

Empowerment of Vocational Education Islamic Schools Through Smart Marketing and Animal Husbandry Goat Iot Based: Approach International Community Service

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Abstract

The growing demand for health-oriented functional foods has positioned goat milk agribusiness as a promising sector in developing countries. However, its potential is constrained by low production efficiency, limited technology adoption, and restricted market access. This study addresses these challenges through a community service initiative integrating smart marketing, Internet of Things (IoT)-based goat farming, and value-added processing technologies within an Islamic boarding school ecosystem. Using a Participatory Action Research (PAR) approach, the initiative was conducted at Pondok Al-Faruqi Islamic Boarding School involving students, educators, farmers, and industry stakeholders. Interventions included an international talk show, prototype testing of IoT-based livestock monitoring systems, and demonstrations of goat milk pasteurization technology. Data were collected through participatory observation, interactive sessions, and participant feedback. The findings indicate improvements in participants' digital marketing literacy, technological awareness, and readiness to adopt innovation. IoT-based systems enabled real-time monitoring of livestock growth, health, and productivity, while pasteurization improved product quality, safety, and marketability. Smart marketing further supported branding, targeted segmentation, and expanded market reach, strengthening community economic capacity and sustainable agribusiness practices. The study proposes the "Smart Technology-Based Agro-Education Empowerment Model," integrating education, technology, and community empowerment. This model extends the practical convergence of Sustainability, Competitive Advantage, and Disruptive Innovation in community-based development. Despite its localized scope and qualitative nature, the study offers scalable insights for similar educational and rural settings and highlights the need for future quantitative and longitudinal assessment.

Keywords: Community engagement; IoT; goat farming; smart marketing; sustainability; empowerment

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INTRODUCTION

Background Activity This based on needs improvement capacity marketing digital-based in institutions education vocational and Islam, besides implementation in MSME businesses. In addition, it is necessary advocacy literacy to students and related communities integration innovation technology like Internet of Things (IoT) in development farm goat as well as goat milk processing as form empowerment economy based public.

Activity this also contributes to achievement Sustainable Development Goals (SDGs), especially in the aspect of work worth and growth economy, industry innovation, as well as responsible consumption and production.

Activity devotion public This motivated by the increasing request to product food Healthy as well as development potential goat milk agribusiness in the middle progress digital technology. Although thus, there are gap between available opportunities with capacity perpetrator business, which is characterized by low efficiency production, limitations market access, as well as lack of adoption modern marketing technology and strategies. To analyze condition said, research This use framework theoretical which includes sustainability, competitive advantage, and disruptive innovation. Third approach This give understanding that sustainability effort, power competitive, and transformation innovative is factor key in development modern agribusiness (Elkington, 2013), (Suhardjo et al., 2025), (Porter & Canada, n.d.), (C. Christensen, 1990). As response to problem mentioned, this PKM activity

implements approach participatory action research (PAR) combined with intervention technology IoT-based, introduction tool pasteurization, as well as education smart marketing through international forums. This integration aims for increase capacity breeders, encourage adoption innovation, as well as creating a sustainable and competitive empowerment model.

Increasing request to food functional oriented health push development goat milk industry as agribusiness prospective in developing countries. This is triggered by a shift preference consumer to more products healthy and easy digested as well as increasing awareness will sustainability system food (Rahmawati et al., 2025). In sustainability context, goat milk business own potential for create value on three dimensions main, namely efficiency environment through use source relative power lower compared to cattle big, empowerment social through improvement welfare breeders scale small, and sustainability economy through diversification product worth plus.

However Thus, various findings empirical show that perpetrator goat milk business Still face constraint significant structural, such as low efficiency production, high cost operational, as well as limitations in increase scale business (Hutahuruk et al., 2026). Conditions This impact straight to the weak formation Competitive Advantage, where the actor business difficulty create differentiation product and efficiency ongoing costs. As a result, although own large market potential, industry This Not yet fully capable compete optimally with conventional dairy products and alternative based vegetable.

Approach Disruptive Innovation become relevant as a transformation strategy sector (CM Christensen, n.d.). Technology integration like Internet of Things (IoT) in health and growth monitoring livestock, as well as innovation in system distribution and processing like modern pasteurization, potentially changing business models traditional become more efficient, adaptive, and data-based (Junaedi, 2025). In general, innovation This No only open opportunity the creation of new markets, but also allows perpetrator business scale small for increase Power competition through efficiency operational and improvement quality product. Therefore that, synergy between sustainability, disruptive innovation, and competitive advantage become key in push transformation goat milk industry going to system more agribusiness resilient and sustainable.

