DEVELOPING A MINOR USE PROGRAM

Guidance and Strategy Principles

Minor Use Foundation





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Minor Use Foundation

The Minor Use Foundation (MUF), created in 2018, operates with a mission to support growers of specialty crops in the service of a commitment to making global agriculture more regenerative and increased economic return for smallholder farmers. We do this by facilitating access to crop protection tools for fruits, vegetables, nuts, and spices.

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I. Introduction

Even small or resource-limited regulatory agencies can successfully support minor crop protections by using smart, streamlined approaches. Leveraging international data, applying crop grouping and extrapolation, simplifying regulatory requirements, collaborating regionally, engaging industry and donors, and following FAO, OECD, and EPPO guidance allows authorities to approve minor uses efficiently and credibly. Strategically applied, Minor use programs can deliver major impact: farmers can protect all their crops, not just the major ones, and consumers gain a safer, more diverse food supply, without the need for large-scale programs.

Minor crops (often high-value fruits, vegetables, nuts, and other specialty crops grown on limited acreage) are vital for nutrition, food security, rural livelihoods, and sustainable food systems, yet they face major pest management challenges. Despite their importance in global agri-food trade and as sources of essential nutrients, minor crops often lack sufficient crop protection tools because pesticide development focuses on larger markets. This “minor use problem” leaves growers vulnerable to yield losses, unsafe pest control practices, and trade rejections due to residue violations.

A fit-for-purpose minor-use program is therefore a public good. It ensures growers have timely access to safer tools, reduces market and residue risks, protects ecosystems, and supports biodiversity and nutrition. By leveraging international guidance, crop grouping, representative commodities, extrapolation, and foreign data, even resource-limited authorities can expand minor crop protections efficiently while maintaining safety and compliance.

This document outlines key principles and best practices for establishing a minor use program, drawing on international experiences, to help policymakers design effective programs adapted to their national contexts.



II. Guidance Principles for Minor Use Programs

A. The "Minor Use Gap" and Need for Programs

There is no single international definition of "minor crops" or "minor uses," as countries tailor criteria to their agricultural, dietary, and economic contexts. Generally, a minor crop is one grown on limited acreage or with small production volume, while a minor use of a pesticide refers either to its application on such crops or to localized/infrequent uses on major crops. Governments often consider production area, economic value, and dietary or trade importance when setting definitions. Clear national definitions are essential for designing effective minor use programs (see **Appendix A** for detailed definitions and international examples).

Because pesticide development is costly, minor crops often lack registered pest control tools, a market failure known as the "minor use gap." This leaves farmers with few legal and safe options, pushing some toward off-label use, unsafe practices, or abandoning crops altogether, with consequences for food safety, trade, and biodiversity. Without registered uses, no Maximum Residue Limits (MRLs) are established, creating barriers for international trade and leading to rejected shipments.

Recognizing these challenges, countries and international bodies have worked to improve data sharing, harmonize definitions, and develop flexible regulatory approaches. National minor use programs have become a key mechanism for coordinating grower needs, data generation, and regulatory approvals, ensuring growers of minor crops gain access to safe, effective pest management tools (see **Appendix B** for details and international initiatives).

Key Principles in Addressing the Minor Use Gap and Develop National Programs

- Establish Clear National Definitions
- Prioritize Grower Needs
- Leverage International Data and Guidance
- Facilitate Public-Private Partnerships
- Optimize Regulatory Flexibility
- Promote Regional and International Collaboration
- Build Targeted Data Generation Capacity
- Track Performance and Outcomes
- Start Simple and Scale Strategically
- Emphasize Safety, Sustainability, and Market Access

National minor use programs all aim to expand pest control options for minor crops, but their structures differ based on resources, agricultural priorities, and regulatory systems. Models range from the U.S. IR-4 Project's large, publicly funded program to Canada's joint government-industry approach, Brazil's regulatory innovations using crop grouping, Malaysia's early steps through partnerships, the EU's coordinated regional framework, and Australia's permit-based, industry-driven system. Common best practices include strong public-private collaboration, transparent priority-setting, and flexible regulatory tools. These lessons offer adaptable pathways for countries seeking to strengthen support for minor crops (see **Appendix C** for detailed case studies).

