

Curriculum for Vocational Schools: “Availability and Cultivation of Traditional Seeds and Breeds as Nature Capital for Rural Innovation and Regional Awareness”

This curriculum aims to equip vocational school students with a comprehensive understanding of the importance, management, and promotion of traditional landraces and livestock breeds as keystones of rural innovation and regional identity. It blends theoretical knowledge with hands-on examples from across Europe. The program is composed of four modules that build on each other but also can be used individually.

Module 1: Management of Seeds and Breeds

Module 2: Cultural Heritage and Local Identity

Module 3: Public Incentives and Product Market Access

Module 4: **Managing Recent Rural Challenges**









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Module 1: Management of Seeds and Breeds

This module focuses on the practical aspects of management and cultivation of traditional seeds and breeds that ensure the availability. It introduces students to the different approaches and organizational models of breeding and seed production, explores the role of seed production and dissemination, and presents European case studies that illustrate effective practices and innovation in the field.

1.1 Introduction

1.1.1. Definition and Importance

- Nature of diversity: Plant diversity includes varieties, landraces, and ecotypes, with significant genetic variation within varieties. Animal diversity is seen in breeds with defined phenotypes and genetic variation both within and across breeds.
- Traditional crop varieties and livestock breeds: Explanation of their role as elements of biological and genetic diversity in European rural regions.
- Genetic resources as natural capital: Their necessity for agricultural stability, adaptability, rural development, and tourism.
- Climate adaptation role: Local plant varieties are essential for coping with drought, pests, and soil constraints. Local animal breeds are adapted to harsh climates and low-input systems, providing resilience in extensive and challenging landscapes.

1.1.2 Threats to Diversity

- Reduction in cultivation and breeding: Effects of replacement by high-yield commercial breeds and varieties.
- Consequences: Genetic erosion and loss local varieties and adaptability, declining breeder numbers, and inbreeding.

1.1.3 Conservation Approaches

- Biological unit conserved: Plants with conservation focuses on seeds, pollen, vegetative tissues, and whole plants; animals with conservation targets breeds, populations, individual animals, semen, and embryos.
- In situ conservation: Farmer-driven maintenance of diversity on-farm.
- Ex situ conservation: Under controlled environment for plants in seed banks and cryopreservation, for animal semen/embryo banks and cryopreservation.
- In situ advantages for plants are the ongoing adaptation and co-evolution with the environment, supports farmer-led selection; for animals are the preservation of full phenotype, social behaviours, and adaptation to local systems, supporting traditional practices.

- Ex situ advantages for plants are the low space and cost that allows long-term viability under controlled storage, for animals are the effective store of genetic material but expensive and no preservation of behaviour or performance traits.

1.2 Community Seed Banks and Participatory Plant Breeding

1.2.1 Community Seed Banks (CSB)

- Purpose: Local seed preservation and sovereignty.
- Functions: Conserving/reintroducing germplasm, community seed access, local empowerment.
- Response to challenges: Role in disaster response, climate adaptation, and underused species conservation.

1.2.2 Participatory Plant Breeding (PPB)

- Definition: Decentralizing breeding to include local farmers and communities.
- Process: Farmer involvement in selection, adaptation to local conditions, and continual improvement.
- Benefits: Faster adoption, better adaptation, increased diversity and resilience.

1.2.3 Case Studies and Experiences from Practice

- VASO Participatory Maize Breeding (Portugal): Collection and selection of maize landraces, local competitions, and farmer-driven improvements.
- ANCRA (Arouquesa Cattle, Portugal): Breed preservation, DOP certification, and sustainable breeding practices.
- Cika Cattle Breeders Association (Slovenia): Conservation of indigenous breeds, training, exhibitions, and trade facilitation.
- Bohinj Flint Maize (Slovenia): Revival of “Trdinka” maize.
- S. Pedro do Sul Bean Inventories (Portugal): Preservation through inventories.
- Regional Breeding Competitions: Events that promote local identity and community engagement.
- Demonstration Field “Dubina” (Germany): Practical cultivation and education about traditional crops.
- Covas do Monte Demonstration Field (Portugal): Organic agriculture on traditional crops for food self-sufficiency.
- Saxonian Livestock Conservation (Germany): Projects to conserve Saxony chicken and Red Mountain Cattle through breeding.