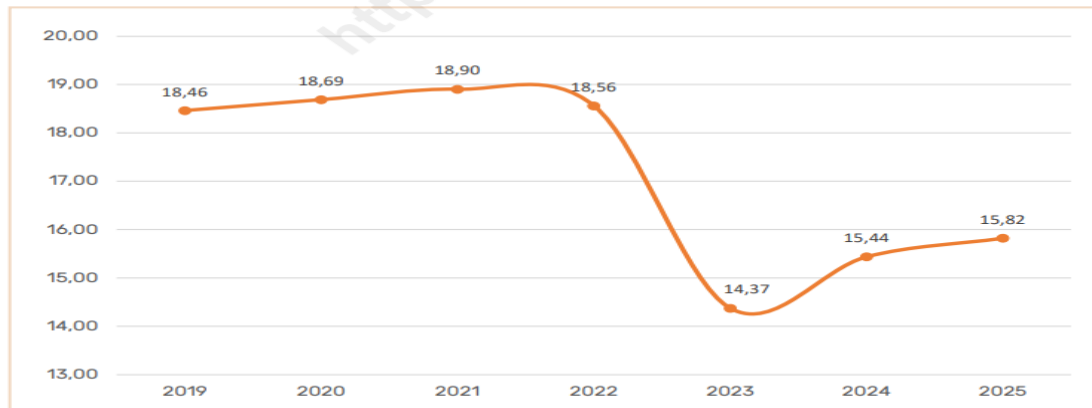
As a historical data overview Can seen, where population goats in Indonesia in the period 2019–2025 shows fluctuating dynamics. In 2019–2021, the population experience improvement from 18.46 million to 18.90 million heads with relative growth stable. However, in 2022 it started happen decline to 18.56 million heads, which then continue in a way significant in 2023 to reached 14.37 million heads or down drastic by 22.58 percent.

After decline sharp said, the population goat returned experience recovery in 2024 to 15.44 million tail and increase again in 2025 to 15.82 million heads. Although thus, the number population the Still be under level population in the period before decline, namely 2019–2022.

Population overview goats in Indonesia become paradox in development agro industry farm specifically farm goats in Indonesia, which have ray sun almost throughout day and have fertility very good soil conditions. This becomes concerns and needs strengthening vocational and introduction education related literacy livestock and agriculture specifically development goat milk farm to generation youth and society wide. Change paradigm farm traditional become modern livestock farming based on technology, disruption innovation with adaptation sustainable business and agro-industry.

It's sad in Indonesia, where Still import the same commodity with more volume large. Import volume milk commodities are the highest compared to with commodities import farm others. The average import volume of milk and milk cream in 2024 reached 28,280.61 tons per month, and the import volume highest in August it reached 35,884.06 tons (BPS, 2026).

Figure 1. Graph Development Population Goats in Indonesia 2019-2025 Period



Sumber: Badan Pusat Statistik, Sensus Pertanian 2023 dan Kementerian Pertanian (Direktorat Jenderal Peternakan dan Kesehatan Hewan)

Activity devotion public This designed for answer challenge the through:

- 1) Implementation smart marketing in education.
- 2) Development farm goat IoT-based.
- 3) Innovation goat milk processing through pasteurization.

As effort improvement quality and value plus product results livestock, activities devotion to community in Pondok Al-Faruqi Islamic Boarding School also includes public tests tool pasteurization of goat milk. Activities This aim for introduce technology capable milk processing increase security food, extending shelf life, and guard quality goat milk nutrition to remain optimal.

Pasteurization equipment introduced Work with principle heating at temperature and time certain for kill microorganisms pathogen without damage content nutrition main in milk. In demonstrations conducted, participants given understanding regarding the proper pasteurization process, starting from stage fresh milk collection, processing thermal, up to storage post-production. Approach This emphasize importance standard hygiene and control quality in chain goat milk production.

In a way empirical, activities This give impact positive to improvement knowledge participant related processing safe and quality dairy products. Before activities, some big breeders Still depend on method traditional with level risk relative contamination high. After introduced with technology pasteurization, participants show improvement understanding to importance security food (food safety) and potential development product processed based on goat's milk which has power sell higher.

In perspective theoretical, application technology pasteurization This contribute to creation of competitive advantage through improvement quality product and market differentiation. Goat milk products that have been through the pasteurization process own mark plus in matter security, power resistant, and standard quality, so that capable compete with other dairy products on the market that are more extensive. In addition, technology this also supports principle sustainability, in particular in aspect economic and social, with open opportunity business new as well as increase income breeders through diversification product.

More further integration technology processing This with system farm IoT-based which has introduced previously create something ecosystem more agribusiness integrated, starting from production until processing and distribution. This show that innovation No only occurs at the stage upstream (production), but also at the stage downstream (processing), so that produce more systems efficient and powerful competition tall.

Thus, the tool testing activity pasteurization This No only functioning as technology transfer, but also as an empowerment strategy economically based mark plus product. It is hoped that through

adoption technology this, farmer capable increase quality products, expanding market access, as well as strengthen position they in chain mark goat milk agribusiness.

This program packed in form International Talkshow featuring practitioners international and public testing prototype technology.

Contribution study This includes: First, developing an integration model education and technology in context vocational and Islamic boarding schools through approach applicable based digital technology and practice field, so that strengthen role institution education community as center innovation and incubation bridging entrepreneurship need industry.

