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The Use of Agricultural Applied Technology, Information and Communication Technology in Forest Farmer Groups Panderman District Batu, Batu City

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Abstract

The Panderman Forest Farmers Group is one of the groups that has succeeded in becoming an example of an indigenous community that can use technology to advance itself. This article aims to determine the use of applied technology, information and communication technology in the panderman forest farmer group. Data were collected by conducting in-person observations, in-depth interviews, and group forums with key informants. Interviews were conducted with twentyfive respondents, namely fifteen members of the panderman forest farmer group, five members of village institutions and five employees of related government agencies. The processing of the interview results was carried out using the help of Atlas. Ti application version 9, and the interview was carried out using the help of a voice recording tool. Data was collected from February 2021 to October 2022. The results of the study show that the panderman forest farmer group has made good use of agroforestry technology. There are three leading commodities that are produced and processed using technology, namely eucalyptus (Melaleuca Leucadendra) which is processed into essential oil, porang (Amorphophallus muelleri) processed into meatballs, Bees (Anthophila) produces processed honey. Marketing is also carried out through the use of information and communication technology, namely through cellphones and internet networks that are marketed in e-commerce directly. The use of this technology is an illustration of the group's success in carrying out empowerment.

Keywords: *Forest Farmers Group; Technology; Forest.*

INTRODUCTION

The demands of industry 4.0 and the fast-paced development after Covid-19 make all activities in agriculture and forestry must also be fast-paced and demanded to develop rapidly. The many potentials it can develop in the forestry industry make people increasingly sure to have a good economy (Zahawi et al., 2020). Covid-19 has many good and bad impacts on agriculture and forestry; the explosion of this virus has become many innovation developments, especially in "Social Innovation", so that it can produce a variety of forestry social companies or forestry social enterprises (Mkono et al., 2022; Nicola et al., 2020; Qiu et al., 2020;

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Utomo et al., 2022). This study found that the covid outbreak and the demands of the community's economic needs resulted in social enterprises in the management field in land conservation areas and educational tourism. This business was born in forestry, enterprise, and society, which merged into 1 unit, according to figure 1:

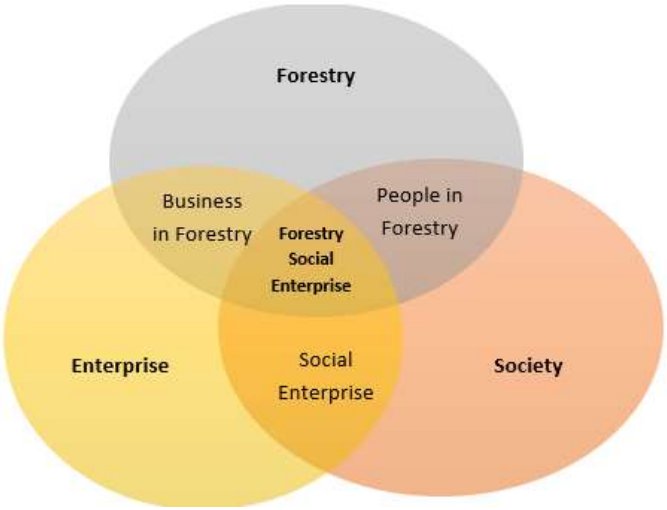


Figure 1. Melting down of Forestry Activities, Communities and Entrepreneurs

The land conservation model area and educational tourism have become social products of community innovation utilizing regional conditions after the covid-19 pandemic. Community activities during the post-covid-19 period are still the same as productivity activities before covid, only time restrictions that have been mutually agreed upon in different community environments as usual. This is due to restrictions on activities to prevent the transmission of covid-19 that endangers a person. Productive activities are activities that can make money or goods to ensure the family's survival. The emergence of government concerns restrictions on events in the form of new adaptations by the applicable provisions of the government.

The new adaptation era of productive activities has gradually recovered as before the Covid-19, although the allocation of work time has been reduced, people can carry out various productive activities in the new adaptation era so that they can meet their needs by using applicable health protocols. Community productive activities are carried out by applying existing technology in the community, both technology in the field of agroforestry and the field of ICT in managing AMKE Panderman. Using this technology, in addition to making it more accessible, also provides efficiency in implementation to accelerate production and marketing. Demands 4.0 amid post-covid-19 recovery (Akbar et al., 2021; Ciesielski et al., 2022; Omar, 2020; Ugochukwu, 2018; Utomo et al., 2022) require a focus on three industry things, namely (a) technology adoption plan, (b) strategic focus of digital transformation, (c) organizational focus of digital transformation.

