Rooted in Place, Built Through Practice: The FARM Learning Cycle for Crop Production

Lanzer Aquino

Abstract

Agricultural crops production is learned most meaningfully when students connect technical knowledge with soil, tools, plants, markets, and community practice. A workbook can support this connection, but a sequence of activities does not automatically produce coherent experiential learning. This conceptual article analyzes Agricultural Crops Production: Student Workbook for Grades 10 and 11 as an instructional source and develops the Frame-Act-Record-Make Meaning (FARM) cycle for place-based agricultural education. The source workbook contains 21 activities involving garden-site analysis, mapping, hand tools, container gardening, indirect planting, soil, personal protective equipment, the Philippine agricultural economy, farmers, marketing, insects, community entrepreneurs, crop maturity, planting distance, harvesting, farm-production surveys, economic analysis, and insecticide-label inquiry. These tasks are reorganized into four instructional domains: agroecological observation; safe crop-production practice; agricultural enterprise and community knowledge; and evidence-based production inquiry. FARM supplies the missing process that links them. Students frame a local problem and criteria for success, act through supervised performance or community investigation, record observable evidence, and make meaning through analysis, feedback, recommendation, and transfer. The article proposes a task-to-evidence assessment chain, safety and ethics gates for fieldwork, and a minimum implementation architecture for schools with different levels of land, equipment, and community access. Its contribution is a design framework, not a claim of measured learning effects. The framework positions the workbook as a bridge among competency standards, school-garden practice, community knowledge, and reflective judgment while preserving teacher responsibility for localization, safety, consent, and assessment quality.

Keywords: agricultural education; place-based learning; experiential learning; authentic assessment; school garden; competency-based education

Introduction

Agricultural education presents a distinctive instructional problem. Students must understand concepts such as soil, crop maturity, spacing, pest management, and marketing, but they must also use tools safely, observe changing biological conditions, gather evidence in a community, and make decisions under local constraints. A written explanation of transplanting cannot establish that a learner can prepare media, handle seedlings, and respond to weather. Conversely, participation in a garden task does not guarantee that the learner understands why a method was chosen or can transfer it to another crop or site. The educational challenge is to connect knowledge, performance, evidence, and judgment.

Philippine curriculum and training standards recognize this connection. The Department of Education's Agricultural Crops Production curriculum organizes learning around competencies, products, processes, tools, environmental conditions, occupational safety, and entrepreneurial understanding (Department of Education, 2016). The Technical Education and Skills Development Authority similarly defines agricultural qualifications through observable competencies that can be performed and assessed in work-relevant conditions (TESDA, 2013). These standards make practical activity necessary, but they do not by themselves determine how a teacher should sequence experience, reflection, evidence, and feedback.

Experiential learning offers a foundation for that sequence. Dewey (1938) argued that education depends not on experience alone but on the quality and continuity of experience. Kolb (1984) later described learning as a transformation of experience through reflection and conceptualization. In agricultural education, Knobloch (2003) connects authentic learning with real-life contexts, learning by doing, projects, and problem solving. The implication is important: hands-on work becomes educational when it is deliberately framed, observed, interpreted, and connected to future action.

Indona's (2022) Agricultural Crops Production: Student Workbook for Grades 10 and 11 provides a useful instructional case. Its 21 exercises extend from garden-site observation and safe tool use to community interviews, marketing inquiries, farm-production surveys, and an economic analysis worksheet. The workbook is not an empirical study, and completed learner data were not supplied for this article. Its value as a source lies in the range of authentic tasks it assembles. This article examines the design logic within that range and proposes a cycle that can make the tasks instructionally coherent without attributing unmeasured outcomes to the workbook.

Purpose of the Article

The article has three objectives: (a) to identify the principal learning domains represented by the workbook's activities; (b) to develop the FARM cycle as a process linking local problems, supervised action, evidence, reflection, and transfer; and (c) to specify assessment, safety, ethics, and implementation requirements for workbook-based agricultural learning. The guiding question is: How can a set of secondary agricultural activities be organized as a coherent place-based learning process rather than treated as isolated worksheets?

Conceptual Approach

Source and Unit of Analysis

The article uses instructional design analysis. The primary source is a 2022 workbook published by Shirley Publishing House for Technology and Livelihood Education, Agriculture and Fishery Arts, and Agricultural Crops Production. The analysis considers the stated task, setting, expected performance, evidence requested from the learner, and assessment or reflection prompt in each exercise. It does not evaluate learner answers, compare classes, or estimate effectiveness.

