Sustainability of Agriculture based on Training Program Systems for Young Lecturers: Researchers in Asian Countries, Case Study in West Sumatra, Indonesia

Ardi
Professor of Agronomy, Faculty of Agriculture
Andalas University

19 December 2025
Tay Do University, Can Tho City, Vietnam

Sustainability Agriculture Concepts

Sustainable agriculture is essential for:

- Environmental stewardship
- Social equity
- Economic viability

Key practices include:

1. Conservation agriculture
2. Crop rotation & intercropping
3. Organic farming
4. Agroforestry
5. Integrated pest management

→ Aim: **Long-term productivity & ecosystem resilience**




Universities play a strategic role in:

- ✓ Human resource development
- ✓ Facilitating the transfer of scientific knowledge from research to farmers and other stakeholders,
- ✓ Driving agricultural innovation through the development and application of environmentally sound and locally adapted technologies.
- ✓ Through the integration of education, research, and community engagement, universities promote productive, resilient, and sustainable agricultural development.

Role of Young Lecturers

Young lecturers act as:

- ✓ Educators integrating sustainability into curricula
- ✓ Researchers developing adaptive technologies
- ✓ Extension agents connecting science and farmers

Training programs strengthen:

- ✓ Pedagogical skills
- ✓ Research capacity
- ✓ Community engagement

Methods

Approach: Qualitative descriptive case study

Location: West Sumatra

Data collection:
Document analysis
Field observations

Focus:
Institutional practices
Lecturer involvement
Community impacts

Study Objectives

Analyze the role of training programs for young lecturers

Examine contributions to agricultural sustainability

Highlight best practices in West Sumatra

Assess integration of education, research, and community service

Case Study Context: West Sumatra

Agriculture dominated by:

- Smallholder systems
- Rice, coffee, cocoa, rubber, oil palm

Emphasis on:

- Low External Input Sustainable Agriculture
- Minangkabau traditional farming systems

Strong role of academic institutions

Faculty of Agriculture, Andalas University

Main contributions:

- Sustainable agriculture training
- Research & innovation
- Student–lecturer–community integration
- Regional agricultural development

Key initiatives:

- Sungkai Green Park
- Technology Transfer Center (Alahan Panjang)
- Organic farming programs
- Community service & internships







1 Sungkai Green Park

- Green educational and ecotourism area
- Platform for:
  - Environmental education
  - Sustainable agriculture learning
  - Public engagement
- Symbol of harmony between:
  - Humans
  - Nature
  - Educational institutions

2 The Center for Technology Transfer and Agricultural Area Development

Functions as:

- ✓ Research and innovation hub
- ✓ Technology testing & dissemination site
- ✓ Internship and training center

Location:

Alahan Panjang, Solok Regency
1,620 meter above sea level

Key Activities

- ➢ Wheat cultivation & processing
- ➢ Organic fertilizer & vermicomposting
- ➢ Certified seed production
- ➢ Biopesticide development
- ➢ Livestock & aquaculture
- ➢ Oyster mushroom cultivation
- ➢ Bioenergy & agroforestry initiatives

→ Integrated **education–research–extension model**



3 Organic Agriculture Development

Organic rice as strategic commodity

Strong government support:

- ✓ Training
- ✓ Standardized cultivation

- According to records from the West Sumatra Organic Certification Agency (SLO), a total of 19 farmer groups received organic certification between 2016 and 2018, encompassing 136.6 hectares of organic rice fields.
- Padang Pariaman Regency ranks second in organic rice cultivation area, with 32.94 hectares, following 50 Kota Regency, which accounts for 37.31 hectares.
- Within Padang Pariaman Regency, Batang Anai District has the largest share of organic rice farming area (Yulinda and Zulvera, 2025).

4 Community Service & Extension

Farmer training and empowerment

Sustainable crop development:
- Sugarcane
- Sugar palm (*Arenga pinnata*)

Etc.

Application of agroforestry principles
Environmental and economic benefits

Figure 4. Community service activities involving sugarcane (a) and sugar palm (b) planting in West Sumatra.

One of the key superior commodities discussed is sugar palm (*Arenga pinnata Merr*). This species was selected due to its high ecological adaptability, multifunctional economic value, and strong potential to support sustainable rural livelihoods.

The Golden Return: Unlocking the Economic Value of Sugar Palm

4 yrs old (2018)

11 yrs old (2025)

Planting Density	Production Start	Productive Trees
With a spacing of 5m x 5m, one hectare can support approximately **400 Sugar Palm Trees**.	Sap tapping typically begins when trees reach maturity, around **7 years of age**.	Assuming a **50% production rate**, 200 trees per hectare will yield sap.

- **Sugar palm is significant in the socio-cultural life of the Minangkabau people in West Sumatra.**
- **Sugar palm is more profitable than other crops, such as oil palm.**
- **Database on the yield potential of sugar palm is essential to update from time to time in order to record the superior parent material, including GPS coordinate of each plant.**
- **Research on all aspects of sugar palm should be done continuously.**

Net Profit Potential: Rp 100,000,000 Per Hectare, Monthly

By calculating the total revenue from sugar production and subtracting the associated costs, we can determine the impressive monthly net profit for farmers.