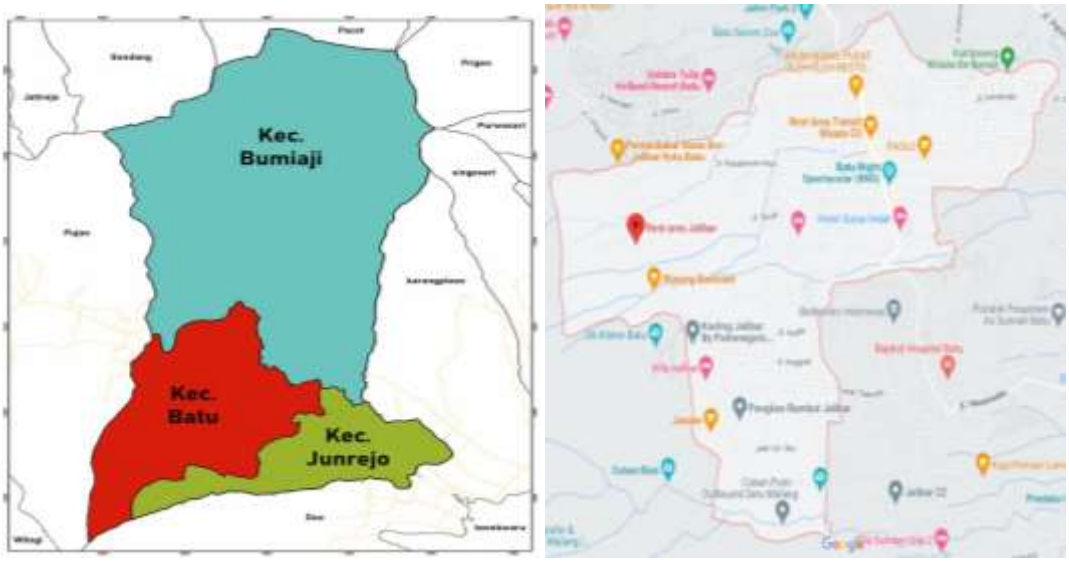
Technology adoption plan is an activity to compile a plan in implementing and developing an idea in the use and absorption of applied technology around the community that can facilitate work. Strategic

focus of digital transformation is a strategic effort that is compiled in transforming digital in all lines of community activities so that they are able to use digital-based technology in production activities. Organizational focus of digital transformation itself is the effort of a group or organization in an effort to focus digital transformation in every line of work carried out (Butkowski et al., 2020; Soliño et al., 2020).

METHOD

Location

The research was conducted at Panderman Farmer Forest Group in Oro-oro Ombo Village, Batu District, Batu City, East Java. The location was chosen intentionally or purposive sampling. The site selection is based on the fact that the research site is a protected area used for educational activities.



(a) (b)

Figure 1. (a) Map showing Batu City, (b) Oro-oro Ombo Village, Batu District Batu City East Java Province, Indonesia.

Questionnaire Design

The questionnaire is prepared based on a literature review related to this research. There are theories used in compiling questionnaires, namely the idea of ICT and Agroforestry (Amirtham & Joseph, 2011; Mohd Danuri et al., 2019; Walter et al., n.d.). Dissemination of questionnaires in digging data with in-depth interviews through enumerators using tools in the form of voice recorders. Interviews were conducted face-to-face with each designated informant in their respective homes to avoid crowds and obtain complete and in-depth data results. The questionnaire focuses on four community participation stages: planning, implementing, utilizing results and evaluating.

Tabel 1. Indicator, Operational Definitions, and Classification/Categories

Indicator	Operational Definitions	Sub Variables	Classification/ Categories
Agroforestry	The ability of the community to manage trees together with crops or livestock in one conservation area aims to be environmentally sustainable and as an educational tourism area through the use of technology.	1. Planting of tree seedlings and agricultural crops	1. Very capable of planting tree seedlings and agricultural crops (100% capable) 2. Able to plant tree seedlings and agricultural crops (75% capable) 3. Slightly able to plant tree seedlings and agricultural crops (50% capable) 4. Incapable of planting tree seedlings and agricultural crops (25% capable)
		2. Care of tree seedlings and agricultural crops	1. Very capable of caring for tree seedlings and agricultural crops (100% capable) 2. Able to care for tree seedlings and agricultural crops (75% capable) 3. Slightly able to care for tree seedlings and agricultural crops (50% capable) 4. Incapable of caring for tree seedlings and agricultural crops (25% capable)
		3. Harvesting trees and agricultural crops	1. Very capable of harvesting trees and agricultural crops (100% capable) 2. Able to harvest trees and agricultural crops (75% capable) 3. Few able to harvest trees and agricultural crops (50% capable) 4. Incapable of harvesting trees

			and agricultural crops (25% capable)
		4. Livestock care and cattle harvesting	1. Very capable of livestock care and livestock harvesting (100% capable) 2. Able to care for livestock and harvest livestock (75% capable) 3. Slightly capable of livestock care and cattle harvesting (50% capable) 4. Incapable of livestock care and livestock harvesting (25% capable)
ICT	Technology used by the community includes technical equipment (communication , tools, activities) used to process and convey information in the management of conservation areas and educational tourism	1. Use of the application with the Internet	1. Very high usage app with internet (100% high) 2. High usage of applications with internet (75% high) 3. Little use of the app with internet (50% moderate) 4. No app usage with internet (low 25%)
		2. Use of modern internet-based tools	1. Very high use of modern internet-based tools (100% high) 2. High usage of modern internet-based tools (75% high) 3. Little use of modern internet-based tools (50% moderate) 4. No use of modern internet-based tools (low 25%)
		3. Use of communication media as a tool	1. Very high level of communication media as an auxiliary tool (100% high) 2. High use of high level of communication media as an

			auxiliary tool (75% high) 3. Slight use of high-level communication media as an auxiliary tool (50% moderate) 4. No use of communication media levels as aids (25% low)