B. Minor Use Program Cost-Benefit Analysis

Establishing a minor use program requires careful investment of public and private resources, and a cost-benefit analysis (CBA) is critical to justify funding and ensure sustainability. CBAs should quantify agricultural benefits by estimating yield protection and quality improvements for minor crops, including the often high-value specialty crops. They should also capture trade and market access benefits, such as export opportunities enabled by MRLs, as well as broader social impacts like improved food security, dietary diversity, and rural livelihoods. Environmental and health benefits, including reduced reliance on hazardous pesticides and promotion of IPM-compatible solutions, should also be considered.

On the cost side, CBAs should include program expenditures (trials, lab work, regulatory staff, and administration) and efficiency gains from data sharing, crop extrapolation, and coordinated efforts that prevent duplicative research. Calculating benefit-cost ratios (BCRs) or returns on investment (ROI) demonstrates the economic impact: mature programs, such as the U.S. IR-4 Project,

Key Principles in Conducting a Cost-Benefit Analysis

- Quantify Agricultural Benefits
- Account for Trade and Market Access Benefits
- Value Food Security and Dietary Diversity
- Consider Environmental and Health Impacts
- Include Program Costs and Efficiency Gains
- Calculate Benefit-Cost Ratios or Returns on Investment
- Incorporate Time Horizon and Sustainability

have shown returns of $17 for every $1 invested, with cumulative effects increasing over time. Multi-year analyses using net present value (NPV) approaches highlight the long-term sustainability and growing legacy of minor use programs, reinforcing their value as strategic public investments (see **Appendix D** for full cost-benefit analysis descriptions and case examples).

C. Crop Grouping and Codex Classification

Crop grouping is a key tool for improving efficiency in minor crop registrations. By categorizing botanically and morphologically similar crops into groups, regulators can extrapolate residue and efficacy data from one representative crop to others, reducing the need for separate trials on each minor crop. This approach, grounded in the Codex Classification of Foods and Feeds and aligned with various national schemes, streamlines pesticide approvals and facilitates MRL establishment (see **Appendix E** for full principles of crop grouping).

Representative crops are selected based on morphology, growth habit, edible portion, and likely pest exposure, ensuring that data reflect a "worst-case" scenario for safety. For example, residue data from tomatoes and bell peppers can be extrapolated to other fruiting vegetables such as eggplant, okra, and chili peppers. Aligning national crop groups with Codex standards allows countries to accept international data, harmonize MRLs, and support trade. Regulatory guidance from

Key Principles for Establishing a Crop Group System

- Adopt or reference Codex Classification groups and commodity codes in national regulation
- Develop national crop group lists and identify representative crops for domestic testing
- Encourage data submissions to follow a group approach, reducing costs and increasing coverage
- Accept foreign trial data for representative crops where usage is comparable.
- Train regulatory staff in extrapolation principles and utilize resources like EPPO databases and FAO guidance
- Establish group MRLs to simplify compliance and expand minor crop access to pest control tools

Codex, OECD, and EPPO provides principles and databases for scientific extrapolation.

By leveraging crop grouping and Codex classifications, countries can extend pesticide tools to many minor crops efficiently, promoting sustainable agriculture without proportional increases in regulatory workload.

D. Approaches to Registering Minor Uses in a Resource-Constrained Environment

For developing countries and smaller economies, generating extensive local data for minor crop registrations can be daunting. Regulators can instead leverage existing work and focus resources strategically - a concept often called "resource rationalization"[87]. Key approaches include:

1) **Acceptance of Foreign Data (Mutual Acceptance of Data):** Authorities can rely on residue and efficacy studies from other countries with similar agricultural conditions, reducing the need for full local trials[88][89]. OECD standards and FAO guidance provide frameworks for assessing comparability, allowing developing countries to cut costs by using international studies.

2) **Data Bridging and Recognition of Evaluations:** Regulators can review risk assessments conducted by trusted authorities (e.g., U.S. EPA, EFSA, APVMA) and adapt conclusions to local conditions[51]. Bridging assessments focuses on meaningful differences, such as climate-adjusted pre-harvest intervals, rather than repeating full evaluations.

3) **Regulatory Flexibility and Streamlined Procedures:** Simplified registration pathways allow waiving or reducing data requirements for minor uses[94]. Minor crops with low dietary exposure may not need full risk assessments if major crop data exist.

4) **Use of Codex and International MRLs:** Adopting Codex MRLs enables authorities to approve minor uses efficiently without local trials, while facilitating trade and aligning national standards with international benchmarks.

5) **Regional Collaboration and Work-Sharing:** Neighboring countries can share trials, risk assessments, and efficacy reviews[95]. Regional working groups and FAO support allow countries to pool expertise and data, reducing duplication and building capacity.

