National Priorities in Postharvest Technology and Human Nutrition

2017-2021

National Committee on Postharvest Technology and Human Nutrition

Sri Lanka Council for Agricultural Research Policy
Ministry of Agriculture

Contents

Message from Chairman, Sri Lanka Council for Agricultural Research Policy

The Sri Lanka Council for Agricultural Research Policy was established in late 1987, as a government statutory body to formulate national level policies for the agriculture sector in the country. In parallel to other similar agencies in the Asian region, such as the Indian Agricultural Research Council (ICAR), the Bangladesh Agricultural Research Council (BARC) and the Pakistan Agricultural Research Council the mission of SLCARP is aimed at ensuring sustainable agricultural research, development and innovation system assuring socio-economic development of Sri Lanka.

As one of the activities aimed towards fulfilling the mission of the SLCARP, the council established several national committees. These committees comprise of key national scientists, policy makers and private sector representing public sector research departments, universities and private sector agencies. One of the activities of the national committees is to formulate national research priorities, as prioritization of research is essential for planning research programs.

Today, Post harvest management of food has become more important, than ever before as it is less feasible and economical to increase food production, but much easier to reduce postharvest losses. In order to meet 2030 agenda postharvest technology research should focus on to reduce food losses and provide safe and healthy food. Research focus therefore, must necessarily be directed in achieving the above objective.

Keeping this in mind the national committee on Postharvest Technology and Human Nutrition has formulated the National Research Priorities in Postharvest Technology and Human Nutrition 2017-2021 with the contribution from the National Workshop on Postharvest Technology and Human Nutrition conducted on 15 December 2016.

On this occasion, I sincerely acknowledge the participants of the workshop and the Members of the National Committee on Postharvest Technology and Human Nutrition for their valuable efforts and for their active involvement in preparing this important document.

Dr SDG Jayawardena

Chairman, SLCARP

Message by Secretary, SLCARP

The national committee on Postharvest Technology and Human Nutrition was established in the year 2005 along with several other national committees at the initiative of the Sri Lanka Council for Agricultural Research Policy. One of the functions of this committee is to mandate to identifiedresearch priorities that required research input and guidelines for research areas in Post HarvestTechnology and Human Nutrition.

Working within this context, the National Committee on Postharvest Technology and Human Nutrition (NCPHT&HN) has focused on identified key postharvest issues in areas relating to food crop sector.

In order to identify research gaps and research needs, the NCPHT&HNconductedan interactive and informative stakeholder workshop on 15 December 2016. The document presented by the NCPHT&HN has used the information generated from the workshop.

I wish to take this opportunity to acknowledge with gratitude the commitment and active participation of the members of the NCPHT&HN.In the preparation of this document. I wish to thank all members for their corporation in attending the workshop in connection with the stakeholder meetings, and for their contribution as resource persons at these events.

Dr JDH Wijewardena

Secretary, SLCARP

Message from Chairman, National Committee on Postharvest Technology & Human Nutrition

Self sufficiency in all our necessities by year 2020 is our priority and the government provides assistance to achieve this target by irrigating new lands and facilitating market expansion through SMEs by creating a conducive environment for the sector.

However, achieving this target by doubling our production level will not be a challenge losses of over 40 of over percent of our fruits and vegetables is a real economic setback to the nation during the last few decades. It has caused losses in production, inputs and valuable nutrient quality. It also discourages both farmers and customers to grow more fruit and vegetable varieties and diminishes consumption due to reductions of real consumption from consumers.

Recently, the government made it mandatory to use plastic crates to minimize postharvest losses due to losses within the supply chain between farmer and consumer. However, we cannot expect massive savings in postharvest handling due to their integration with other factors such as pre-harvesting operations, harvesting at maturity levels, use of unnecessary chemicals for ripening of fruits etc. Other than handling the harvest safely.

The National Committee on Postharvest Technology and Human Nutrition (NCPHT&HN) of the Sri Lanka Council for Agricultural Research Policy prepared the "National Priorities on Postharvest & Value Addition Research in Agriculture" with special emphasis on food products to introduce an integrated approach to achieve some of landmarks identified by the government. It stress policy issues to address some of the key limitations in the sector and provides recommendations to the government for overcoming these limitations.

I appreciate the contribution of the participants of the stakeholder workshop conducted on 15 December 2016 and members of the NCPHT&HNin preparing this document

I expect that this document will be a useful guide that fulfils the requirements of the industry to achieve our national targets.

Dr DBT Wijeratne

Chairman, National Committee on Postharvest Technology and Human Nutrition

Preamble

The mandate of the Sri Lanka Council for Agricultural Research Policy (SLCARP) is to plan and design the national agricultural research in line with the Government's national development objectives. The agricultural research policy, based on the sectoral policies, is formulated through close co-operation with all stakeholders including the scientific community, entrepreneurs, producers and end users of products and services etc.