Sampling and Data Collection

In determining informants in this study. That is, through snowball method sampling. Therefore, the researchers first interviewed one of the informants for her 33% percentage of community members in community-strengthening activities. Moreover, according to previous whistleblower recommendations Nazir (2014) relevant to this study, it will continue to increase until it is determined that 30 whistleblowers have been interviewed as key informants. It consisted of formal and informal community leaders, village officials, Forest Farmers Group (KTH) managers, Karang Taruna managers and Batu City Forestry Director. As a good source for obtaining information from key informants, the following three phases are performed:

1. Selection of preliminary information on the research focus.
2. Select advanced informants to enrich the description of information and track variations of information that may exist.
3. Select advanced informants only when there is new information. In addition to critical informants, supporting informants are also used in this study to support research data. Supporting informants come from tourism departments, forest departments, universities and educational institutions/schools involved in conservation and education area management activities at KTH Punderman. There is one supporting information provider at a time. The data collection techniques used in this study were primary and secondary data collection.

Data Analysis

The qualitative data analysis processing technique used in this study is the analytical technique using Atlas.ti application version 9. In Atlas.ti, analyzed data sources can be divided into internal research data sources, external research data sources, and research records during the data collection and matrix framework. Additionally, Microsoft Excel 2010 is another application that simplifies data collection.

RESULT AND DISCUSSION

Agroforestation Technology in Management in Land Conservation Areas and Educational Tourism

Farming activities in conservation model areas and educational tourism have a new breakthrough. If usually the farmers carry out activities with only 1 one line of farming business, but the Panderman Teknologi Forest Farmer Group is able to manage their agricultural products into superior production using post-harvest technology. The Panderman Forest Farmers Group is one of the groups that has succeeded in reading the market share in the agro-industrial world, especially in the production of whitewood oil (eucalyptus). The demand for eucalyptus in Indonesia is very high, especially in the pharmaceutical world, the production of forest products has a market demand of 1,500 tons annually, where in Indonesia itself it is only able to meet the needs of 500 tons per year (Ghiffari, 2016). The use of forest products is certainly processed by forest farmer groups by converting raw materials from crops into semi-finished materials that can be sold in the form of oil. This production is certainly carried out through technology in the refining of eucalyptus oil.

The distillation carried out by the Panderman Forest Farmers Group uses the distillation method with a production time of 7-8 hours. The results of KTH Panderman's own laboratory test, pure eucalyptus oil produced from the distillation method has the main quality or super level with a content of 68% sineol and no mixed ingredients. These results when compared with the SNI 06-3954-2006 value standard regarding the character of eucalyptus essential oil are very good which can be seen in Table 2.

Table 2. KTH Panderman Eucalyptus Oil Production Results

Spesification	International Value/Content	Harvesting Results
Color	Clear to greenish-yellow	Clear to greenish-yellow
Smell	Typical eucalyptus	Typical eucalyptus
Breed Weights	0,900-0,930	0,930
Refractive Index	1,450-1,470	1,470
Solubility in ethanol 70%	1:1 to 1:10 Clear	1:10 Clear
Optical Spins	(-4°)-(0°)	(-3°)
Sineol content	50%-65%	68%

The production of the Forest Farmers Group using technology in the form of distillation resulted in the purification of 1.8 cineol compounds. According to Helfiansah, Sastrohamidjojo, & Riyanto (2013), Purifying eucalyptus essential oil with the compound 1.8 cineol until it reaches a minimum level of 85% can be obtained by two fractionation processes. The production of eucalyptus essential oil, in addition to being in the form of oil, is also processed by KTH Panderman as a food product in the form of sweets marketed through marketing technology in the form of e-commerce which can be seen in Figure 2:

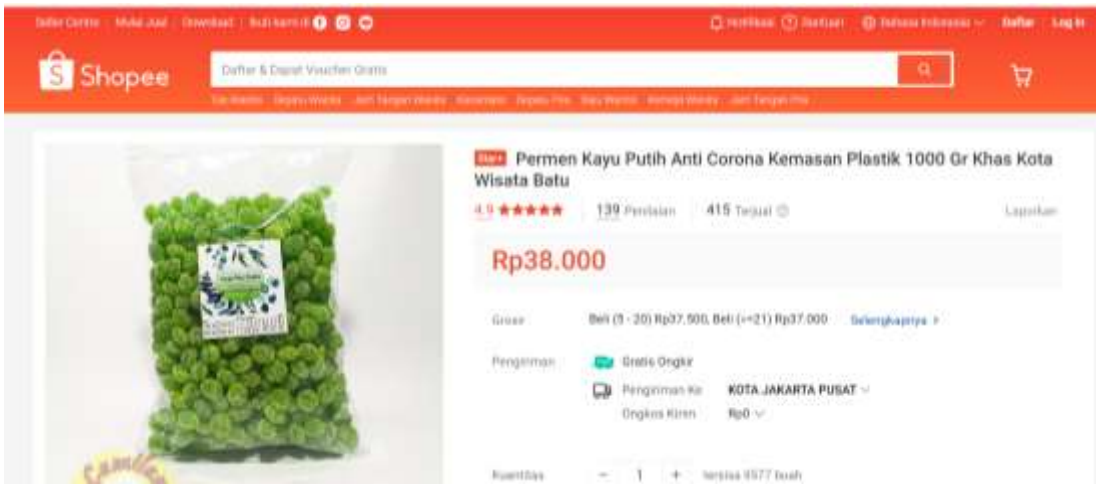


Figure 2. Processed Eucalyptus Candy Production Results

Group members carry out this eucalyptus utilization activity in maximizing the potential of forest areas with guidance from extension workers and assisted by the Batu City forestry and environment service. This is by the interview results of the Head of Batu City forestry and environment Service (51 years old):

"..... Panderman Forest Farmers Group has tremendous potential in managing forest wood products and forest agricultural products; usually, tree harvesting is carried out according to the group and function of the trees. If wood trees that are indeed used for timber production purposes, such as acacia and eucalyptus wood, will be harvested and replaced trees intentionally, while for trees whose purpose is to protect the soil and where water sources are not harvested, but the surrounding land is planted by horticultural crops that can produce in an intercropping system, such as chilli with acacia wood and porang with eucalyptus....."

Agroforestry technology carried out by the Panderman Forest Farmers Group is very complex. The sweet potato plant can be harvested after the stems have fallen and the leaves have dried. At that time, the glucomannan content was more significant than before the layover. The glucomannan content in plants at the beginning of growth is lower, which is used as an energy source for leaf growth. After the leaves experience maximum growth, glucomannan is no longer used in metabolic processes, accumulating in tubers until it reaches the dormancy phase (R. Sari & Suhartati, 2015). The porang cultivation of the Panderman Forest Farmers Group is carried out intensively, such as land processing for seeding and planting, plant maintenance and how harvest tubers. Plant seeds/seeds come from seeds, and seedbeds are prepared for seedlings when germinated are transferred to the seedbed. This porang cultivation activity is also carried out by farmer groups in such a way, according to the results of interviews with extension workers:

".....We plant porang and also adjust the characteristics of the seedlings to be harvested; the depth of the soil for planting is carried out according to the type of seed. If the seedling is a large bulbil, the planting depth is ±5 cm. If the seedling is a stem tuber with a weight of less than 200 g, the planting depth is ±10 cm, and if the weight of the tuber is

heavier, the planting depth is ±15 cm. Porang cultivation, can have a separation of land use or a rotating planting method is carried out on available land, namely land for separate nurseries with land for production so that it can be harvested regularly continuously ....."

The harvest of porang plants in the Panderman Forest Farmers Group is used as meatballs that are processed through the flour and mixed with meat. This post-harvest processing technology is carried out by farmer groups directly and marketed through BUMDes Oro-oro Ombo Village. The processed porang meatballs are liked by people who travel to AMKE Panderman.

Figure 3. Simultaneous Porang Planting Activities and Processed Porang Meatballs

Processed porang meatballs are one of the superior products in Oro-Oro Ombo Village. The use of processing using food technology is one of the group's creativity so that it can increase the selling value of local products for the use of food technology through scavenging techniques using disc mills (holding machines), ball mills, and separation using fractionation of compound separation based on specific gravity. At this stage, calcium oxalate and other impurities will be removed by exhaling through the tool to get pure porang flour which can be processed into meatballs. The content of the Nutritional Adequacy Rate (NAR) of meatballs created by the Panderman Forest Farmer Group can be seen in Table 3.

Table 3. Nutritional Adequacy Rate (NAR)

Nutritional Value Information		
Serving size 1 pack (75 gr)		
Number of servings per package :1		
Quantity per serving		
Total energy 308.75 kcal	Energy of fat 46.27 Kcal	
		%AKG*
Protein	5.67 g	7.53%
Fat	5.53 g	12.3%
Carbohydrates	8.42 g	2.54%
Calcium Oxalate	0.65 g	
*% NAR based on total energy requirement of 2000 kcal		

Based on the Nutritional Adequacy Figure above, it can be concluded that the Forest Farmer Group can utilize their forest products and is processed using sophisticated processing technology to produce ready-to-eat products with good nutritional fulfilment. In addition to porang, the Panderman Forest Farmers Group also develops honey bee

cultivation. This cultivation helps provide productive assets at the family level of forest farmers. As a result of this productive asset, families in forest farming groups can easily earn additional income in the family economy. The contribution of forest farmers' income from bee farming can reach 21.68% of the total farm income. This means that cultivating honey bees is an alternative to generate an addition to the income of the farmer's family. (Rahmayanti, 2020). Of course, the Batu City Forestry Service and various other policymakers are also reviewing the potential of this honey bee in the Oro-oro Ombo Area.