The unit of analysis is the learning task rather than the page or topic. For example, identifying a rake is a knowledge task; selecting it for a garden operation is a decision task; using it with protective equipment is a performance task; and explaining its safe use is a reflection and transfer task. Treating these as related but distinct forms of evidence helps a teacher avoid assuming that one worksheet response proves complete competence.

Design Lenses

Four bodies of literature guide the synthesis. Experiential learning explains the movement from concrete action to reflection and conceptual understanding (Dewey, 1938; Kolb, 1984). Place-based and land-based education direct attention to local phenomena, culture, environmental conditions, and community participation (McKim et al., 2019; Smith, 2002). Authentic assessment requires learners to perform meaningful tasks and produce evidence resembling competent practice (Sluijsmans et al., 2008; Wiggins, 1998). Constructive alignment requires coherence among intended competence, learning activity, evidence, and criteria (Biggs & Tang, 2011). The FARM cycle integrates these lenses for secondary agricultural instruction.

The Workbook's Activity Architecture

Agroecological Observation

The first domain concerns the relationship among site, soil, climate, water, crops, and the agricultural economy. Exercises on garden location, site mapping, the Global Soil Partnership, Philippine agriculture, farmers, and national agricultural problems ask students to observe conditions and connect them with wider systems. Their strength is contextualization: a learner must look at an actual or imaginable site rather than recite a universal answer. The teacher's role is to make the criteria explicit. A site recommendation should be supported by observations of drainage, sunlight, water access, soil condition, exposure, security, and intended crop, not by preference alone.

Safe Crop-Production Practice

A second domain groups tools, land preparation, container gardening, raking, indirect planting, personal protective equipment, hand-tool classification, and planting distance. These tasks move from recognition toward performance. The workbook includes procedures and, in selected exercises, performance criteria. This direction is consistent with competency-based instruction, but performance evidence should be disaggregated. Correct sequence, tool condition, protective equipment, quality of output, care of planting material, housekeeping, and explanation of decisions may each require observation. A single total score can hide a safety failure or a misconception.

Agricultural Enterprise and Community Knowledge

Marketing, community entrepreneurship, crop maturity, and harvesting activities position agriculture as both biological production and livelihood. Learners are asked to inquire about vegetable prices, interview retailers, service providers and producers, examine business challenges, identify harvest indicators, and document local handling and marketing practices. These tasks connect the school with people who hold situated knowledge. They also require ethical preparation: community members should understand the purpose of the activity, participation should be voluntary, photographs should require permission, and learner questions should avoid soliciting confidential commercial information.

Evidence-Based Production Inquiry

The most demanding tasks involve insects, baseline farm-production management, production costs, and insecticide information. They ask learners to gather, organize, compare, and interpret evidence. The farm survey moves beyond a simple interview by recording land, soil, irrigation, yield, pests, control practices, inputs, labor, and costs. The insecticide-store task directs attention to active ingredients, concentration, hazards, precautions, application, target pests, and price. These are promising forms of agricultural literacy, but they require careful scaffolding. Students must distinguish observation from inference, brand name from active ingredient, gross income from net profit, and label information from a recommendation to use a product.

Table 1

Instructional domains represented in the source workbook

Domain	Workbook exercises	Primary evidence	Instructional emphasis
Agroecological observation	1-2, 8, 10-12	Site notes, maps, concept maps, explanations	Relate land, water, climate, soil, crops, economy, and farmer conditions
Safe crop-production practice	3-7, 9, 14, 18	Tool selection, demonstrated procedure, safety check, crop plan	Perform work safely and explain why tools, sequence, spacing, and media are appropriate
Enterprise and community knowledge	13, 16-17, 19	Price records, interviews, maturity indicators, narrative and pictorial report	Connect production with livelihood, quality, harvest timing, handling, and markets
Evidence-based production inquiry	15, 20-21	Comparisons, survey records, cost analysis, pesticide-label analysis	Organize local evidence, distinguish variables, analyze costs and risks, and justify recommendations

Note. Exercise numbers refer to Indona (2022). The domains describe the dominant learning function; several exercises contribute to more than one domain.

The FARM Cycle

The four workbook domains identify what students encounter; the FARM cycle specifies how an encounter becomes learning. FARM is recursive. A learner may return from evidence recording to additional action, or from reflection to a revised problem frame. The cycle also separates student activity from proof of competence. Completion is not the endpoint; the endpoint is a defensible performance or judgment that can be explained and, when appropriate, repeated.