Second, research This implement innovation smart farming-based Internet of Things (IoT) for increase efficiency and productivity farm goat through real-time monitoring, accurate data management, and taking decision-based evidence, which at the same time reflect the role of Disruptive Innovation in transformation agribusiness.

Third, research This developing an empowerment model public based Islamic boarding school with approach Participatory Action Research (PAR), which encourages participation active and learning collaborative, as well as contribute to sustainability and the formation of Competitive Advantage through improvement capacity source Power humans and differentiation product-based mark local. In overall, research This offer something framework integrative that combines education, technology, and empowerment public in an applicable and sustainable model. Contribution This expected can become reference for development of community service programs communities in various context, in particular in push transformation agribusiness-based community going to more systems innovative, competitive, and sustainable.

Study education in the sector agribusiness and animal husbandry cow milk important for improvement capacity through training vocational education in the next generation young, outreach program to society and education entrepreneurship. Experts have an opinion that effective education can increase efficiency production, quality products, and retrieval decision business among large-scale milk producers farmer (Hutahuruk et al., 2026).

LITERATURE REVIEW

Community Service and Knowledge Transfer. Devotion modern society emphasizes the approach participatory and knowledge transfer involving public as subject active. Devotion to public is one of the main pillars in three pillars college functional height as a dissemination medium knowledge knowledge from academics to society. In modern perspective, activities This No Again understood just as activity social, but rather as a knowledge transfer process that is structured and oriented towards empowerment. Knowledge transfer includes the process of distribution, adaptation and utilization knowledge from source academic to users end, so that produce change behavior, improvement capacity, as well as innovation at the community level (Lutfiyah, 2025).

Smart Marketing in Education. In frame increase Power competitiveness and sustainability business based Islamic boarding school, activities devotion to community in Pondok Al-Faruqi Islamic Boarding School adopt approach smart marketing as a marketing strategy digital-based (Irawati, 2025). Approach This designed for answer challenge limitations market access and low visibility products that have been This faced by the perpetrator business, especially in sector goat milk agribusiness (Rahmawati et al., 2025).

In a way conceptual, smart marketing applied in activity This covers three component main, namely digital branding, social media utilization, and market segmentation.

Digital Branding. In the digital branding aspect, participants equipped understanding about importance build identity strong and consistent products through brand name selection, visual design, and narrative that emphasizes mark superior like health and authenticity of goat's milk, so that capable form perception consumers and increase market confidence (AT Junaidi et al., 2024), (Anggraini, 2025). The importance of digital performance as factor mediating center connection between innovation blue, creation value, taking decisions, and sustainability (Renaldo et al., 2024).

Use of Social Media. In this aspect utilization of social media, activities This emphasize use of digital platforms as means efficient promotion with wider market reach area, where participants trained for manage content marketing, interacting with consumers, as well as utilise feature such as marketplace, live promotion, and analytics simple to evaluate effectiveness campaign (Manggopa, 2023), (AT Junaidi et al., 2024). Approach This allows perpetrator business for do marketing in a way more adaptive and responsive to market dynamics.

Market Segmentation. In this aspect market segmentation, participants equipped understanding about importance identify and analyze characteristics of target consumers. Goat milk products, for example, can positioned as product targeted health segment specific like individual with need nutrition special, children, or sensitive consumers towards cow's milk. With the right segmentation, marketing strategies can designed in a way more focused and effective so that increase opportunity success market penetration (Zohriah, 2023).

Internet of Things (IoT) in Farm. In a number of years lastly, the internet of things (IoT) is increasingly become focus main in various research. IoT is seen as part from future evolution of the internet that will covers billions device intelligent mutual connected and communicate. Development this leading to the formation of network integrated device in a way heterogeneous, which expands interaction between entity physical and virtual components. Through draft this, IoT provides ability new for various device connected for operate in a way more intelligent, adaptive, and efficient (Shancang Li, 2014), (Prayetno et al., 2026). IoT enables livestock monitoring in a way real-time, including:

Growth. Development the rapid growth of the Internet of Things (IoT) has allows transformation practice agriculture conventional become system intelligent and data-driven production (Prayetno et al., 2026). In frame increase efficiency and accuracy management farm goats, activities devotion to community in Pondok Al-Faruqi Islamic Boarding School develops and adopts approach-based Internet of Things (IoT) as part from transformation going to system smart farming technology this enables the livestock monitoring process done in a way real-time and data-driven, so that give convenience for breeders in do taking more decisions precise and responsive (Prayetno et al., 2026).

In a way operational, the IoT system introduced capable integrate various important parameters in management livestock farming, which includes aspect growth, health, and productivity livestock. In the aspect of growth, technology This allows monitoring development weight and condition physique goat in a way periodically through connected sensors with digital system. Generated data give a clearer picture accurate about performance growth livestock, so that breeders can do adjustment to pattern giving feed and management maintenance.