The term postharvest technology is defined as "interdisciplinary science and techniques which are applied to agricultural produce after harvest for protection, conservation, processing, packaging, distribution, marketing and utilization". *Nutrition is the science that interprets the interaction of nutrients and other substances in food in relation to maintenance, growth, reproduction, health and disease of an organism. It includes food intake, absorption, assimilation, biosynthesis, catabolism and excretion.*

Therefore, this document addresses the following key principles.

- *Specification of priorities* of national research needs oriented towards the establishment of the most efficient postharvest systems by supporting national income generation through the export of goods, technology and services based on long-term economic growth in the country.
- Stabilizing a sustainable financial support system for the postharvest sector to uplift technology to achieve international standards, with the participation of all sectors in the postharvest research system, including private sector, research institutes and universities. The financial support system works as the investment strategy to strengthen the food culture, health and food security of the nation together with other basic needs.
- Supporting the transfer of scientific information and technological knowhow to the nation.

In general, prevention of postharvest losses is a globally accepted strategy for assuring food security. Reducing the high level of food losses not only increases food availability for consumption but also indirectly contributes to environment conservation through minimization of using agricultural inputs, the disposal of spoilt produce, and conserving the limited recourses of good quality fresh water. Therefore, the motto of the policy document is to navigate R&D towards the national postharvest loss management strategies while encouraging quality management after harvest "from field to the fork"

Economically, the post production operations, including marketing account for about 55 – 60% of the agricultural sector GDP of the country.Therefore, this document for the postharvest sub-sector is submitted to the Government of Sri Lanka together with the National Agricultural Research Policy Framework as a proposal for planning its future policies, research funding and implementation of strategies for improving national postharvest management systems to pave the path for sustainable agricultural development.

Present Status of the Research Requirement

The food industry demands constant changers. These changers focus on new developments, increased nutritional values and consumer preferences. The overall Research requirement is listed below based on the current demands.

Commodity	**Research Requirement**
Rice	Value addition for rice and by products
	Quality improvement through improved drying and storage technology for paddy for small and medium scale entities. Innovative strategies for handling wet grains at farm level under adverse rainy conditions. Value addition strategies for milled rice and production of fortified rice to mitigate the micronutrient deficiencies.
	Technology for pollution minimization in rice processing and application of greening concepts in to enhance eco-efficiency in the rice milling industry.
Pulse crops: Mung beans, Cowpea & Black gram Oil Crops: sesame, soybean, groundnut Minor grain crops: Millets (kurakkan)	Technology enhancement for cost effective harvesting, threshing, cleaning, grading and for primary processing technology. Compatible storage techniques and efficient oil processing techniques. Product development research and by – product utilization.
Vegetables	Research for reduction of postharvest losses from 30% to 10% throughout the distribution chain.
	Establishment of quality standards (local and international). Green technology development for postharvest crop conservation (energy saving and waste management). Technology development for organic produce.
Fruits	Research on reduction of Postharvest losses from 30% to 15% throughout the distribution chain. Utilization of by products and waste.
	Processing and value addition to increase utilization of seasonal fruits. Utilization of by products and waste.
	Food safety issues including ripening treatments and pesticide residues.

Spices	Harvesting and postharvest technology development and quality assurance
	Small to medium – scale processing equipment design.
	Value addition and product development research.
Cinnamon	Technology for primary and secondary processing.
Ginger and Turmeric	Processing and value addition
Chilli	Drying technology, processing technology and product development
Onion	Compatible technology development for harvesting, curing, storage & vernalization. Technology for true seed production.
Tea	Energy conservation techniques in tea harvesting and postharvest processing. Value addition and product development through latest technology
Coconut	Mechanization of harvest and postharvest operations Value addition and product development through latest technology
Research Requirement Common to the Food Crop Sector	Innovative Food Products and Processes
	Food Safety and Quality control
	Nutrition
	Food Security
	Functional properties through isolation and extraction
	Safety issues including pesticide and heavy metal contaminations.
	Technology development for organically grown produce.

Research Priorities in Postharvest Technology and Human Nutrition

1.0 Priority Goals

1.1. Enhance the national agricultural growth by; reducing postharvest losses and assuring food security through innovative technology development, increasing value addition, improving sustainable agro – industries, creating new employment opportunities in the sector and increasing the income level of the rural farming community.

1.2. Address future challenges faced by national agriculture through; reducing the income disparity in rural and urban areas, withstanding the market challenges due to liberalization of economies and reducing the cost of production of goods to reduce problems related to economies of scale.

1.3. Increase consumption and improve the quality of food products in the country by;
Increasing consumer health and satisfaction, reducing prices and increasing the availability and quality of food products, decreasing the import of main food products. (ie. Fruitvegetables and cereals), which can be grown domestically, reducing the health related issues related to food crops and establishing quality standards for import food products.

1.4. Increase export earnings through agricultural commodities by; increasing capacities and opportunities to deliver to export markets and increasing foreign income and inventive opportunities for the agricultural sector.