1.3 Production of Seeds and Breeds: Ensuring Availability and Quality

1.3.1 General Aspects of Reproduction and Breeding

- Plants: Controlled through pollination systems (selfing, outcrossing).
- Animals: Managed via controlled mating systems, with inbreeding risks if populations are small.

1.3.2 Population Management

- Plants: Focuses on seed viability, regeneration cycles, and maintaining genetic heterogeneity.
- Animals: Involves managing effective population size, avoiding genetic bottlenecks, and tracking pedigrees.

1.3.3 Storage & Longevity

- Seeds can be stored for decades to centuries at −18°C, ensuring long-term preservation.
- Semen and embryos need specialized cryogenic facilities, and their viability can vary depending on species and storage conditions.

1.3.4 Models of Seed Production

- Farmers' own seed production: On-farm preservation and storage; advantages in cost and accessibility.
- Centralized certified seed production: Higher quality control, but often more expensive and less tailored to local needs.
- Decentralized seed production models: Networks of local producers, balancing quality and local adaptation.

1.3.5 Traditional Seed Storage and Quality Assurance

- Traditional technologies and practices: Pre- and post-harvest processing to maintain seed viability.
- Quality perceptions: Differences between farmers' and formal seed systems in evaluating seed quality.
- Role of local seed enterprises: Importance of embedding seed producers in broader sector networks for recognition and demand.

1.4 Seed Dissemination: Networks and Exchange

1.4.1 Sources of Planting Material

- Farm-saved seeds: The backbone for smallholders, but often insufficient to meet all needs.
- External sources: Supplementing own production with exchanged, purchased, or gifted seeds.

1.4.2 Seed Exchange Networks

- Structure and function: Sharing among relatives, neighbours, and friends; includes gifting, barter, and sales.
- Benefits**:** Maintains agrobiodiversity, cultural identity, and resilience to shocks.
- Scaling up**:** Challenges in moving from isolated local initiatives to broader regional or national networks.

1.4.3 Regulatory Frameworks

- Plants are governed by seed laws, certification rules, and the FAO Treaty on Plant Genetic Resources.
- Animals are regulated through herdbooks, breed standards, and the FAO Global Plan of Action for Animal Genetic Resources.

1.4.4 Case studies and Experiences from Practice

- Sementes Vivas, Portugal**:** Commercial enterprise recovering and marketing traditional varieties. Network of 35 farmers producing organic and biodynamic seeds. Registration of traditional varieties (e.g., Pau Roxo das Seis Marias carrot, Murtosa bean).
- VERN Association, Germany: Non-commercial network preserving and recultivating old and rare cultivated plants. Membership-based access to a diverse seed catalogue (1200+ origins). Educational outreach, research, and a propagation garden.
- Dreschflegel, Germany: Hybrid commercial and non-commercial network (18 gardening farms).Focus on propagating neglected old varieties and experimenting with new ones. Financial sustainability through breeding, propagation, and marketing of organic seeds.
- ZMAG Seed Exchange Fairs, Croatia: Biannual public seed exchanges for traditional Croatian varieties. Platform for organic seed collectors, community enrichment, and free seed movement.

1.5 Learning Activities

1.5.1 Discussion and Analysis

- Compare the strengths and weaknesses of in situ and ex situ conservation.
- Compare the advantages and challenges of centralized and decentralized seed production models.
- Debate the role of seed exchange networks in addressing biodiversity loss and climate change.
- Debate the value of certified seeds versus traditional farmer-saved seeds.



1.5.2 Collaborative Projects

- Create a poster or digital presentation on a local landrace or breed, including history, uses, and conservation status.
- Interview local farmers or breeders about their challenges and successes.
- Design a marketing campaign for a traditional crop seed, emphasizing its history, uniqueness, and environmental value.

1.5.3 Practical Activities

- Organize a mini breeding competition or variety taste-test.
- Design a small demonstration plot for a local traditional crop.
- Create a small seed exchange network within the school or local community.
- Local Variety Research: Investigate and document traditional crop varieties in the school's region.