In order to increase added value to the honey harvest, the Forest Farmer Group utilizes information technology to help its sales by providing barcodes. This barcode guarantees the authenticity of honey products and then carries out digital marketing and packaging technology, namely induction sealers. *Induction sealer* is a technology with a heat induction system for sealing bottles to produce tightly sealed product packaging, and the product is airtight. The working principle of this induction sealer is that the heat delivered by the induction machine targets heating the aluminium foil in the bottle opening so that the aluminium foil can stick to the bottle opening so that the honey product packaging can be sealed tightly and airtight.

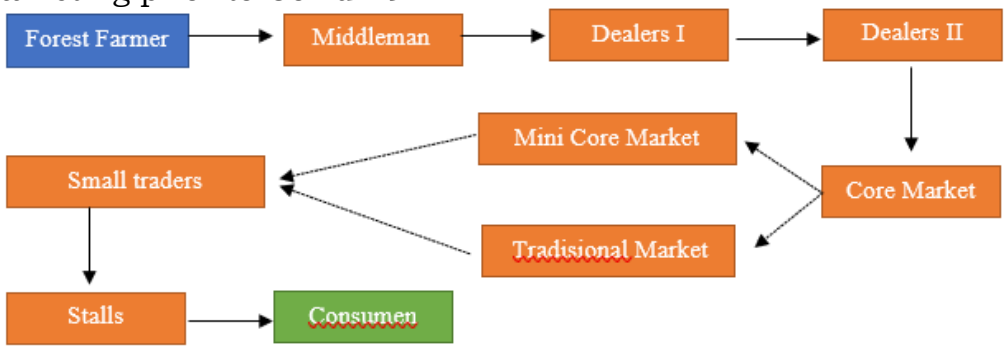
Figure 4. Product Results from Agroforestry Activities Honey and Hanging Essential Oil

Information and Communication Technology in Management in Land Conservation Areas and Educational Tourism

The Covid-19 pandemic last year turned out to be increasingly gaining the insights of Panderman forest farmers on the importance of using ICT in activities that support their production. During Covid-19, regional restrictions and rules that limit their trade movements have become a challenge because so far agricultural products have always been sold directly with the market or called bussinees to market. Covid poses various risks for forest farming families, namely the lack of institutional activities of forest farmer groups, a decrease in income at the family level of forest farmers, and increasing disruption to the existence of forest sustainability. Panderman Forest Farmers Group first step in reducing social, economic, and ecological impacts during the Covid-19 pandemic is to maximize ICT to facilitate their business

activities. The difference between marketing before covid-19 and after covid-19 in the Panderman Forest Farmer Group can be seen in Figure 5.

(a) Marketing prior to Covid-19



(b) Marketing after Covid-19

Figure 5. Differences in the Marketing System of the Panderman Forest Farmer Group

When viewed from the differences in the marketing system, it looks better marketing after the covid 19 outbreak and after covid 19. Forest Farmers can break such a long and detrimental market chain. The market chain expected so far by forest farmers can be felt so that it has a good impact on product sales. The production process in the picture cuts middlemen and dealers directly so that the production process can reach consumers directly. In the same production system, marketing activities using ICT only involve three transaction actors, namely forest farmers, e-commerce and consumers. This is by the statement of the interview with Mr D (44 Years Old):

"... The sales process at KTH Panderman during Covid-19 until now has yet to go through middlemen, so I provide a low price and fast and safe obtaining this product. Since launching on Instagram, Shopee, and WA, my business has delivered directly to consumers' homes and through delivery services. When launching, it was a time of change from selling to the market to selling using technology. Consumers at the housewife level do not want to be complicated and want to click click....."

Covid-19 turned out to bring about a significant change. The changes that lead to work effectiveness and efficiency colour these changes. This influence can be seen from the increasing popularity of electronic commerce or e-commerce, which combines one business with another (business to business) and combines business with customers or customers (business to customers). This process is often called "business to customer". Business-to-customer applications are part of the Electronic Commerce (e-commerce) marketing system. E-Commerce is one of the internet functions as a means of business for information

providers. Many developing companies are applying e-commerce services because they are considered very profitable and more effective in terms of time and energy. The Panderman Forest Farmers Group was good at reading the occasion to use ICT as a sales medium.

The use of e-commerce not only opens up opportunities for large and medium-sized and small-scale companies such as the Panderman Forest Farmers Group to become an option for consumers because e-commerce can meet only needs but also sells to consumers who were initially unreachable and can now be reached or as a form of market expansion. The use of e-commerce helps support consumer transactions across islands or countries. Consumers can access the web owned by e-commerce with a broader distance scope and make purchase transactions. The ability of consumers to currently support transactions that can be carried out from an infinite distance makes the market owned by the Forest Farmers Group even wider.