Health. In this aspect health, IoT systems play a role in detect condition physiological cattle in a way early, such as change temperature body, activities, and indication symptom disease. With the presence of system warning (early warning system), livestock breeders can do action preventive in a way fast, so that capable pressing risk distribution disease and reduce level mortality livestock. this is show that utilization technology No only increase efficiency, but also strengthens aspect biosecurity in farm (Prayetno et al., 2026).

Productivity. As for the aspect productivity, the use of IoT allows output measurement in more systematic, such as milk production, pattern consumption feed, as well as efficiency conversion feed become results production. This data becomes base important in evaluation performance business, at the same time as reference in increase scale and quality production in a way sustainable (Prayetno et al., 2026).

In perspective theoretical, application technology this in line with draft Disruptive Innovation, where digitalization capable transform practice farm traditional become a more modern and data-based system technology (C. Christensen, 1990). In addition, the use of IoT also contributes to achievement sustainability, in particular in improvement efficiency source power and productivity economy, as well as support formation Competitive Advantage through improvement quality and consistency results production (Suhardjo et al., 2025).

Thus, integration IoT technology in this PKM activity No only functioning as innovation technical, but also as instrument strategic in push transformation agribusiness farm goat going to more systems efficient, adaptive, and sustainable.

Sustainability and Empowerment. Approach sustainability in activity devotion to community activities carried out at the Pondok Al-Faruqi Islamic Boarding School was designed for ensure that interventions carried out No only give impact term short, but also capable create mark term long for community. Approach this referring to the principle sustainability that includes three dimensions main, namely aspect economic, social and environmental, which are interrelated integrated in support development agribusiness-based community (Suhardjo et al., 2025), (Elkington, 2013). Approach sustainability includes:

Economic Aspects. From the side economy, this PKM activity focused on improving mark add and power competition business farm goat through implementation modern marketing technology and strategies. Introduction system Internet of Things (IoT) based technology allows improvement efficiency production through monitoring health and growth cattle in real-time (Prayetno et al., 2026), (Shancang Li, 2014). In addition, the use of tool pasteurization of goat milk open opportunity diversification product with better quality standardized and have mark sell higher. Intervention This in a way direct contribute to improvement income breeders, strengthening capacity entrepreneurship, as well as expansion market access through smart marketing strategies. Thus, the activities this push creation independence economically based innovation (Suhardjo et al., 2025), (Elkington, 2013).

Social Aspects. In dimension social, this PKM activity emphasizes empowerment public through improvement capacity source Power humans and participation active in the learning process. Approach Participatory Action Research (PAR) allows breeders, students, and labor educator for involved in a way direct in identification problem, formulation solutions and implementation innovation. This process No only increase skills technical, but also strengthens the sense of ownership of the program being implemented. In addition, the activities like talk show international and public trials prototype participate push formation network collaborative between academics, practitioners, and other stakeholders. Impact social outcomes covers improvement literacy technology, change pattern think going to innovation, as well as strengthening solidarity community (Suhardjo et al., 2025), (Elkington, 2013).

Aspects Environment. From the perspective environment, this PKM activity contributes to management source more power efficient and sustainable in sector livestock farming. Utilization IoT technology helps breeders in optimize use feed and monitor condition cattle in a way more accurate, so that can reduce waste source power. In addition, the application of practice hygienic milk processing through Pasteurization also supports subtraction waste and improvement quality safe products consumed. In overall, approach This push practice more farms friendly environmentally friendly, efficient and responsible answer (Suhardjo et al., 2025), (Elkington, 2013).

Study interdisciplinary latest start explores relatedness between education, innovation agribusiness, and digital finance, which shows that framework learning integrated can increase performance economy and sustainability (Hutahuruk et al., 2026).

METHODS

Approach. Study This apply approach Participatory Action Research (PAR), which emphasizes involvement active breeders in all over stages of the research process. In context goat milk farming, approach This allows breeders for in a way participatory identify problems faced, formulating solution strategies, and implement various improvements that include aspect production, management feed, until marketing (Molise, 2024), (Yuanita, 2025). Through cycle reflection and continuous action, the PAR method does not only functions as tool solution problem, but also as means improvement capacity. In terms of empirical approach This proven capable strengthen skills technical breeders like practice hygienic milking and processing product based on goat's milk, as well as push improvement

independence economy through strengthening competence and decision-making decision based experience direct (MU Absor & M Anshori, 2025).

At this talk show, the speaker after to explain material, giving space and time to all over participant for ask and discuss and sharing. From the results interview to participants, in general participant interested with draft smart marketing, use technology such as IoT and the use of cellphones and laptops as digital monitoring tools on farms that are implemented.