6) **Public-Private Partnerships for Data:** Universities, extension services, and industry can support minor use trials through collaboration or incentives, such as data protection, reduced fees, or expedited reviews[24][98]. Donor-funded projects can also help fill data gaps[96][97].

7) **Leveraging the FAO Pesticide Registration Toolkit:** The FAO Toolkit provides detailed guidance on resource rationalization, data extrapolation, and bridging, helping authorities determine when local data are essential versus when international or regional evaluations suffice[87][100][86].

8) **Efficacy Considerations and EPPO Standards:** EPPO guidance (PP 1/224) allows extrapolating efficacy data from related crops or pests[60][61]. Limited local demonstration trials or overseas data can confirm performance without extensive testing[101][102].

9) **Risk Mitigation and Adaptive Management:** Where uncertainty exists, registrations can proceed with restrictions (e.g., limited sprays or longer pre-harvest intervals) and ongoing monitoring. Adaptive management ensures minor uses are introduced safely while data gaps are addressed.

By applying these approaches, even small regulatory authorities can approve minor uses efficiently, improving crop protection, supporting trade, and enhancing agricultural sustainability.

Key Principles for Registering Minor Use Products in Resource-Constrained System

- Utilize Existing International Data and Assessments
- Implement Crop Grouping and Data Extrapolation
- Streamline Regulatory Procedures
- Promote Regional and International Collaboration
- Engage Public-Private Partnerships and Donors
- Follow International Guidelines



III. Strategy Principles for Developing a Minor Use Program

Implementing a national minor use pesticide program requires a structured, phased approach that aligns with national agricultural priorities, regulatory frameworks, and available resources. Below are key strategic steps and recommendations for regulators to consider:

1. Establish Clear Definitions and Priorities

- **Define "Minor Use" and "Minor Crop":** Develop national definitions based on acreage, economic value, and dietary significance. Align these definitions with international standards, such as those from Codex Alimentarius, to facilitate data acceptance and harmonization.
- **Conduct Stakeholder Consultations:** Engage with growers, commodity groups, and researchers to identify critical pest management needs. Utilize surveys, workshops, and advisory panels to gather input and set priorities.
- **Develop a National Priority List:** Create a transparent, regularly updated list of high-priority minor uses and crops. This list should guide resource allocation and inform data generation efforts.

2. Build Collaborative Partnerships

- **Public-Private Partnerships:** Foster collaborations between government agencies, agricultural research institutions, and the private sector. These partnerships can facilitate data sharing, joint research initiatives, and the development of innovative pest management solutions.

- **Regional and International Collaboration:** Participate in regional initiatives and international networks, such as the OECD Expert Group on Minor Uses and the FAO Minor Use Pesticide Program, to share data, harmonize MRLs, and reduce duplication of efforts.
- **Engage with Donors and NGOs:** Seek support from international organizations and non-governmental organizations to fund data generation, capacity building, and outreach activities.

3. Streamline Regulatory Processes

- **Adopt Flexible Regulatory Pathways:** Implement expedited registration processes for minor uses, including the acceptance of foreign data where appropriate, to reduce the time and cost associated with approvals.
- **Utilize Crop Grouping and Extrapolation:** Employ crop grouping methodologies to extend data from representative crops to related species, thereby reducing the need for extensive testing. Align national crop groups with Codex classifications to facilitate international data acceptance.
- **Establish Group MRLs:** Set maximum residue limits for entire crop groups rather than individual commodities to simplify compliance and expand access to pest control tools.

4. Invest in Data Generation and Capacity Building

- **Develop Domestic Research Infrastructure:** Establish or strengthen laboratories and field research centers that adhere to Good Laboratory Practices (GLP) to generate reliable data for pesticide registration.
- **Train Regulatory and Research Personnel:** Provide training on data generation, risk assessment, and regulatory procedures to build national capacity and ensure high-quality submissions.
- **Leverage International Guidelines and Tools:** Utilize resources such as the FAO Pesticide Registration Toolkit and OECD guidance documents to inform data generation and regulatory practices.

5. Monitor, Evaluate, and Adapt

- **Track Program Performance:** Establish metrics to monitor the effectiveness of the minor use program, including the number of registrations, stakeholder satisfaction, and trade impacts.
- **Conduct Cost-Benefit Analyses:** Regularly assess the economic and social benefits of the program to justify continued investment and inform policy decisions.
- **Adapt to Emerging Needs:** Stay responsive to changes in pest pressures, crop production practices, and market dynamics by regularly updating the priority list and program strategies.

