *SSM - Mental Health*, *2*, 100149. https://doi.org/10.1016/j.ssmmh.2022.100149