Market expansion is possible with e-commerce in terms of cost. Forest Farmer Groups no longer need to build shops in markets that were initially unaffordable. The web can be used as a substitute by continuing to make transactions even though it does not have significant funds for investment in physical form because it is much cheaper than for the provision of stores physically. This capability is more likely for the Panderman Forest Farmers Group to expand the market. The benefits to market expansion are also possible due to the potential to cut distribution channels. The use of the internet makes Forest Farmer Groups sell products to other companies or to end consumers. The potential to cut distribution channels brings support to expand the market by setting lower prices for the end consumer. This is because it does not involve many levels or processes in distribution that want to make more profit by raising the selling price to consumers, but directly from the company to the final consumer.

Table 4. Information and Communication Technology

No	Activities	Value (%)	Category classification
1	Use of the application with the Internet	100	Very high usage of the application with the internet
2	Use of modern internet-based tools	75	High usage of modern internet-based tools
3	Use of communication media as a tool	100	Very high use of communication media as a tool

From the table, it can be seen that most farmers have access to the Application on smartphones using the internet. If you look at the value of access to the internet in the Panderman Forest Farmer Group, reaching 100% of the total information interviewed, this shows that ICT in forest farmers is one of the critical aspects. This access is higher than smartphone ownership by residents in rural areas at the national level, which only reaches 73.7%. The ownership of smartphones in farming

families in villages is advantageous because, in addition to being used to access cyber information (internet), the primary function of smartphones is also as a two-way audio communication tool, namely a mobile phone. By having a smartphone, farmers not only have ICT devices for internet access but also, at the same time, have mobile phones to communicate with others and can be used as a medium for online sales.

The use of agricultural applied technology in cultivation technology, yield processing and packaging is one of the skills or abilities of a group to increase economic yields from farming activities. In addition, the ability to use information and communication technology in an application and the internet also supports disseminating information about Panderman's Conservation and Education Model Areas and Products. The results of data processing using the Atlas Ti. The result obtained the application that the word "technology" occupies the most significant percentage in community activities at 29%, followed by the word "community" at 10%, so it can be concluded that the community is very close in using technology upstream and downstream. This technology has become the primary need of the community in carrying out activities in managing the Panderman Conservation and Education Model Area. The results of the processing of Atlas.Ti can be seen in Figure 6 and Figure 7:

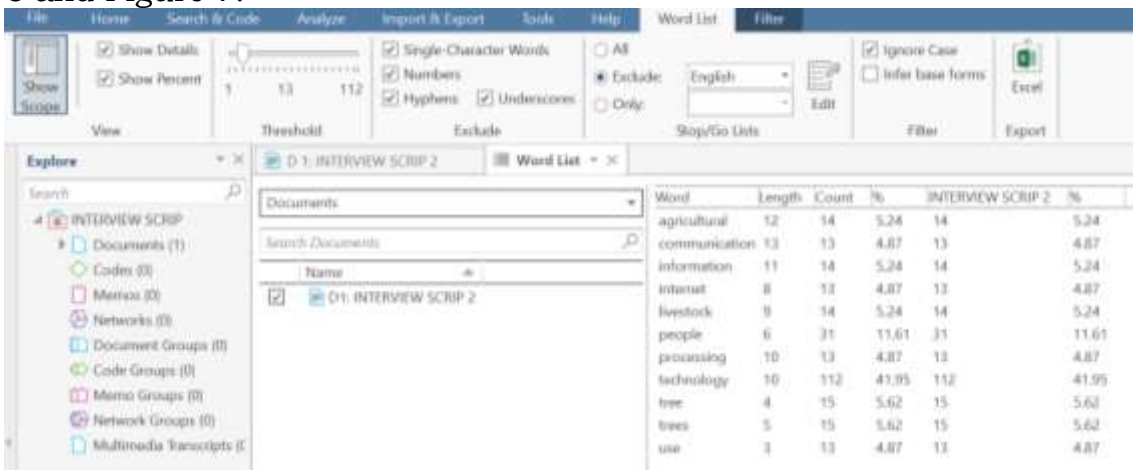


Figure 6. Wordlist Results Using Agricultural Applied Technology, Information and Communication Technology

Figure 7. Wordcloud Results Using Agricultural Applied Technology, Information and Communication Technology

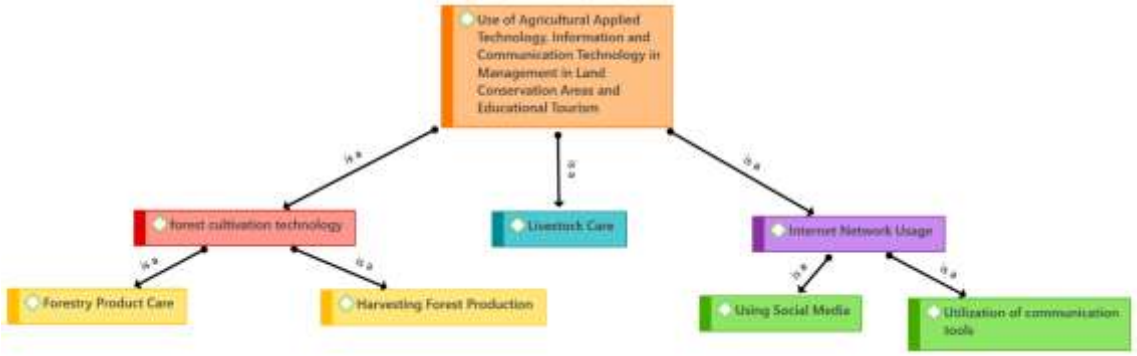


Figure 8. Networking Results Using Agricultural Applied Technology, Information and Communication Technology

