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LEGAL AND INSTITUTIONAL BARRIERS TO HACCP IMPLEMENTATION IN UZBEKISTAN: A COMPARATIVE ANALYSIS BASED ON CENTRAL ASIAN EXPERIENCE AND THE GERMAN APPROACH

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Abstract. Food safety is an essential component of public health, agricultural development, food trade, and consumer protection. The Hazard Analysis and Critical Control Point (HACCP) system is internationally recognized as a preventive approach for identifying, evaluating, and controlling biological, chemical, and physical hazards throughout the food chain. This study examines the principal legal, institutional, and technical barriers affecting HACCP implementation in Uzbekistan and compares these challenges with selected principles of food safety governance applied in Germany and reflected in international standards.

A qualitative comparative approach was employed using international food safety standards, Codex Alimentarius principles, World Health Organization and Food and Agriculture Organization materials, ISO 22000 requirements, WTO sanitary and phytosanitary provisions, and publicly available information concerning food control systems. Particular attention was given to regulatory coordination, laboratory capacity, accreditation, personnel competence, documentation, traceability, and risk-based official controls.

The analysis indicates that effective HACCP implementation cannot be achieved solely through the preparation of HACCP plans at individual enterprises. Its effectiveness depends on the wider national food control infrastructure, including coherent legislation, clearly defined institutional responsibilities, competent laboratories, trained personnel, traceability mechanisms, and appropriate verification procedures. A phased implementation model is proposed for Uzbekistan, combining legislative harmonization, institutional capacity development, laboratory strengthening, professional training, digital traceability, and gradual expansion of HACCP-based management practices.

The study concludes that a coordinated national approach to HACCP can strengthen preventive food safety management while supporting consumer protection and improving the preparedness of food businesses for international market requirements.

Keywords: HACCP; food safety; Codex alimentarius; ISO 22000; Uzbekistan; food control system; accreditation; laboratory diagnostics; traceability; WTO SPS Agreement.

Introduction. Food safety is an important component of public health, economic development and international food trade. Contaminated food may contain biological, chemical or physical hazards capable of causing disease and economic losses. The World Health Organization's global estimates for 2010 indicated approximately 600 million cases of foodborne illness and 420,000 deaths annually, demonstrating the substantial public-health burden associated with unsafe food.

Globalization has made food supply chains increasingly complex. Raw materials, processed products and ingredients may pass through several stages and geographical locations before

reaching consumers. Consequently, food safety control based exclusively on testing finished products is insufficient to identify and prevent every relevant hazard.

HACCP provides a preventive framework based on systematic hazard identification and control at appropriate stages of food production. The approach is closely connected with prerequisite hygiene programmes and is reflected in international food hygiene guidance developed through the Codex alimentarius system.

For Uzbekistan, development of HACCP-based food safety management is particularly relevant because the country is developing its agricultural and food-processing sectors and seeking greater participation in international markets. Nevertheless, implementation requires more than technical changes at the enterprise level. It also depends on legislation, institutional coordination, laboratory capacity, accreditation, professional competence and effective official controls.

Therefore, this study examines the principal barriers to HACCP implementation in Uzbekistan and proposes a phased institutional approach based on international food safety principles and selected lessons from the German food control framework.

Materials and methods. The study employed a qualitative comparative and analytical methodology.

The research examined:

- Codex Alimentarius food hygiene and HACCP principles;
- WHO information on foodborne disease;
- FAO guidance on food hygiene and HACCP;
- ISO 22000 requirements for food safety management systems;
- WTO provisions concerning sanitary and phytosanitary measures;
- ISO/IEC 17025 principles concerning laboratory competence;
- selected institutional features of the German food control system;
- the legal and institutional context relevant to food safety governance in Uzbekistan.

The analysis focused on six interconnected dimensions:

1. legislative and regulatory arrangements;
2. institutional coordination;
3. laboratory infrastructure;
4. professional competence;
5. HACCP documentation and traceability;
6. international trade and SPS requirements.

Rather than measuring HACCP implementation through a single numerical indicator, the study identifies structural barriers and develops a conceptual phased model for strengthening the national food safety system.

Results and discussion. HACCP as a preventive food safety approach. HACCP differs fundamentally from a system based primarily on inspection of finished products. Its objective is to identify significant hazards in advance and establish appropriate controls at the stages where those hazards can be prevented, eliminated or reduced.

An effective HACCP system requires hazard analysis, identification of critical control points, establishment of critical limits, monitoring, corrective actions, verification and appropriate documentation.

However, HACCP should not be regarded as an isolated technical procedure. Effective prerequisite programmes covering hygiene, sanitation, personnel practices, equipment, water, pest control and environmental conditions are necessary before HACCP controls can operate effectively.

ISO 22000:2018 establishes requirements for food safety management systems applicable to organizations throughout the food chain. ISO describes the standard as a framework enabling organizations to consistently provide safe products and services and to demonstrate compliance with applicable food-safety requirements. ISO

Legislative and institutional barriers. One of the principal challenges in developing an effective food safety system is the coordination of responsibilities among competent authorities.

Food safety intersects with veterinary control, sanitary supervision, agricultural production, plant protection, laboratory diagnostics, consumer protection and international trade. If institutional responsibilities are insufficiently coordinated, enterprises and regulators may face duplicated procedures, inconsistent interpretation of requirements or gaps in official control.

A modern food control system therefore requires:

- clearly defined institutional responsibilities;
- harmonized terminology;
- transparent procedures;
- risk-based inspection;
- effective exchange of information;
- coordination between laboratories and competent authorities.