6. Ensure Sustainability and Long-Term Impact

- **Secure Stable Funding:** Identify sustainable funding sources, including government budgets, grants, and industry contributions, to support the ongoing activities of the minor use program.
- **Promote Public Awareness:** Educate stakeholders about the benefits of the minor use program to garner support and encourage participation.
- **Foster Policy Integration:** Integrate minor use considerations into broader agricultural and trade policies to ensure alignment and maximize impact.

By following these strategic steps, regulators can establish a robust and effective minor use pesticide program that addresses the unique challenges of minor crops and pest management needs. This approach not only enhances agricultural sustainability but also supports food security, trade competitiveness, and environmental stewardship.



IV. Summary

This guidance outlines a practical toolkit for countries to address the systemic minor-use gap. Core elements include clearly defining “minor crop/minor use,” establishing cyclical public–private partnerships to identify grower needs, and implementing internationally aligned approaches: adopting Codex crop groups and commodity codes; using representative crops and scientifically justified extrapolation to set group MRLs; accepting foreign data and bridging trusted evaluations; and applying OECD/EPPO guidance to extrapolate efficacy and crop safety.

Authorities can take staged actions to move from principle to practice. In the near term, this includes formalizing definitions and priority-setting processes, adopting Codex standards and guidance on data acceptance, piloting high-priority minor uses using foreign residue data and extrapolation, and instituting simple performance metrics. Over the medium term, countries can selectively build laboratory and trial capacity (often through regional work-sharing), integrate pollinator and high-hazard pesticide management into labels and review criteria, and establish coordination platforms to avoid duplication and maintain a responsive regulatory pipeline.

When implemented with discipline and flexibility, these measures narrow the minor-use gap and produce multiple co-benefits: safer working conditions and foods, reduced losses of nutrient-dense crops, enhanced biodiversity through diverse cropping patterns and selective tools, and stronger competitiveness in regional and global markets. Crucially, they create a durable policy feedback loop—needs identification, data mobilization, regulatory decision, and outcome monitoring—that adapts to evolving pests, climate pressures, and trade requirements. Minor-use programs are therefore not a niche reform but a strategic investment in the resilience, nutrition, sustainability, and competitiveness of national agriculture.



Appendix A

Defining "Minor Crops" and "Minor Uses"

There is no single internationally accepted definition of a "minor crop." National and regional definitions vary, reflecting differences in agriculture, climate, diets, and economic priorities. The Food and Agriculture Organization (FAO) broadly defines "minor uses" of pesticides as those uses where either the crop is of low economic importance at the national level (a minor crop), or the pest/disease itself is of minor significance on a major crop.

Key elements governments consider when defining minor crops and uses include:

- **Extent of cultivation area or production volume:** e.g., in the United States, any crop grown on ≤300,000 acres is considered minor; in the EU, thresholds of a few thousand hectares are common.
- **Dietary and trade significance:** crops with broad dietary or export importance may be deemed major, even on small areas.
- **Economic value and return on investment:** high-value crops (fruits, vegetables, ornamentals) may still be minor if their aggregate value is too low to attract pesticide industry investment.

Countries adapt these criteria to their contexts. For example, Ireland treats crops >10,000 ha as major; Lithuania and Germany have historically used <5,000 ha as a cutoff but considered raising it to 10,000 ha. Thailand has used <30,000 metric tons/year as a threshold.

Summary:

In summary, a "minor crop" generally refers to a crop with limited acreage or production, while a "minor use" extends either to those crops or to occasional/localized uses on major crops. The FAO Pesticide Registration Toolkit and OECD guidance recommend that definitions rely on measurable criteria (acres/hectares, economic importance, dietary intake) but remain flexible to evolving agricultural realities. Clear national definitions provide the foundation for the scope of minor use programs.

Appendix B

The Minor Use Gap and International Responses

Minor crops often lack registered pesticides because the cost of generating full data packages (residue, efficacy, toxicology, and environmental studies) can reach hundreds of thousands or even millions of dollars, far more than companies can recover from sales on small markets. This creates the “minor use gap”: growers face serious pest problems but have few legal, safe, or effective pest control options.

Impacts of the Minor Use Gap:

- **Food safety and legality:** Farmers may resort to off-label use, resulting in unapproved residues and potential trade rejections.
- **Yield and biodiversity:** Uncontrolled pest outbreaks can devastate harvests, discourage cultivation of minor crops, and erode agricultural diversity.
- **Trade disruptions:** If a pesticide is not registered for a crop, no Maximum Residue Limit (MRL) is set. Even trace residues can then make shipments non-compliant, creating barriers to export and import.