If you look at the networking results, it can be seen that there are 3 activities carried out by Panderman Forest Farmers Group in utilizing ICT in it, namely forestry cultivation technology, livestock care and the use of internet networks. When viewed in Figure 8, the results of the networking interview resulted in a conclusion that the use of technology is not limited to one activity, there are 3 activities carried out using technology to facilitate work. The proximity of the Panderman Forest Farmer Group to technology is a form of progress in a group environment, because through technology it is able to increase turnover in a group (Berliana et al., 2020)

Ugochukwu (2018) stated that the success of a technology development will be more meaningful if all stakeholders have a contribution. These contributions include knowledge exchange, capacity building, technology transfer, extension services, and input output arrangements to minimize losses from product results by maximizing the variety of technologies. The Panderman Forest Farmer Group has been able to take part in activities to utilize various technologies. The three main activities that utilize this technology include the use of internet networks and ICT as a medium for product promotion and sales, the use of livestock cultivation technology in the form of forest bees, the use of livestock processing technology, agriculture and forestry, namely honey, porang tubers and eucalyptus.

The Forest Farmers Group is one of the actors who can properly collaborate technology with forestry and agriculture, so there is no need to open up new agricultural land by destroying forestry ecosystems. The value of group collaboration with this technology was an excellent step to avoiding conflicts in changing forestry land's function into agriculture. One of the factors underlying the occurrence of the match is the lack of access to land availability for the surrounding community. There is greater attention that the community can explore opportunities to cultivate land legally without destroying and converting forest functions into commercial agricultural land through appropriate technology (Nindyatmoko, Setyowati, & Haryanti, 2022).

Research in the Panderman Forest Farmer Group is an agent of change or pioneer farmer in the use of agroforestry technology. Technology in developing countries can make an advance, for example in Thailand, Buddhist farmers use a variety of agricultural technologies to

grow crops in forestry areas such as farming bananas in the forest (Penot, Thériez, Michel, Tongkaemkaew, & Chambon, 2022). The Panderman Forest Farmers Group also uses various types of technology such as eucalyptus planting to be harvested using yield processing technology to produce pure eucalyptus essential oil with good quality values according to industry standards. In addition, the processing of porang tubers into flour until they are processed into meatballs and marketed to broad consumers. In addition to forest and agricultural products, there are forest bee livestock products that are marketed as fresh honey products with a durable and durable packaging process.

Information and Communication Technology used by the Forest Farmers Group in the form of mobile phones as a means of communication, the internet as a network that connects data services, and e-commerce and social media are used as marketing and advertising media directly. The results of the use of agroforestry and ICT technologies can be seen in Table 5:

Table 5. Results of the Use of Agroforestry and ICT Technology

Types of commodities	Types of technology	Processing results	Types of marketing	Stuff
Eucalptus (*Eucalyptus*)	Distillation, Packaging	Essential Oils, Sweets	E-commerce in the form of Shopee	Handphone, PC
Porang (*Amorphophallus muelleri*)	Drying, scavenging, emulsification	Meatball	Directly and Open orders using social media in the form of Instagram and WhatsApp	Handphone
Bumblebee (*Anthophila*)	Electroosmosis, packaging	Pure honey	E-commerce in the form of Shopee	Handphone, PC

The results of natural resources and the use of technology in the Panderman Forest Farmers Group are one of the proofs that the group has the strength to be empowered and able to produce a superior product, of course, using a modern marketing technology. The existence of strength in the group and technology finally makes a modern agricultural environment in a fast-paced world. The empowerment of a group can be determined by the successful use of technology to make the group advanced and superior.

CONCLUSION

The ability to use information and communication technology in an application and the internet also supports disseminating information about Panderman's Conservation and Education Model Areas and Products. The results of the processing of Atlas.Ti that the word "technology" occupies the most significant percentage in community activities at 29%. KTH Panderman utilizes ICT, namely forestry

cultivation technology, livestock care and internet networks. The proximity of the Panderman Forest Farmer Group to technology is a form of progress in a group environment. Technology can increase turnover in a group. The success of technology development will be more meaningful if all stakeholders contribute. The Panderman Forest Farmer Group has participated in activities utilizing various technologies. The Forest Farmers Group is one of the actors who can properly collaborate technology with forestry and agriculture, so there is no need to open up new agricultural land by destroying forestry ecosystems. Research in the Panderman Forest Farmer Group is an agent of change or pioneer farmer in the use of agroforestry technology. KTH Panderman's use of agroforestry and ICT technologies. The results of natural resources and the use of technology in the Panderman Forest Farmers Group prove that the group has the strength to be empowered and able to produce a superior product using modern marketing techniques. The empowerment of a group can be determined by the successful use of technology to make the group advanced and superior.