International harmonization is also relevant to trade. Under the WTO SPS Agreement, food safety standards developed by the Codex alimentarius commission are specifically recognized within the framework of international SPS harmonization.

Laboratory capacity and accreditation. Reliable laboratory infrastructure is an essential component of food safety governance.

Although HACCP is primarily a preventive management system rather than a product-testing programme, laboratory analysis remains important for verification, outbreak investigations, contaminant monitoring and official controls.

Laboratories should therefore have:

- competent personnel;
- validated analytical methods;
- appropriate equipment;
- quality assurance procedures;
- proficiency-testing arrangements;
- documented measurement processes;
- internationally recognized accreditation where appropriate.

ISO/IEC 17025 provides an internationally recognized framework for demonstrating the competence of testing and calibration laboratories.

Strengthening laboratory capacity would therefore complement HACCP implementation by providing reliable analytical evidence for verification and official decision-making.

Human-resource competence. The effectiveness of HACCP depends substantially on the competence of personnel.

Employees must understand hygiene procedures and the consequences of deviations, while HACCP team members require more advanced knowledge of hazard analysis, critical control points, monitoring, verification and corrective actions.

A national training framework should therefore distinguish between:

Food handlers: hygiene, sanitation, temperature control and cross-contamination prevention.

HACCP teams: hazard analysis, CCP determination, monitoring, validation and verification.

Inspectors: risk-based inspection, HACCP auditing, sampling and interpretation of laboratory results.

Laboratory personnel: analytical methodology, quality assurance, validation and proficiency testing.

Continuous professional development should form an integral part of the national food safety strategy.

Documentation and traceability. Documentation is necessary to demonstrate that HACCP procedures are actually being implemented.

Relevant records may include:

- temperature-monitoring results;
- cleaning and sanitation records;
- laboratory results;
- corrective-action reports;
- supplier information;
- production records;
- traceability information.

However, excessive documentation without practical control can turn HACCP into a formal administrative exercise. Documentation should instead provide evidence that significant hazards are controlled and that deviations are addressed systematically.

Digital traceability systems could improve this process by connecting information between producers, processors, laboratories, regulators and exporters.

Lessons from the German approach. The German food control framework demonstrates the importance of integrating food businesses, competent authorities, laboratories and scientific expertise within a structured regulatory environment.

The main transferable principles are not specific administrative structures but broader organizational concepts:

- risk-based official controls;
- clear distribution of responsibilities;
- reliable laboratory support;
- qualified personnel;
- traceability;
- documented procedures;
- cooperation between authorities and food businesses;
- evidence-based food safety management.

These principles can be adapted to Uzbekistan's institutional and economic circumstances rather than directly replicated.

HACCP and international trade. Food safety requirements have an important relationship with international market access.

The WTO SPS Agreement encourages Members to base sanitary and phytosanitary measures on international standards where they exist. For food safety, the Codex Alimentarius Commission is specifically identified as the relevant international standard-setting body.

For Uzbek food exporters, a stronger HACCP-based system could improve process control, traceability, documentation and communication with international buyers.

Nevertheless, HACCP implementation, ISO 22000 certification and compliance with destination-country import requirements should not be treated as identical concepts. An enterprise may implement HACCP without being ISO 22000 certified, while export markets may impose additional requirements beyond HACCP.

Proposed Model for HACCP Implementation in Uzbekistan

A phased implementation model can be developed around five stages.

Stage 1 - Legislative harmonization

- review food safety legislation;
- harmonize terminology;
- clarify institutional responsibilities;
- strengthen risk-based official controls;
- increase alignment with Codex principles.

Stage 2 - Institutional capacity development

- strengthen competent authorities;
- improve interagency coordination;
- develop professional training programmes;
- establish technical guidance for enterprises.

Stage 3 - Laboratory development

Continuous professional development should form an integral part of the national food safety strategy.

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- documented procedures;
- cooperation between authorities and food businesses;
- evidence-based food safety management.

HACCP and international trade

- modernize analytical equipment;
- introduce validated methods;
- strengthen quality assurance;
- develop accreditation capacity;
- increase participation in proficiency testing.

Stage 4 - Enterprise implementation

Food enterprises should progressively develop:

- prerequisite programmes;
- HACCP teams;
- hazard analyses;
- CCP monitoring;
- corrective-action systems;
- verification procedures;
- traceability mechanisms.

Stage 5 - Digital integration and international cooperation

The longer-term objective should be an integrated system linking:

Producer → Processor → Laboratory → Competent Authority → Exporter → International Buyer.

Such integration could facilitate rapid traceability and improve the availability of reliable food safety information.

Conclusion. HACCP implementation in Uzbekistan should be understood as both an enterprise-level food safety measure and a component of national food control reform.

The principal challenges concern legislative coherence, institutional coordination, laboratory capacity, professional competence, documentation and traceability. Addressing these areas simultaneously would provide a stronger foundation than focusing exclusively on HACCP documentation at individual enterprises.

A phased approach based on legislative harmonization, institutional development, laboratory strengthening, professional education, risk-based controls and digital traceability provides a practical framework for strengthening food safety management.

International standards are particularly important in this process. Codex provides the principal international reference for food safety within the WTO SPS framework, while ISO 22000 provides a broader food safety management-system framework.

The proposed model can therefore contribute to the development of a more coordinated preventive food safety system in Uzbekistan while supporting consumer protection, regulatory confidence and the preparedness of food businesses for international markets.

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