International Efforts:

Over the past two decades, international collaboration has grown to address these challenges:

- **Global Minor Use Summits (GMUS):** Since 2007, these summits have convened FAO, regulators (e.g., U.S. EPA, Canada PMRA), research groups (such as the U.S. IR-4 Project), and industry. They identified key action items including improved international data sharing, capacity-building in developing countries, greater Codex engagement to support minor crops, and joint research projects.
- **Codex role:** The Codex Committee on Pesticide Residues (CCPR) has revised food classifications and developed guidance for data extrapolation, enabling group MRLs that better accommodate minor crops.
- **OECD guidance:** OECD has issued recommendations to harmonize definitions of minor uses and provide incentives for industry to register them.

National Minor Use Programs:

Building on these global initiatives, many countries have established national minor use programs. These programs:

- Identify and prioritize grower needs.
- Generate or coordinate the necessary residue and efficacy data.
- Submit registration or label expansion requests for minor uses.
  They typically operate through partnerships between government agencies, growers, and the crop protection industry, ensuring that solutions are practical and sustainable.

Summary:

The minor use gap reflects a market failure that threatens food safety, biodiversity, and trade. International efforts, including GMUS, Codex, and OECD initiatives, highlight a shared commitment to maintaining pest management options for minor crops. National programs provide the mechanism to deliver these solutions on the ground, supporting both growers and sustainable food systems.

Appendix C

National Minor Use Programs – Comparative Case Studies

Minor use programs worldwide vary in size, resources, and approach, but all share the goal of ensuring pest management solutions for minor crops. Below is a comparative overview of selected models, highlighting structures, strategies, and lessons learned.

United States – IR-4 Project (Public Sector-Led Model)

- **Structure:** Federally funded program (est. 1963) led by USDA and land-grant universities; works closely with EPA.
- **Process:** Growers and researchers identify needs annually; IR-4 prioritizes projects, conducts residue and efficacy trials, and prepares data for EPA. Registrants submit label amendments.
- **Strengths:** Large public investment, grower-driven priorities, rigorous data generation, close regulator coordination.
- **Impact:** Supports >50% of all U.S. minor use/specialty crop registrations; contributes ~$9B to GDP and 100,000+ jobs annually; provides data to Codex for global MRLs.
- **Lesson:** Strong public sector leadership and grower engagement create a “gold standard” model, though resource-heavy.

Canada – Pest Management Centre Minor Use Program (Joint Government-Industry Model)

- **Structure:** Government-led program within Agriculture and Agri-Food Canada, working with Health Canada’s PMRA.
- **Process:** Annual national workshop to prioritize grower requests; government-funded trials; data submitted via registrants.
- **Strengths:** Transparent priority-setting, national coordination across diverse climates, close alignment with U.S. IR-4.
- **Impact:** Hundreds of new registrations, including reduced-risk and biopesticide options; improved competitiveness for Canadian growers.
- **Lesson:** Collaboration with industry and cross-border partners enhances efficiency and export opportunities.

Brazil – National Minor Use Initiative (Regulatory Innovation)

- **Structure:** Regulatory reforms (2010–2011) created crop groups and allowed data extrapolation. EMBRAPA (public research) is building capacity to generate data.
- **Process:** Representative crops serve as data sources for grouped crops; regulatory incentives encourage industry support.
- **Strengths:** Aligns with Codex/OECD crop groupings; increases efficiency by covering multiple crops per registration.
- **Impact:** Expanded registrations for fruits and vegetables, including safer, modern products.
- **Lesson:** Regulatory innovation (grouping/extrapolation) can lower barriers; gradual public-private capacity-building is key.

Malaysia – Emerging Efforts (Developing Country Context)

- **Structure:** No dedicated national program yet; relies on partnerships with international organizations (e.g. Minor Use Foundation, ASEAN collaboration).
- **Process:** Joint field trials (e.g. papaya fungicide), acceptance of foreign data, use of FAO's Pesticide Registration Toolkit.
- **Strengths:** Leverages external expertise and regional cooperation; regulatory flexibility to bridge data gaps.
- **Impact:** Improved access to tools for key export crops (e.g. durian, pepper, papaya).
- **Lesson:** Even without large budgets, partnerships and data-bridging can provide workable solutions.