Location. Cottage Al-Faruqi Islamic Boarding School, Kampar Regency, Riau, where management Cottage Al Faruqi Islamic Boarding School is managed by the Al-Ifkar Islamic Foundation. Islamic boarding school This Already a number of years stand namely April 22, 2016, also developed Entrepreneurship here. There are junior high and vocational schools in line with the santripreneur program, Al-Faruqi Vocational School was established on April 22, 2016, by decree of the Head of the Education & Culture Office. Kampar Regency No. 421 / P and K / 4119. VISION of the Pondok Al Faruqi Islamic Boarding School "The Realization of an Excellent, Cultured Islamic Educational Institution" Malay and Having an *Entrepreneurial Spirit as well as Insightful Environment "2025".

International Talk Show. Activity devotion to community in Pondok Al-Faruqi Islamic Boarding School started with organization International Talk Show themed "Smart Marketing Strategies for Vocational and Islamic Schools" which was designed as means of knowledge transfer at a time strengthening capacity source Power humans, in particular for students, educators, and actors business based Islamic boarding school in face challenges of the digital era.

Talk show present source person international, Willem Dresselhuys, who delivered material comprehensive regarding modern digital marketing strategies, including digital branding, data-based market segmentation, and social media optimization for increase Power competition institution education and business units Islamic boarding school. The approach used nature interactive, so that participant No only accept material in a way conceptual, but also active involved in discussion and reflection to condition real that they face it.

In a way empirical, activities This show improvement understanding participant to importance digital transformation in marketing, which is reflected from height participation in session discussion as well as ability participant in identify previous market opportunities Not yet utilized. In addition, talk shows This functioning as catalyst in grow awareness will importance integration between education vocational, entrepreneurship, and digital technology.

In perspective devotion community, activities this No only play a role as a dissemination medium knowledge, but also as instrument empowerment that encourages change pattern think from approach conventional going to a more approach adaptive, innovative, and based technology. Therefore that, activity This become foundation beginning in build ecosystem sustainable education and entrepreneurship in the environment Islamic boarding school.

Demonstration Technology. As part from strengthening capacity technology in sector agribusiness, activities devotion to community in Pondok Al-Faruqi Islamic Boarding School also held a public test prototype-based Internet of Things (IoT) for development farm goats. Activities This presented by Dr. Nicholas Renaldo and Dr. Jahrizal, who presented innovation technology to support system more modern, efficient, and data-driven farming.

The prototype introduced designed for monitor condition cattle in real-time, covering growth, health, and pattern consumption feed. System This utilizing integrated digital sensors and devices for collect data in a sustainable, which then can accessed and analyzed by farmers through application. Thus, taking decision No Again only depends on experience traditional, but also supported by more data accurate and measurable.

In a way empirical, implementation technology This give outlook new to participant about potential digital transformation in sector livestock farming. The response shown by livestock farmers and participants was very positive, especially related ability technology in increase efficiency production, pressing risk disease, as well as optimize growth livestock. In addition, innovation this also

opens opportunity improvement productivity and quality results livestock that has an impact directly on the increase mark economy business.

In perspective theoretical, application prototype This reflect draft Disruptive Innovation, where digital technology becomes driver transformation from system conventional going to more systems adaptive and based technology. On the other hand, the use of IoT also supports principle Sustainability, especially in increase efficiency utilization source power and welfare breeders through optimization production.

Thus, the prototype test This No only functioning as event demonstration technology, but also as an educational and empowerment medium that encourages adoption innovation at the level society. Integration between IoT technology and practices farm traditional expected become step strategic in build system more agribusiness competitive, sustainable and based knowledge.

Public Prototype Testing. Activity devotion to community in Pondok Al-Faruqi Islamic Boarding School also carries out public test prototype as stage crucial in the validation process at a time dissemination innovation technology to community. Activities This designed No only for introduce developed technology, but also for measure level reception user acceptance, in particular in context farm goat digital-based and goat milk processing.

Implementation of public testing involving various stakeholders interests, such as breeders, students, educators educators and practitioners who interact directly with prototype shown. The process is No only demonstrative, but also participatory, where participants given chance for observe, try, and give input related function, convenience uses and benefits technology in condition real.

In a way empirical, activities This show level high enthusiasm and participation. Most of the participant capable understand function base prototypes, both related with livestock monitoring system IoT-based as well as tool goat milk processing. Feed collected returns indicates that technology the relevant with need field, although still required development further, especially from aspect convenience use and accessibility.

In perspective academic, public test This represent approach evaluative in cycle innovation that is not only focus on development technology, but also on acceptance as well as adaptation by users end. This is in line with the concept of disruptive innovation, where success innovation is highly dependent on the level its adoption in society. In addition, this process also contributes in build competitive advantage through utilization bait come back users for improvement products to be more in accordance with market needs.

From the corner view sustainability, activities this support sustainability innovation through approach inclusive involving public in the development process. Approach the No only increase opportunity success implementation technology, but also strengthens the sense of ownership that encourages adoption term long.

Thus, public testing prototype in this PKM activity No just become stage testing technical, but also as means learning collaborative between developers and users. Integration between input field and development technology expected capable produce more innovation adaptive, applicable, and sustainable in support development agribusiness based Islamic boarding school.