10L
Average sap yield per tree, per day, from a productive palm.

10%
Average sugar content in the sap, yielding 1 kg of sugar per day.

Rp 35 K
Approximate current market price per kilogram of palm sugar.

The Income Breakdown (Monthly Estimates)

Gross Revenue (Per Tree)
Rp 1,050,000 (30 kg sugar/month at Rp 35k/kg)

Production Costs (50%)
~Rp 105,000,000 (Labor, firewood for boiling, etc.)

Total Revenue (Per Hectare)
Rp 210,000,000 (200 productive trees)

Net Profit (Per Hectare)
Rp 105,000,000 per month

Note: This simple calculation assumes stable market prices and consistent production yields. The net profit highlights the significant potential for increased farmer income and rural economic growth.

Research Dissemination (PENAS XVI)

Participation in National Farmers and Fishermen Week

Activities:

- Research exhibitions
- Seed distribution
- Urban farming outreach
- Micro, Small, and Medium Enterprises products promotion

Impact:

- Increased public awareness
- Strong community engagement

6 Curriculum & Pedagogical Development

Sustainability integrated into courses:

- ✓ Biodiversity
- ✓ Soil & Water Conservation
- ✓ Integrated Farming Systems
- ✓ Bioenergy Crop Development
- ✓ Sustainable Agricultural Development

Outcome:
Critical thinking
Climate-resilient competencies
Systems-based understanding

7 Contribution to Young Lecturer Development

Training programs enhance:

- Teaching quality
- Research productivity
- Innovation capacity
- Stakeholder collaboration

Young lecturers become:

- Agents of sustainable transformation
- Bridges between academia and society

Conclusion

Integrated training programs are vital for:

- Sustainable agriculture
- Human resource development

Andalas University plays a strategic role in West Sumatra

Collaboration among:

- Universities
- Government
- Communities
- Industry

is essential for long-term sustainability

References

Liu, M., X.Chen, and Y.Jiao. 2024. Sustainable Agriculture: Theories, Methods, Practices and Policies. MDPI. 1-4. https://doi.org/10.3390/agriculture14030473

Nyamweru, J.C., W.M.Ndayitwayeko, A. Kesseler and H. Biemans. 2025. Fostering Students' Competencies in Sustainability in Vocational Agriculture Education in Burundi: Effects of a Participatory Integrated Planning (PIP) Module. International Journal of Training and Development. 29:108–123. https://doi.org/10.1111/ijtd.12347.

Sari, A., A.Anwar, I.Dwipa, and D.Hervani. 2021. Morphological characteristics of sugar palm [Arenga pinnata Merr.] seedling growth based on cotyledon petiole position. IOP Conf. Series: Earth and Environmental Science. doi:10.1088/1755-1315/741/1/012002

Setiawan. R.B., I.Dwipa, Yaherwandi, Reflinaldon and A.Sari. 2023. Pameran diseminasi hasil riset pada pecan nasional petani dan nelayan (PENAS) XVI di Kota Padang, Sumatera Barat. Communnity Development Journal. 4(3): 6841-6845

Setyaka, V., D.Yulianti, Andrezal, A. Bainus, and I.Indrayanis. 2025. Sawah pokok murah : a localized, sustainable alternative to the capitalist global food system. Journal of Sosial Political Sciences. 6(3):263-286.

Shubham and R.Kumari. 2024. Education and Training in Agriculture: Learning from Each Other. Chaudhary Charan Singh Haryana Agricultural University, Hisar. India. ISBN: 978-93-5996-033-3

Suliansyah, I. 2020. PATPKP. https://www.scribd.com/document/454050691/09-PATPKP

Sukarli., R.Syahni, Elfindri, and H.B. Tanjung. 2025. Analysis of the Development of Food Crops in Supporting Sustainable Agriculture in West Pasaman Regency. Journal of Universal Studies. 5(10): 13099-13114

Thoa, H. T. (2024). Experience in developing lecturers in the fields of agriculture, forestry, and aquaculture in various countries: Lessons for Colleges under the Ministry of Agriculture and Rural Development in Vietnam. Tennessee Research International of Social Sciences. 6(1):38–51. Retrieved from https://triss.org/index.php/journal/article/view/46

Umar, I. and Arif, D.A. 2023. Spatial models of rice fields change and sustainable agriculture in Solok District, West Sumatra Province. Journal of Degraded and Mining Lands Management 11(1): 4875-4885. doi:10.15243/jdmlm.2023.111.4875.

Yulinda and Zulvera. 2025. Critical issues in the development of organic farming systems in West Sumatra. Journal of Sustainability Science and Development. x(x): 1-19. https://jssd.pasca.unand.ac.id/

thank you