1.6 Expected Outcomes

- Recognize the role of farmers in cultivating and innovating crop varieties.
- Define community seed banks and their main functions.
- Explore the role of CSBs in conserving and reintroducing germplasm.
- Understand how CSBs enhance seed and food sovereignty.
- Explain the concept and process of participatory plant breeding.
- Identify the benefits of decentralization and farmer participation in breeding.
- Recognize the importance of genetic diversity in breeding for local adaptation.
- Understand the practical challenges and successes of community-led breeding and conservation.
- Understand how seed exchange networks support genetic diversity and resilience.
- Understand legal and marketing aspects of seed dissemination.



Module 2: Cultural Heritage and Local Identity

This section explores how traditional landraces are not only resources for food production and biodiversity but also vital pillars of rural cultural heritage, local identity, and community pride. Students will learn how the preservation and revitalization of traditional breeds and crop varieties contribute to regional culture, community cohesion, and sustainable rural development.

2.1 Cultural Heritage & Traditional Knowledge

2.1.1 Significance of Traditional Landraces

- Historical roots**:** How traditional varieties and breeds reflect centuries-old practices, regional adaptation, and rural lifestyles.
- Role in cultural heritage**:** Local foods and farming methods as expressions of community identity and continuity.

2.1.2 Traditional Knowledge Systems

- Plants: Traditional seed saving, selection cycles, and seasonal adaptation are key knowledge systems.
- Animals: Pastoral knowledge, grazing patterns, and reproductive management are central to maintaining diversity.

2.1.3 Threats and Opportunities

- Aging knowledge keepers**:** The risk of losing valuable know-how as older generations retire.
- Empowering communities**:** Revitalizing traditions by engaging older and younger members, and supporting learning and innovation.

2.2 Extensive Use and Local Community Practices

2.2.1 Community-based Management of Extensive Use

- Traditional extensive use practices: As contemporary models for sustainable land management, biodiversity conservation, and the preservation of cultural identity.
- Role of community action: Collective rotational grazing, harvesting, and shared processing supports sustainable use, social cohesion and adaptive capacities in the face of changes.

2.2.2 Case studies and Experiences from Practice

- Arouquesa cattle (Portugal, Manhouce): Extensive, free-range grazing in mountains. High-quality beef with DOP status; local, decentralized slaughterhouse.

- Goat herding in Covas do Monte, Portugal: Communal grazing of native Serrana and Bravia goats. "Bio aldeia" (organic village) status; integration of livestock, landscape, and local gastronomy.
- Tepka Pears (Zasip, Slovenia): Historic famine crop; innovative uses (pear flour "Prga", brandy, compotes). Collective harvesting and drying; preservation of pear orchards and local landscape.
- Traditional Maize for Broa (Portugal): Local maize landraces for traditional maize bread. Changing practices and the threat of hybrid varieties; need for consumer and restaurant awareness.

2.3 Local Community Gatherings and Celebrations

2.3.1 Local community Gatherings and Festivals as Cultural Anchors

- Roots of gatherings and celebrations: Agricultural cycles, local foods, and communal rituals reflect the connection between people and landscapes.
- Role of community events: Showcasing local food and crafts, transmit tradition, and knit together generations in maintaining local identity.
- Demonstration of history and present: history and values are demonstrated as moments of development and identity of local community.

2.3.2 Case studies and Experiences from Practice

- Bean Festival (São Pedro do Sul, Portugal): Annual event celebrating with about 25 local bean varieties. Producers receive support, and local recipes are showcased—strengthening identity and social bonds.
- Cow's Ball / Cika Cattle Festival (Bohinj, Slovenia): Historic celebration of alpine grazing and return of cattle. Parade and traditional festivities; challenge of balancing tradition with growing tourism.
- Lusatian Fish Weeks (Germany): Autumn festivals in the Upper Lusatian Biosphere Reserve. Fresh fish, traditional fishing demonstrations, music, and crafts as part of living heritage.
- Prisnacfest (Obrovac, Croatia): Local culinary festival dedicated to prisnac, a traditional cheese-based dish of the region. The event brings together producers, artisans, and visitors to celebrate traditional food heritage, music, and community activities.
- Croatia's indigenous products: Lika Pramenka sheep (PGI lamb), Pag cheese, and heritage grape varieties. Branding and reintroduction in gastronomy, food events and agrotourism boost local pride and reputation.