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REFERENCES

Akbar, I., Myrzaliyeva, Z. K., Tazhekova, A. Z., Saulembayev, A. T., & Kenzhebay, R. N. (2021). Evaluation of the community-based ecotourism development status in the Aksu-Jabagly nature reserve, Kazakhstan. *Geojournal of Tourism and Geosites*, *35*(2), 381–389. https://doi.org/10.30892/gtg.35216-662

Amirtham, T., & Joseph, M. J. (2011). ICT and life long learning pedagogy for development and empowerment: An illustration from farmers in India. *Journal of Technology in Human Services*, *29*(1), 49–63. https://doi.org/10.1080/15228835.2011.562658

Butkowski, O. K., Baum, C. M., Pakseresht, A., Bröring, S., & Lagerkvist, C. J. (2020). Examining the social acceptance of genetically modified bioenergy in Germany: Labels, information valence, corporate actors, and consumer decisions. *Energy Research and Social Science*, *60*(October 2019), 101308. https://doi.org/10.1016/j.erss.2019.101308

Ciesielski, M., Tkaczyk, M., Hycza, T., & Taczanowska, K. (2022). Was it really different? COVID-19-pandemic period in long-term recreation monitoring – A case study from Polish forests. *Journal of Outdoor Recreation and Tourism*, *July 2021*. https://doi.org/10.1016/j.jort.2022.100495

Ghiffari, R. A. (2016). Development of Eucalyptus Oil Agro-industries in Kabupaten Buru. *Procedia - Social and Behavioral Sciences*, *227*(November 2015), 815–823.

https://doi.org/10.1016/j.sbspro.2016.06.150

Mkono, M., Hughes, K., & McKercher, B. (2022). Does the environment matter in the 'new normal'? *Annals of Tourism Research Empirical Insights*, *3*(2), 2021–2023. https://doi.org/10.1016/j.annale.2022.100060

Mohd Danuri, M. S. N., Shahibi, M. S., & Abdul Kadir, M. R. (2019). Transforming smallholder farmers business towards agribusiness: A framework using ICT. *Pertanika Journal of Social Sciences and Humanities*, *27*(3), 1635–1658.

Nazir, M. (2014). *Metode Penelitian* (R. F. Sikumbang (ed.); kesembilan). Ghalia Indonesia.

Nicola, M., Alsafi, Z., Sohrabi, C., Kerwan, A., Al-Jabir, A., Iosifidis, C., Agha, M., & Agha, R. (2020). The socio-economic implications of the coronavirus pandemic (COVID-19): A review. In *International Journal of Surgery* (Vol. 78). IJS Publishing Group Ltd. https://doi.org/10.1016/j.ijsu.2020.04.018

Omar, S. S. (2020). Impact of pandemic crisis : COVID-19 on food safety knowledge , attitudes and practices among food workers in Jordan. *EurAsian Journal of Biosciences*, *14*(May), 3581–3586.

Qiu, R. T. R., Park, J., Li, S. N., & Song, H. (2020). Social costs of tourism during the COVID-19 pandemic. *Annals of Tourism Research*, *84*(June), 102994. https://doi.org/10.1016/j.annals.2020.102994

Soliño, M., Alía, R., & Agúndez, D. (2020). Citizens' preferences for research programs on forest genetic resources: A case applied to Pinus pinaster Ait. in Spain. *Forest Policy and Economics*, *118*(October 2019), 102255. https://doi.org/10.1016/j.forpol.2020.102255

Ugochukwu, A. (2018). *From Agriscience to Agribusiness* (Issue January). https://doi.org/10.1007/978-3-319-67958-7

Utomo, M. M. B., Sudomo, A., Pieter, L. A. G., Maharani, D., Swestiani, D., Siagian, C. M., Fambayun, R. A., Perdana, A., & Roshetko, J. M. (2022). COVID-19 Pandemic: Impacts, Craftsmen's Living Strategies, and Economic Recovery of Bamboo Handicraft Enterprise in Gunungkidul, Indonesia. *Forest and Society*, *6*(2), 620–638. https://doi.org/10.24259/fs.v6i2.20599

Walter, D., Thanks, S., Kennedy, M., & Nrcs, M. (n.d.). *Silvopasture Defined Historical Context Components of Success◦ Livestock husbandry◦ Pasture management ◦ Forest management Integrating the Components Planning and Monitoring*.

Zahawi, R. A., Reid, J. L., & Fagan, M. E. (2020). Potential impacts of COVID-19 on tropical forest recovery. *Biotropica*, *52*(5), 803–807. https://doi.org/10.1111/btp.12851