European Union – Coordinated Framework (Regional Collaboration)

- **Structure:** EU Regulation (1107/2009) allows extensions of use; the Minor Uses Coordination Facility (MUCF) supports information-sharing.
- **Process:** Member States use Article 51 to extend registrations; MUCF manages a central database (EUMUDA); EPPO provides standards and extrapolation tables.

- **Strengths:** Regional coordination, work-sharing, industry incentives (data protection extensions).
- **Impact:** Expanded minor use authorizations across Europe; reduced duplication; smaller countries benefit from pooled resources.
- **Lesson:** A central coordination body (MUCF) and harmonized standards make multi-country cooperation feasible.

Australia – Minor Use Permit System (Industry-Driven Approach)

- **Structure:** APVMA issues time-limited "minor use permits"; requests often led by grower groups or industry.
- **Process:** Industry funds trials; government provides limited support through initiatives (e.g. Improved Access to Agvet Chemicals).
- **Strengths:** Flexible, relatively fast response to emerging needs; strong role for industry groups.
- **Impact:** Dozens of permits issued in recent years; supports horticulture, nuts, forestry, and other specialty sectors.
- **Lesson:** A permit-based system can work without heavy government funding, especially if industry is well-organized.

Key Takeaways Across Models

Across diverse national experiences, several common principles and lessons stand out for designing effective minor use programs:

- **Grower-Centric Needs Assessment:** Successful programs actively involve growers in setting priorities—through structured workshops (U.S., Canada), industry networks (Australia), or informal consultation (developing countries). This ensures resources are targeted at the most pressing pest management gaps.
- **Public-Private Partnerships:** Cooperation between government agencies, research institutions, industry, and growers is universal. Governments often lead coordination and fund research, while companies provide products, data, or submission support. Grower associations articulate needs and sometimes co-fund trials. Partnerships are cyclical and adaptive, revisiting priorities as pests, crops, and markets evolve.

- **Data Generation and Sharing:** Generating residue, efficacy, and crop safety data is central. Efficient programs maximize value by sharing results nationally and internationally, using extrapolation methods, and leveraging mechanisms such as the EU's MUCF or IR-4's Codex submissions. Work-sharing prevents duplication and stretches limited budgets.
- **Regulatory Flexibility:** Tools like crop grouping, extrapolation, permits, data waivers, fast-track reviews, and foreign data acceptance reduce regulatory hurdles. Incentives such as extended data protection can encourage industry participation. Programs thrive when the regulatory system is responsive, proportionate, and supportive of minor crop needs.
- **Regional and International Cooperation:** Engagement with Codex, OECD, and cross-country trial networks enhances harmonization, reduces duplication, and supports trade by aligning MRLs and safety standards.
- **Adaptability to Local Context:** Each country has tailored its model to its resources and agricultural realities, but the underlying principles—grower-driven priorities, partnerships, data efficiency, and regulatory innovation—are broadly transferable.

Summary:

In summary, there is no one-size-fits-all program structure, but any country can draw on these best practices. A developing country might start with a simple priority list and permit approvals, then evolve toward more data generation capacity and formalized processes as resources allow. The guiding principle is to engage stakeholders and use innovative regulatory and scientific approaches to bring much-needed crop protection tools to minor crop farmers, thereby strengthening the overall food system.

Appendix D

Principles of Minor Use Program Cost-Benefit Analyses

Establishing and maintaining a minor use program requires investment of both public and private resources. To design a sustainable program and justify funding, policymakers should conduct a cost-benefit analysis (CBA) that captures tangible and intangible impacts of addressing minor crop needs.

Quantify Agricultural Benefits: Minor use registrations prevent crop losses and improve yields and quality. Analyses should estimate the economic value of these benefits. For example, preventing a 30% yield loss in a $10 million/year chili pepper industry yields $3 million in annual benefit. Summing across supported crops provides a total grower benefit. High-value minor crops can yield disproportionately high returns. The U.S. IR-4 Project's economic assessments found its work contributes billions of dollars to specialty crop production; in 2021, IR-4 was estimated to add $8.97 billion to U.S. GDP and support 111,000 jobs [28]. Australia's APVMA estimates that each dollar invested in its Improved Access to Agvet Chemicals program generates $117 in economic value [29].

Account for Trade and Market Access Benefits: Minor use registrations often enable exports or prevent trade disruptions. Meeting foreign MRL standards can unlock markets worth millions annually, while unregistered uses may block access entirely. Avoiding rejected shipments and related costs is another quantifiable benefit.