2.3.3 Valuing Traditional Family Gardens

- "Harvest" project in Portugal: Family gardens as centres of social activities, self-sufficiency, healthy nutrition, and biodiversity. Higher nutrient content and authentic flavours in home-grown traditional varieties.



2.4 Learning Activities

2.4.1 Discussion and Reflection

- How do traditional crops and breeds shape local identity and pride?
- What are the dangers of losing traditional knowledge, and how can communities safeguard it?

2.4.2 Collaborative Project

- Interview local elders or farmers about traditional varieties or practices.
- Plan a mini-festival or exhibition to highlight a traditional crop or breed.

2.4.3 Practical Activities

- Organize a “heritage food day” at school, featuring local dishes and crops.
- Develop a local garden plot with traditional varieties, documenting cultivation and culinary uses.

2.5 Expected Outcomes

- Understand the historical and cultural importance of traditional crops and breeds in rural communities.
- Recognize the risks of losing traditional knowledge and the importance of intergenerational transfer.
- Learn how decentralized, extensive practices contribute to breed and crop conservation.
- Recognize the role of community events in maintaining and revitalizing local identity.
- Appreciate the multi-functional value of traditional family gardens for food, environment, and social life.
- Understand the role of local varieties in nutrition and biodiversity.



Module 3: Public Incentives and Product Market Access

This section highlights how public policies, incentive structures, and market access strategies support the conservation and sustainable use of traditional landraces. Students will explore funding opportunities, regulatory frameworks, and practical examples of adding value to local products, empowering rural innovation and reinforcing regional identity with economic models.

3.1.Public Incentives for Conservation and Innovation

3.1.1 Importance of Incentives

- Encouraging sustainable use**:** Economic and policy support increases success in conserving traditional seeds and breeds.
- Benefits to rural actors**:** Incentives compensate farmers and communities for extra efforts, encouraging ongoing participation in conservation.

3.1.2 EU Common Agricultural Policy (CAP)

- Pillar I: Voluntary Eco-Schemes**:** Short-term (1-year) incentives for environmental protection.
- Pillar II: Agri-environmental and climate schemes**:** Longer-term (5-year) voluntary commitments.
- Other instruments**:** LEADER (bottom-up rural development), EIP-Agri (innovation partnerships).

3.1.3 National and Regional Incentive Programs

- Portugal**:** Financial support for endangered native breeds based on extinction risk (e.g., Arouquesa cattle, with tiered aid levels).
- Croatia**:** National programs for traditional plant and animal genetic resources; annual payments for maintaining low-yield, valuable breeds; special support for native poultry.
- Germany**:** National programs coordinated federally, implemented by states with their own priorities; targeted subsidies for rare livestock; compensation for economic disadvantages from keeping endangered breeds.

3.2 Product Market Access and Value Creation

3.2.1 Adding Value to Local Plant Varieties and Animal Breeds

- Premium pricing**:** High-quality, culturally significant, and environmentally friendly products can justify higher prices and market positioning.
- Quality marks and labelling**:** Use of protected designation (e.g., DOP, PGI), territorial brands, and certificates to boost consumer trust and recognition.

3.2.2 Building Regional Value Chains

- Cooperation along the chain**:** Success depends on efficient collaboration between producers, processors, marketers, and consumers.
- Market access strategies**:** Utilizing farmers' markets, fairs, festivals, rural tourism, and gastronomy to reach consumers.

3.2.3 Case Studies and Experiences from Practice

- CERTRA Project (Traditional Cereals), Portugal**:** Creation of a value chain for local cereals, promotion of organic farming, and development of new market opportunities for quality products.
- Upper Lusatian Biosphere Value Chain, Germany**:** Revival and large-scale cultivation of old grain varieties (e.g., Champagne Rye) via cooperation between biosphere reserves, farmers, and bakeries.
- Territorial Brand "Bohinjsko/From Bohinj", Slovenia**:** Certification and promotion of regional products (food, handicrafts, experiences) based on quality and geographical origin. Partnership with local producers of Trdinka maize and Cika cattle; integration into tourism and gastronomy.
- São Pedro do Sul Farmers' Market, Portugal: Direct-to-consumer sales improve communication about landrace history and quality, offer better prices, and enhance local food identity through simple branding.
- "Os Amigos de Covas do Monte" Restaurant, Portugal**:** Local gastronomy featuring traditional dishes and homegrown ingredients; attracts visitors and supports rural tourism.
- Frika Festival (Soča Valley) Slovenia**:** Annual autumn event celebrating the return of Cika cattle and traditional cheese-making, blending cultural tradition with tourism and gastronomy.