Observation Participatory. As part from approach methodological based Participatory Action Research (PAR), activities devotion to community in Pondok Al-Faruqi Islamic Boarding School participate integrate observation participatory as method main. Approach This allows researchers for involved direct in activity participant at a time observe dynamics social, learning process, and response to various interventions provided during activity ongoing.

Implementation observation done in a way comprehensive throughout series of activities, start from international talk show, prototype test technology IoT based, up to demonstration tool pasteurization of goat milk. In in practice, researchers No only act as observer, but also as interacting facilitators active with participants, so that get greater understanding deep related behavior, perception, and level reception to innovations introduced.

In a way empirical, results observation show existence change significant in aspects cognitive and affective participants. From the side cognitive, occurs improvement understanding to draft digital marketing, technology farm IoT-based, as well as importance processing products that meet standard security food. Meanwhile that, from side affective, visible improvement motivation, enthusiasm, and openness to adoption technology new. Intense interaction between Participants and speakers also strengthen the learning process-based experience (experiential learning).

In perspective theoretical, observational participatory this plays a role in study the extent of the intervention carried out capable support sustainability principles, especially in the dimensions social through empowerment and improvement capacity society. In addition, the findings observation also provides outlook related potential formation competitive advantage, especially through improvement quality source Power humans and abilities adaptation to market dynamics.

Further, approach this also allows identification beginning towards the adoption process innovations introduced, which are relevant with draft disruptive innovation. Through interaction directly, can identified various factor supporters and inhibitor implementation technology, such as convenience usage, perception benefits, as well as readiness infrastructure at the level field.

Thus, observation participatory in this PKM activity No only functioning as method data collection, but also as means reflection for evaluate effectiveness intervention. The results become runway important in designing a more effective program development strategy adaptive, contextual, and sustainable in support empowerment public based innovation.

Participants. Participants present in activity This attended by $\pm$ 1000 participants consisting from:

- 1) Students Al Faruqi Islamic Boarding School and Students Islamic Boarding School from other schools
- 2) Teacher
- 3) Practitioner
- 4) Stakeholder
- 5) Sponsor

RESULT AND DISCUSSION

Implementation of Smart Marketing. Implementation results activity show that implementation smart marketing approach in Pondok Al-Faruqi Islamic Boarding School give impact real in increase capacity participant in understand modern digital marketing strategies. Participants No only get understanding in a way conceptual, but also capable identify and apply practice relevant marketing with context business based Islamic boarding school.

In a way more detailed, improvement understanding seen in three main aspect. First, in digital marketing strategy, participants understand importance utilization of digital platforms for reach consumer in a way more extensive and efficient. Second, in terms of institutional branding, participants start realize importance build identity strong effort through visual consistency, narrative, and values product. Third, in terms of market expansion, participants get outlook about opportunity expansion through social media and various online platforms.

Findings This indicates existence transformation pattern think from approach marketing traditional towards a more strategic adaptive and based technology, which is theoretical contribute to the formation of competitive advantage through differentiation as well as improvement visibility product.

Farm IoT Prototype Goat. Implementation prototype-based Internet of Things (IoT) in this PKM activity show impact positive in increase understanding participant to smart farming concept. Through experience directly, participants can understand utilization technology for monitor condition cattle in real-time, covering aspect growth, health, and productivity.

In a way empirical, participants show high interest to technology this, especially Because his abilities in increase efficiency production and minimize risk in management livestock farming. IoT is also perceived as solution innovative and capable overcome limitations approach traditional.

In perspective theoretical, findings This confirm role disruptive innovation as catalyst in transform system farm towards a more modern, adaptive, and data-driven model.

Technology Goat Milk Pasteurization. Benefits of use technology pasteurization of goat milk in produce products that aim for:

- 1) Increase quality product.
- 2) Extend shelf life.
- 3) Ensure security food.

Introduction technology pasteurization of goat milk give impact real in increase awareness participant to importance quality and safety product. Participants understand that pasteurization No only aim eliminate microorganisms dangerous, but also plays a role in extend shelf life as well as expand market opportunities.

In a way empirical, occurs improvement understanding about practice hygienic and appropriate milk processing standard. In addition, participants start identify potential diversification product goat milk based as a strategy for increase mark plus.

In perspective strategic, implementation technology This strengthening Competitive Advantage through improvement quality and differentiation products, at the same time support Sustainability principles, especially in the dimensions economic and social.

Sponsor and Stakeholder Involvement. involvement and various stakeholders interest in this PKM activity become element important to support program success. The collaboration that was formed No only present support financial, but also expand network partnership as well as open opportunity program sustainability to front.

In a way empirical, participation stakeholders contribute to improvement effectiveness implementation activities, good in provision source Power and in strengthen legitimacy of the program in the middle society. In addition, synergy between the party also encourages formation ecosystem supportive collaborative development agribusiness-based community.