Value Food Security and Dietary Diversity: Minor crops contribute to nutrition and food security, including indigenous vegetables, pulses, and fruits. Ensuring these crops are successfully grown supports healthier diets, reduces long-term healthcare costs [68], and improves livelihoods for smallholders. These social benefits should be acknowledged, even if qualitative.

Consider Environmental and Health Impacts: Well-run programs can promote safer pesticide options, reducing environmental contamination and improving farmworker safety. Introducing IPM-compatible products for minor crops can reduce broad-spectrum chemical use and yield ecosystem benefits. These positive externalities align with sustainable agriculture goals and strengthen the policy case.

Include Program Costs and Efficiency Gains: Program costs include research trials, lab analyses, regulatory staff time, and administration. Efficiency gains arise from coordinated efforts, which prevent duplicative studies and costly emergency responses when pests go unmanaged. Use of foreign data and crop extrapolation reduces the need for repeated trials, amplifying the value of each dollar spent.

Calculate Benefit-Cost Ratios or Returns on Investment: Quantifying benefits and costs enables calculation of BCRs or ROI. Mature programs often show very high returns: IR-4 reports ~$17 in direct economic benefits per $1 of core funding, with even larger returns when secondary economic effects are included [28,69]. Similar studies in Canada and the EU show that modest investments yield large multiples in crop value and trade benefits. High BCRs provide a strong rationale for funding.

Incorporate Time Horizon and Sustainability: Minor use benefits persist over multiple years; registrations today continue to provide grower benefits for years to come. CBAs should capture multi-year streams of benefits and costs, using net present value (NPV) approaches over 10-year horizons. Past investments accumulate, creating a compounding effect: each year's production benefits from all prior minor use registrations [70]. This long-term perspective reinforces the sustainability and strategic value of minor use programs.

Summary:

In summary, a cost-benefit analysis gives policymakers a clear, evidence-based case for investing in a minor use program. By weighing agricultural, trade, food security, and environmental benefits against program costs, and by capturing the multi-year, compounding nature of those benefits, countries can show that minor use programs return far more than they cost. A well-constructed CBA is therefore both a planning tool and a strong rationale for sustained public and private support.

Appendix E

Principles of Crop Grouping and the Codex Classification Code

Crop grouping is a key tool to improve the efficiency of minor crop pesticide registrations. It allows regulators to extrapolate residue and efficacy data from one crop to others that are botanically and morphologically similar, reducing the need for separate datasets for each minor crop. Authorities can therefore require data on a representative crop and extend registration and MRLs to the entire group. This approach is rooted in the **Codex Classification of Foods and Feeds (CAC/MISC 4-1989)** and national schemes aligned with Codex.

Crop Grouping Concepts and Benefits

Crops are grouped based on morphology, growth habit, edible portion, and pest exposure. Codex classifications include Fruiting Vegetables, Leafy Vegetables, Citrus Fruits, Small Berries, and subgroups. Representative crops within each group allow residue trials and efficacy data to cover other group members. For example, a tolerance established on one pepper variety can apply to all peppers, or wheat data can extend to other cereals. Recent Codex revisions (2017–2018) expanded coverage to herbs, spices, edible fungi, and grasses, reflecting the importance of minor crops. Harmonizing national crop groups with Codex facilitates MRL extrapolation, mutual recognition, and the use of JMPR evaluations for domestic or import tolerances.

Example: Residue trials on tomatoes and bell peppers (representative of Fruiting Vegetables) can be extrapolated to eggplant, okra, and chili peppers. Codex has recognized similar extrapolations, such as using chili and sweet peppers to set MRLs for eggplants. This scientifically justified approach reduces data requirements, streamlines regulatory processes, and benefits minor crop producers. The EU uses similar logic, with group tolerances and detailed extrapolation guidance from EFSA and EPPO.

From a regulatory perspective, crop grouping lowers costs for both regulators and registrants. As APVMA notes, it allows inclusion of minor crops on labels without additional permits and reduces the need for multiple trials. Companies are more likely to register minor crops if one dataset can unlock multiple markets. Developing countries can accept foreign data aligned with Codex or major regulator group tolerances, even if local trials on specific minor crops are lacking.

Codex Classification Codes and Implementation

Each commodity has a unique Codex code (e.g., FT 0305 for mango, VA 0385 for spinach), used in MRL tables and national databases. Incorporating these codes aids clarity, facilitates harmonization, and allows countries to adopt group MRLs efficiently. OECD and FAO guidance, including Codex CXG 84-2012, provides principles for selecting representative crops and applying extrapolation. Representative crops are typically worst-case scenarios with higher residue potential, and grouping considers similar growth habit and edible portion.