3.3 Learning Activities

3.3.1 Discussion & Analysis

- Compare different types of public incentives and their impact on the conservation of landraces.
- Debate the pros and cons of benefits through public incentives vs. market access and branded value chains.

3.3.2 Practical Exercises

- Design a mock application for a public incentive program to preserve a local breed or crop.
- Develop a product label or territorial brand for a traditional variety, considering quality, origin, and marketing appeal.



3.3.3 Case Study Review

- Analyse a local or regional festival, market, or restaurant to assess its role in adding value to traditional landraces and supporting rural development.

3.4 Expected Outcomes

- Understand the structure and objectives of public funding programs for traditional landraces and breeds.
- Recognize the importance of financial and policy support in conservation and rural development.
- Learn how market access and value chain development can add value to products from traditional landraces.
- Understand the role of branding, quality marks, and direct sales in supporting rural economies.



Module 4: Managing Recent Rural Challenges

This final section addresses the urgent challenges facing rural communities, especially the generational shift, the need for economic opportunities, and the risk of losing traditional knowledge. It explores how traditional landraces, when integrated with rural tourism, sustainable agriculture, and digital innovation, can offer solutions for rural revitalization and regional resilience.

4.1. Generational Change and Knowledge Transfer

4.1.1 Aging Rural Populations

- Many rural communities are experiencing an aging population, with traditional knowledge holders retiring or leaving agriculture.
- Challenge: Preventing the loss of valuable know-how about landraces and rural practices.

4.1.2 Engaging Younger Generations

- Younger people need clear perspectives: income, benefits, public services, and affordable housing.
- Opportunities: Support for business ideas, innovation, and entrepreneurship, especially those that leverage the unique value of traditional landraces and attractive landscapes.

4.1.3 Immediate Action

- There is an urgent need for practical solutions that can deliver quick wins for rural youth and communities.

4.2. Synergy Between Rural Tourism and Sustainable Agriculture

4.2.1 Twin Pillars of Rural Revitalization

- Rural tourism and sustainable agriculture can work together to create new opportunities for young people.
- Each rural community should develop tailored approaches based on its unique assets, traditions, and personalities.

4.2.2 Role of Digital Connectivity

- Digital infrastructure is essential for modern rural development, enabling innovation, education, and access to markets.
- Digital tools can help promote landraces, connect producers with consumers, and support tourism initiatives.

4.2.3 Traditional Seeds and Breeds as Regional Identity

- Traditional seeds and breeds give rural regions a distinctive profile, raising awareness and attracting visitors.

- Chefs and local businesses can showcase old varieties and breeds in new culinary interpretations, setting trends and educating consumers.

4.3. Balancing Authenticity and Commercialization

4.3.1 Risks of Over-Tourism

- Turning rural heritage and landscapes into mere tourist attractions can lead to "touristification," where authenticity is lost and local identity is diluted.
- Challenge: Maintaining the balance between welcoming visitors and preserving genuine rural culture.

4.3.2 Role of Coordinating Organizations

- Biosphere reserves, municipalities, and regional stakeholder groups can help manage this balance.
- These organizations can integrate diverse interests, ensure sustainable tourism, and protect the core values of rural communities.

4.4. Learning Activities

4.4.1 Discussion and Reflection

- What are the main challenges facing rural youth, and how can traditional landraces be part of the solution?
- How can rural communities use tourism and agriculture together to create sustainable futures?

4.4.2 Practical Activities

- Develop a business plan for a rural enterprise that combines landrace cultivation with tourism or gastronomy.
- Design a digital campaign to promote a local landrace or rural tourism experience.

4.4.3 Role-Playing Exercise

- Simulate a community meeting where stakeholders debate how to balance tourism growth with the preservation of local identity.

5.5 Expected Outcomes

- Understanding the challenges faced by rural communities, especially generational change and the need for innovation.
- Combining rural tourism with sustainable agriculture, supported by digital innovation, to create new opportunities for young people and communities.
- Understanding strategies maintaining authenticity and local identity and avoiding “touristification” of rural culture.