In perspective theoretical, collaboration This reflect approach multi-stakeholder engagement that plays a role in achievement sustainability, especially in strengthen dimensions social and economic through synergy between actor.

Integration Model. Based on results implementation activity devotion to community in Pondok Al-Faruqi Islamic Boarding School, research This formulate an integrative model that links three main component, namely education, technology, and society in mutual relationship strengthen. The model describe that education play a role in produce knowledge, technology become driver innovation, and society functioning as actor main in the empowerment process.

In dimension first, the relationship between education and knowledge seen through activity such as international talk shows and training that are capable increase capacity cognitive participant in a way significant. The knowledge gained No only nature conceptual, but also applicable, so that relevant with need practical in the field. This confirms that practice-based education practice own role important in speed up transformation knowledge become skills.

In dimension second, the relationship between technology and innovation reflected from implementation technology such as the Internet of Things (IoT) and tools pasteurization that encourages change from system conventional going to approach based technology. In matter this technology No only functioning as tool supporters, but also as source innovation that is capable increase efficiency, productivity, and quality results. Transformation This in line with Disruptive Innovation concept, where technology become driving force change going to a more modern and adaptive system.

Temporary that, in dimension third, the relationship between community and empowerment realized through approach participatory that places public as perpetrator main change. In this process, society No only play a role as recipient benefits, but also active in identify problem as well as implement solution. Approach the contribute in strengthen capacity individual and collectively, so that push creation independence sustainable economic and social development.

Analysis Impact. Analysis impact this PKM activity can shared to in three stages time, namely term short, medium, and long. At stage term short, this program succeeds increase digital literacy of participants, especially in understand marketing technology-based strategies as well as utilization of digital media. This reflected from ability participant in recognize market opportunities and understanding draft base smart marketing.

At the stage term medium, expected impact is increasing adoption technology in the sector livestock, especially use system Internet of Things (IoT) for livestock monitoring as well as implementation technology pasteurization in milk processing. This process shows existence shift from practice traditional going to a more modern, data-driven approach.

Temporary that, in term long, activities This potential push improvement welfare economy public through improvement productivity, quality products, and expansion market access. Impact the No only felt in a way individual, but also as a collectively, so that strengthen ecosystem agribusiness-based community.

In a way overall, findings This confirm that PKM activities contribute to achievement sustainability, especially in the dimensions economic and social.

Contributions Theoretical. One of contribution important from study This is conceptual model formulation the new one called as “Empowerment Model Agro-Education Based on Smart Technology”, which integrates three main pillars; education, technology, and community empowerment in something comprehensive and applicable framework. This model enriches literature devotion public with emphasize importance synergy between knowledge transfer, adoption technology, and engagement active society. In framework said, technology No only play a role as tools, but also as enablers that accelerate the empowerment process as well as improvement capacity.

Further, this model strengthens draft competitive advantage, where increases quality source Power humans and utilization innovation become factor main in create superiority sustainable competition. Thus, this model No only own relevance theoretical, but also offers implications extensive practice in development of community service programs communities in various sector.

Table 1. Matrix Analysis Tree PKM Problems and Tree of Hope

Root Causes	Core Problem	Impacts	Intervention (PKM)	Tree of Hope (Expected Outcomes)
Digital literacy is not yet optimal	Marketing strategy still semi-digital and not patterned / focused	Limited market access	Training <i>smart marketing</i> and talk shows international	Improvement digital literacy and skills marketing based technology
The lack of adoption technology farm	Productivity and efficiency low	Cost high and risk business increase	Implementation <i>Internet of Things</i> (IoT) in livestock farming	System modern, efficient, and data-based farming (<i>smart farming</i>)
Lack of knowledge processing product	Quality and power stand product low	Sale value product limited	Demonstration tool pasteurization of goat milk	Product hygienic, valuable add, and empower competition

Limitations network business	Market access and collaboration low	Business scale difficult develop	Stakeholder and sponsor involvement	Formed ecosystem partnerships and greater market access wide
Approach empowerment Still passive	Participation public not optimal	Lack of program sustainable	Approach <i>Participatory Action Research</i> (PAR)	Active, independent and empowered society

Analysis tree problem shows that constraint main in development agribusiness based Islamic boarding school covering low digital literacy, lack of adoption technology, limitations processing product, weakness network business, as well as low participation society. Conditions This impact on low productivity, quality products, and market access.

Through PKM program interventions that include smart marketing, implementation technology Internet of Things (IoT), innovation pasteurization, as well as approach participatory, generated tree hope in the form of improvement capacity, adoption technology, quality products, and reinforcement ecosystem business.

In a way overall, discussion This confirm that success PKM activities do not solely determined by the implementation of the program, but also by the ability in integrate education, technology, and empowerment public in a way systematic. The resulting model give base strong conceptual For development of similar programs in the future as well as potential become references in study advanced related transformation agribusiness- based community.