Frame a Local Agricultural Problem

Framing begins with a local object of inquiry and criteria for success. The object may be a school-garden site, a crop requiring transplanting, a market-price pattern, a farmer's harvesting practice, or a pesticide label. The teacher links the problem to a defined competency and identifies relevant prior knowledge, available resources, hazards, evidence, and boundaries. Students should know what decision they will make after gathering information. 'Observe the garden' becomes 'recommend a site and justify the recommendation using drainage, sunlight, water, accessibility, and crop requirements.'

Framing also protects against decontextualized answers. Planting distance varies with crop, variety, production system, and purpose. Market price varies by time, grade, volume, and location. A maturity index may combine color, size, texture, age, or intended market. The task should therefore state which conditions are fixed, which must be discovered, and which sources are acceptable. This makes local variation an object of reasoning rather than a reason for inconsistent grading.

Act Through Supervised Practice or Inquiry

Action may involve physical performance, observation, construction, interviewing, mapping, price gathering, or document analysis. Before action, the teacher demonstrates critical procedures, checks tools and protective equipment, and establishes roles. Students then perform as independently as safety and competence permit. In the garden, action can include preparing a seed box, sowing, watering, thinning, and transplant readiness. In the community, it may include interviewing a producer or recording prices at a public market.

Authenticity does not require uncontrolled exposure. A simulated tool-selection task may precede garden use. A teacher-provided set of pesticide labels may replace a store visit when travel or chemical exposure is inappropriate. Photographs, sample soil profiles, market records, or farmer narratives can support a reduced-resource version. The educational requirement is that students make consequential choices using credible conditions, not that every class reproduce the same field setting.

Record Observable Evidence

Recording converts activity into an inspectable learning trace. Appropriate records include site observations, annotated maps, tool checklists, procedure notes, dates, photographs with permission, crop measurements, market prices, interview summaries, maturity indicators, cost calculations, and assessment rubrics. Evidence should be contemporaneous where possible and should distinguish what was seen or reported from the learner's interpretation. A teacher can then give feedback on both the performance and the reasoning.

The record should be proportionate. A short tool-use demonstration may need an observation checklist and one reflection prompt. A farm-production survey requires a data dictionary, units, missing-data rules, interview notes, and a calculation sheet. Learners should retain original entries when correcting a value so that the path from field record to summary remains visible. This habit introduces data integrity without turning a secondary activity into an unnecessarily complex research exercise.

Make Meaning Through Reflection and Transfer

Meaning-making asks learners to explain what happened, why it happened, what evidence supports the explanation, what should change, and where the learning can transfer. Reflection can be oral, written, diagrammatic, or demonstrated. The format should match the competency. After indirect planting, students may explain why thinning and true-leaf development matter. After a market inquiry, they may compare peak and off-season prices while identifying limits in the sample. After a farm survey, they may distinguish gross yield, gross income, production cost, and net return before offering a recommendation.

Feedback should lead to revision or a new attempt. Black and Wiliam (2009) emphasize that formative assessment becomes useful when evidence of learning informs subsequent teaching and action. In FARM, a weak map can be revised after a site walk; unsafe tool handling requires reteaching before independent use; an unsupported conclusion returns the learner to the record; and a technically correct performance may be extended to a new crop or constraint. Transfer completes the cycle by showing that the learner can adapt rather than merely repeat.

Table 2

Decision structure of the FARM cycle

Stage	Teacher design question	Student action	Required learning trace
Frame	Which local problem, competency, criteria, hazards, and evidence define the task?	Clarify the question, conditions, sources, and intended decision	Problem statement, success criteria, safety and inquiry plan
Act	What authentic performance is safe, feasible, and sufficiently supported?	Perform, observe, construct, interview, survey, or analyze	Observed performance or collected field and document evidence
Record	What evidence will permit checking, feedback, and later interpretation?	Document observations, measures, sources, calculations, and changes	Dated record, checklist, artifact, data table, or authorized image
Make Meaning	How will evidence be interpreted, revised, and transferred?	Explain, compare, calculate, reflect, recommend, revise, and apply	Reasoned conclusion, feedback response, corrected work, or transfer task

Assessment, Safety, and Ethics

The Task-to-Evidence Chain

A coherent assessment begins with a traceable chain: competency to authentic task, task to observable evidence, evidence to criteria, criteria to feedback, and feedback to revision or transfer. This chain prevents attractive products from substituting for competence. A decorated container garden may demonstrate creativity but not drainage, material safety, crop suitability, or maintenance planning. A completed interview table may show diligence but not accurate interpretation. Each criterion should correspond to an aspect of the intended performance.