Countries may develop their own crop group lists if none exist. For instance, Brazil groups crops by edible peel and botanical traits while maintaining compatibility with Codex. Using international standards aligns with WTO SPS Agreement obligations, which favor basing measures on established guidelines, including Codex, OIE, and IPPC standards. EPPO's 82 extrapolation tables, now searchable online, are another resource to support scientifically justified extrapolation globally.

Key Recommendations for Policymakers

- Adopt or recognize Codex Classification groups and commodity codes in national regulation.
- Develop national crop group lists and identify representative crops for domestic residue and efficacy testing.
- Encourage or require minor use data submissions to follow a group approach. Consider a single application fee covering a group.
- Accept foreign trial data on representative crops if domestic usage patterns are comparable.
- Train reviewers in extrapolation principles and provide access to EPPO and FAO resources.
- Establish group MRLs in national regulations where possible, simplifying compliance and expanding minor crop access.

Summary:

By implementing crop grouping and Codex classification codes, countries can increase the number of minor crops with pesticide tools available without proportionally increasing workload or data requirements. This represents a smart regulatory approach that supports sustainable agriculture.

Appendix F

Approaches to Registering Minor Uses in Resource-Constrained Environments

For developing countries and smaller economies, generating extensive local data for minor crop registrations can be challenging. Resource-constrained authorities can employ strategies to leverage existing work and focus efforts efficiently - often called “resource rationalization.” Key approaches include:

- **Acceptance of Foreign Data (Mutual Acceptance of Data):** Authorities can rely on residue and efficacy studies from other countries with similar agricultural conditions, avoiding costly local trials. OECD-compliant data are widely accepted, and regional collaborations (e.g., ASEAN) facilitate sharing of trials. FAO guidance provides criteria to assess data comparability.
- **Data Bridging and Recognition of Evaluations:** Regulators can review assessments conducted by trusted authorities (e.g., U.S. EPA, EU EFSA, APVMA) and accept conclusions under local conditions with minimal adjustments. This reduces workload and allows focus on local differences, such as pre-harvest intervals or application rates.
- **Regulatory Flexibility and Streamlined Procedures:** Simplified minor use registration pathways can reduce or waive certain data requirements. Authorities may streamline efficacy or dietary risk assessments proportionally to the scale of use, right-sizing evaluations to actual risk.
- **Use of Codex and International MRLs:** Adopting Codex MRLs for minor crops allows safe use approvals with minimal effort, supporting both domestic safety and export opportunities. Registration can be as simple as aligning domestic approvals with Codex MRLs when usage patterns are comparable.
- **Regional Collaboration and Work-Sharing:** Neighboring countries can divide tasks, share data, or mutually recognize evaluations. Successful examples include Central American countries aligning minor use data requirements and African regional initiatives under the AU. International or regional bodies (e.g., FAO) can facilitate such cooperation.

- **Public-Private Partnerships for Data:** Universities, extension services, and industry can generate minor use data, sometimes supported by donors or incentive programs. Examples include EU-funded projects in ACP countries and data protection or fast-track registration incentives, as in Brazil and the U.S.
- **Leveraging FAO Toolkit and Guidelines:** The FAO Pesticide Registration Toolkit provides stepwise guidance on resource rationalization, data extrapolation, bridging, and work-sharing. Authorities can systematically decide when full datasets are needed versus when international data suffice.
- **Efficacy Considerations and EPPO Standards:** Minor crop efficacy can often be inferred from related crops or overseas data, supplemented with limited local demonstration trials if needed. EPPO's minor use standards and extrapolation tables provide guidance to ensure products will work under local conditions.
- **Risk Mitigation and Adaptive Management:** Authorities can grant registrations with restrictions (e.g., limited sprays, extended pre-harvest intervals) and monitor outcomes. Adaptive management allows minor uses to be approved safely even with incomplete local data, with controls relaxed as evidence supports safety and efficacy.

Summary:

Even resource-limited agencies can advance minor use approvals by:

- Leveraging existing international data and assessments
- Grouping crops and extrapolating results
- Simplifying regulatory requirements for minor uses
- Collaborating regionally and internationally
- Engaging industry, donors, and universities
- Following international guidelines (FAO, OECD, EPPO)

By implementing these approaches, small regulatory agencies can significantly expand access to minor use pesticides, supporting crop protection, food security, and agricultural sustainability without overextending their capacity.