CONCLUSION

Activity devotion to public This proven capable increase capacity participants, encourage adoption technology, as well as produce an empowerment model based sustainable innovation. Findings This confirm that synergy between education, technology, and empowerment public is effective approach in transform agribusiness based community. Through series activity such as international talk shows, prototype testing based Internet of Things (IoT), as well as demonstration tool goat milk pasteurization, this program succeed strengthen capacity participant from side knowledge, skills, to readiness in adopt innovation.

In a way empirical, activities This push improvement digital literacy, understanding to technology modern farming, as well as awareness will importance processing hygienic and valuable products added. The Participatory Action Research (PAR) approach applied has also proven to be effective effective in increase participation active community, strengthening the sense of ownership, and guard program sustainability. This show that approach participatory more capable produce sustainable change compared to top-down method.

From the corner view strategic, integration smart marketing, IoT technology, and innovation processing product contribute in build competitive advantage through improvement quality, efficiency, and differentiation products. In addition, activities this is also in line with principle sustainability Because give impact positive in aspects economic, social, and environmental. Utilization technology as form disruptive innovation participate play a role as catalyst in transform practice farm traditional going to a more modern and adaptive system.

More far, activities This generate a conceptual model "Empowerment Model Agro-Education Based Smart Technology ", which integrates education as source knowledge, technology as driver innovation, and society as actor main empowerment. This model No only relevant to the context local, but also has the potential replicated in various regions with characteristics similar.

Thus, this PKM activity No only give benefit practical for society, but also provide contribution academic in development of service models based innovation and sustainability. In the future, it is necessary strengthening the long-term monitoring aspect length, measurement impact in a way quantitative, as well as expansion collaboration cross sectors to ensure sustainability and scalability of the program.

PRACTICAL IMPLICATIONS

Activity results devotion to community in Pondok Al-Faruqi Islamic Boarding School produce various implications practical that can utilized by various stakeholders interest in development agribusiness based education and technology. One of them implications main is opportunity program replication to other Islamic boarding schools to expand impact. A model that integrates smart marketing, technology Internet of Things (IoT), and processing product worth plus proven effective in increase capacity as well as independence society, so that can adapted in accordance with characteristics local For push equality economy based community.

In addition, integration technology in curriculum education become step strategic For ensure program sustainability. Islamic boarding schools and institutions education vocational can enter material such as smart farming, digital marketing, and processing product based technology to in the learning process, so No only increase competence technical participant educate, but also prepare they face the needs of the world of work and entrepreneurship based technology.

More further, strengthening collaboration with sector industry and various stakeholders become factor crucial in guard sustainability and scalability of the program. Involvement partners like industry, institution finance, and parties strategic other allows support in form funding, technology transfer, and market access, while build ecosystem sustainable innovation. Thus, the community service program No stop at the stage implementation, but potential develop become an independent and competitive business model.

In a way overall, implications This confirm that the success of PKM is not only determined not only by the implementation of the program, but also by the ability For develop, replicate, and integrate the result to in more systems extensive and sustainable.

LIMITATIONS

Limitations. Although activity devotion to community in Pondok Al-Faruqi Islamic Boarding School show positive results, studies This Still own a number of necessary limitations noticed in interpret findings. First, the research This nature contextual and only focus on one location, so that generalization to other areas must done in a way Be careful Because difference condition social, economic and cultural can influence success implementation.

Second, the approach used tend qualitative and exploratory, so that Not yet equipped with comprehensive quantitative data, such as measurement improvement income, productivity, or level adoption technology in a way statistics, which limits strength proof empirical.

Third, not yet done evaluation term long (longitudinal), so impact program sustainability, in particular related adoption technology and effects economy, not yet can analyzed optimally.

Fourth, from aspect technology, the prototype introduced Still be at the stage beginning development, so that need testing advanced For ensure reliability, scalability, and convenience use in various condition field.

Future Research. Based on various limitations mentioned, there are a number of opportunity study continuation that can developed For strengthen contribution academic and practical from studies this. First, research next recommended use mixed-method approach with combine qualitative and quantitative data to produce more analysis comprehensive, especially related impact economy and productivity. Second, it is necessary longitudinal study for evaluate sustainability adoption technology

as well as the impact to improvement welfare public in term long. Third, development technology based on the Internet of Things (IoT) in sector farm can explored more further, including its integration with data analytics and intelligence artificial to improve accuracy prediction and efficiency operational.

Next, research future can also study in a way more in-depth chain model mark goat milk agribusiness, starting from stage production until distribution, for identify opportunity improvement Power compete in a bigger market wide. In addition, the expansion object study to various Islamic boarding school or other important areas done For test replication and scalability of the empowerment model, so that obtained a more accurate model adaptive and able generalized.

In a way overall, description limitations and direction study to front This show that although studies This has give contribution significant start, still there is room extensive development in strengthen validity empirical, expanding implementation, as well as increase depth analysis. This is at a time open opportunity for research advanced in formulating an empowerment model based more technology comprehensive and sustainable.

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ATTACHMENT