Rubrics should separate critical from compensatory criteria. A safety violation should not be offset by neat handwriting or presentation quality. For tool use, critical criteria may include inspection, protective equipment, control of the working area, correct handling, and safe storage. For a community report, critical criteria may include consent, accurate attribution, source distinction, and evidence-based interpretation. Analytic feedback then tells the learner what must be corrected before competence is accepted.

Safety and Ethics Gates

Three gates should precede field activity. The safety gate confirms risk assessment, supervision, serviceable tools, appropriate protective equipment, hygiene, weather conditions, first-aid readiness, and an emergency procedure. The ethics gate confirms voluntary participation of community respondents, age-appropriate teacher or guardian arrangements, privacy, permission for images, respectful questioning, and a plan for storing or discarding records. The evidence gate confirms that students know the units, sources, and recording method required for the task.

Pesticide-related activities deserve additional restraint. The educational objective can be met through label literacy, risk recognition, active-ingredient comparison, and supervised document analysis. A student survey should not become a recommendation to purchase, mix, or apply a chemical. Handling or application requires the applicable curriculum, competent supervision, approved facilities, protective measures, and compliance with product labels and institutional rules. When these conditions are absent, teachers should use labels or case materials rather than live products.

Implementation in Diverse School Settings

A Minimum Viable Sequence

A school can implement FARM with six planning moves. First, select one defined curriculum competency. Second, identify a local phenomenon or realistic proxy. Third, specify the product or performance and the evidence needed to judge it. Fourth, complete safety and ethics gates. Fifth, schedule action, recording, feedback, and revision as separate instructional moments. Sixth, end with a transfer question or performance. This sequence can be applied to one lesson, a multiweek garden project, or a community inquiry.

The teacher should build progression across tasks. Early activities may use structured tables, labeled examples, and teacher demonstrations. Intermediate activities can require students to choose tools, plan a site, compare maturity indicators, or calculate costs using supplied data. Later activities can integrate observation, community evidence, production reasoning, and recommendation. Progressive reduction of scaffolding makes the workbook a pathway toward independence rather than a set of equally guided exercises.

Resource and Access Adaptation

Place-based learning must not penalize students for unequal access to land, transport, tools, internet service, or farming contacts. Teachers can offer equivalent routes to the same evidence. A garden-site task may use the school grounds, a container system, photographs, or a scaled plan. A market inquiry may use an organized class dataset when travel is unsafe. A farmer interview may be conducted by an invited community resource person with shared class questions. The assessment should reward the targeted competence, not private access to resources.

Local adaptation should preserve technical accuracy. Teachers can revise crop examples, seasons, language, units, and community contexts while maintaining the underlying competency and criteria. FAO's school-garden guidance emphasizes planning, participation, resources, maintenance, and links with families and communities (FAO, 2005, 2010). These considerations are especially important when biological timelines continue beyond a class period or school break. A garden is an instructional environment only when responsibility for its care is realistically organized.

Discussion

From Activity Completion to Competent Judgment

The FARM cycle's main contribution is continuity. The workbook already contains practical and community-facing tasks; FARM links them through a repeatable process. Framing prevents action without purpose. Action prevents agricultural knowledge from remaining abstract. Recording creates evidence for assessment and analysis. Meaning-making prevents completion from being mistaken for understanding. The cycle therefore connects experience with accountable judgment.

The framework also clarifies the role of a workbook. A workbook can prompt, structure, and preserve evidence, but it cannot supervise a blade, judge a seedling's handling, obtain community consent, or decide whether weather makes an activity unsafe. Those responsibilities remain with the teacher and institution. Likewise, the workbook should not become a script that erases local knowledge. Farmer accounts and community observations can challenge, enrich, or contextualize standardized examples when students learn to compare sources respectfully. Liu and Buck (2022) describe farming practices as funds of knowledge that can strengthen curricular relevance.

A Basis for Curriculum and Teacher Development

FARM can support collaborative planning. Teachers may map each competency to a frame, action, record, and meaning-making prompt, then identify duplicated tasks or missing evidence. A program may discover that it offers many practical experiences but little structured reflection, or many written questions but few observable performances. The map makes the imbalance visible. It can also guide resource decisions by identifying which competencies truly require a garden, community visit, tool set, or specialized safety provision.

Professional development should focus on task design, observation, questioning, evidence quality, and safe facilitation. Technical expertise remains essential, but the teacher also needs to know when to intervene, how to elicit reasoning, how to provide criteria-based feedback, and how to adapt a task without lowering the intended competence. These practices make experience educative rather than merely engaging.

Research Agenda

The framework should be evaluated before claims are made about its effects. Design-based studies could examine how teachers adapt the cycle to school gardens, container systems, community interviews, and classroom simulations. Classroom research could compare the quality of learner explanations before and after explicit recording and reflection routines. Assessment studies could test the reliability of analytic criteria for tool use, crop establishment, field records, and economic reasoning.

Future work should also examine access, language, and boundary conditions. Rural and urban schools may have different community assets and risks. Students may contribute substantial family agricultural knowledge that is not visible in standard tasks. Weather, land tenure, school calendars, disability access, and tool availability may constrain authentic performance. Research should identify adaptations that preserve competence while expanding participation. No effectiveness or generalizability claim is made in the present conceptual analysis.

Conclusion

Agricultural crops production requires more than factual recall and more than unstructured participation. Learners must connect local conditions with safe performance, reliable records, economic and ecological reasoning, and defensible decisions. Indona's 2022 workbook supplies a broad set of activities through which these connections can be developed, from garden observation and planting to farmer interviews, market inquiry, farm surveys, and pesticide-label analysis.

The FARM cycle organizes those activities as a coherent process: Frame a local problem, Act through supervised practice or inquiry, Record observable evidence, and Make meaning through reflection, feedback, and transfer. Each activity begins with a competency and produces evidence for explanation, revision, or new application. Used this way, a workbook becomes an interface among curriculum, school, land, community, and learner judgment.

References

Baker, M. A., Robinson, J. S., & Kolb, D. A. (2012). Aligning Kolb's experiential learning theory with a comprehensive agricultural education model. Journal of Agricultural Education, 53(4), 1-16. https://doi.org/10.5032/jae.2012.04001

Biggs, J., & Tang, C. (2011). Teaching for quality learning at university (4th ed.). Open University Press.

Black, P., & Wiliam, D. (2009). Developing the theory of formative assessment. Educational Assessment, Evaluation and Accountability, 21(1), 5-31. https://doi.org/10.1007/s11092-008-9068-5

Department of Education. (2016). K to 12 basic education curriculum: Agri-Fishery Arts - Agricultural Crops Production (NC I). https://lrmds.deped.gov.ph/detail/15586

Dewey, J. (1938). Experience and education. Macmillan.

Food and Agriculture Organization of the United Nations. (2005). Setting up and running a school garden: A manual for teachers, parents and communities. https://openknowledge.fao.org/handle/20.500.14283/a0218e

Food and Agriculture Organization of the United Nations. (2010). Setting up and running a school garden: Teaching toolkit. https://openknowledge.fao.org/handle/20.500.14283/i1118e

Indona, N. L. (2022). Agricultural crops production: Student workbook for Grades 10 and 11 (1st ed.). Shirley Publishing House.

Knobloch, N. A. (2003). Is experiential learning authentic? Journal of Agricultural Education, 44(4), 22-34. https://doi.org/10.5032/jae.2003.04022

Kolb, D. A. (1984). Experiential learning: Experience as the source of learning and development. Prentice Hall.

Liu, L. B., & Buck, G. A. (2022). Farming practices as funds of knowledge. Science Education and Civic Engagement, 14(1), 45-58.

McKim, A. J., Raven, M. R., Palmer, A., & McFarland, A. (2019). Community as context and content: A land-based learning primer for agriculture, food, and natural resources education. Journal of Agricultural Education, 60(1), 172-185. https://doi.org/10.5032/jae.2019.01172

Sluijsmans, D. M. A., Straetmans, G. J. J. M., & van Merrienboer, J. J. G. (2008). Integrating authentic assessment with competence-based learning in vocational education: The Protocol Portfolio Scoring. Journal of Vocational Education & Training, 60(2), 159-172. https://doi.org/10.1080/13636820802042438

Smith, G. A. (2002). Place-based education: Learning to be where we are. Phi Delta Kappan, 83(8), 584-594. https://doi.org/10.1177/003172170208300806

Technical Education and Skills Development Authority. (2013). Training regulations for Agricultural Crops Production NC I. https://www.tesda.gov.ph/Downloadables/TR%20-%20Agricultural%20Crops%20NC%20I.doc

UNESCO. (2020). Education for sustainable development: A roadmap. https://unesdoc.unesco.org/ark:/48223/pf0000374802

Wiggins, G. (1998). Educative assessment: Designing assessments to inform and improve student performance. Jossey-Bass.