2. Overall Objectives

2.1. Significant reduction of postharvest losses in all crop sectors

2.2. Ensure quality, safetyof food and nutritional benefits to the consumer.

2.3. Increase efficiency of postharvest systems in the country.

2.4. Further enhancement of farmer income through technological advances and dissemination.

2.5. To develop demand driven and compatible agro-technology to cater to the domestic and foreign markets assuring sustainable agricultural industry.

2.6. To analyze information systems and ensure equity of the accessibility to innovative technology for all stakeholders.

2.7. Increase agricultural exports significantly.

2.8. Provide result oriented funding for R & D in postharvest sector according to a strategic plan.

3.0 Thematic Areas of Research

The following thematic areas are taken into consideration during priority setting

1. Pre and Postharvest Losses
2. Processing and Value Addition
3. Postharvest Engineering
4. Quality andNutritional based Research and Food Safety

4.0 Research Priorities

4.1 Research Priorities on Pre and PostharvestLosses

- Quality management and prevention of losses in marketing channels of fruits and vegetables and value addition activities for income generation at regional level
- Networking to establish sustainable marketing and technical information networks among growers, researchers, consumers and producers and encourage investment for the sector.
- Enhance national level research programs for the postharvest sector to address technological gaps mainly focusing on the following aspects.
    a. Pre-harvest treatment,
    b. Identification of maturity indices,
    c. Postharvest handling of fresh produce and the application of Post harvest treatments,
    d. User – friendly and cost – effective packaging,
    e. Appropriate transportation and storage methods,
    f. Introduction of value added products, and product formulation
    g. Dehydration and processing to assure quality and storability
    h. Pre and Postharvest research related to organic products

- Adopt national and international quality standards and safety protocols for important fresh products.
- Optimize profitability through improving drying capacity of different processors for enhances grain drying.

- Examine appropriate alternative energy sources and energy efficient techniques for agro-processing.
- Develop drying stems suitable for different types of grain with the use of adaptive trials and tests.
- Be aware of consumer preferences, demand, purchasing power and other similar factors through systematic and periodic data collection activities.
- Cost effective storage methods. Awareness programs to convert exiting household storage to suitable storage under optimum conditions
- Develop environmentally friendly pest management methods for stored products
- Detection, surveillance and management of quarantine pest
- Minimization of pre and postharvestlosses due to effects of climate change

5.0 Research Priorities

5.1 Research Priorities on Processing and Value Addition

- Adopt national and international quality standards and safety protocols for important processed products.
- Development of technological support to start processing industries.
- Grain processing to be further enhanced through provision of locally installed grain drying/storage facilities.
    a. Develop maturity indices for commercially important fruit crops Develop user-friendly packaging materials and techniques
    b. Developing innovative harvesting instruments/tools
    c. Cost effective cooling systems / storage systems
    d. Crop varieties resistant to post-harvest diseases and insect damage
    e. Socio-economic studies for post-harvest sector on lack of adaptation of the packaging materials
    f. Development of bio-pesticides for post – harvest pest control
- Value addition research in export agricultural crops.
- Upgrading the regulatory framework for processing and value addition.
- Enhancing the export market and establishment of market information systems.
- Developing national brands and standards for the spice sector in respect of Bio-medical research on spice crops
- Value addition research to produce organic value added products and Green Technology in Food Processing.
- Research on the production of value added products from crops collected during glut periods so that of value added products are available for consumption with climate change and mitigation.
- Product formulation on fermentation technology
- Food engineering processing and technology

- Novel preservation technologies
- Research on value addedfuture foods
- Research oninnovative by-product utilization techniques

6.0 Research Priorities

6.1 Research Priorities on Nutrition based Research and Food Safety

- Improved food processing methods to secure the available nutrients
- Develop food processing methods that make the nutrients more bio available.
- Total diet study
- Survey on prevalence and severity of nutritional deficiencies in Sri Lanka.
- Formulation of suitable complementary food (eg. High energy, High protein, rich in vitamins and minerals)
- Food fortification
- Identification of food sources rich in bio active compounds
- Extraction and evaluation of functional properties of identified bio active compounds
- Formulation of functional foods and nutraceuticals using identified food sources.

  (eg. Anti diabetic food range)
- Studies on possible food borne pathogens / toxins / allergens throughout the food supply chain

  (eg: Salmonella, Listeria, Clostridium, aflatoxin…etc)

- Identification of safety assurance procedures to minimize health hazards
- Development of natural antimicrobial agents
- Identification of chemical contaminants present in food materials in local market.
- Development of rapid methods to identify the contaminated food materials.
- Explore methods to reduce the health risk originated from contaminants.
- Identify the possible adulterants used in Sri Lanka and their health effects
- Development of rapid field method (eg. test kits) to identify adulterated food.
- Nutritional biochemistry
- Food safety and standards
- Food shelf life extension

7.0 Research Priorities Postharvest Mechanization, Fisheries, Livestock and Floriculture

The Research priorities on Postharvest Mechanization, Fisheries, Livestock and Floriculture have been formulated by the respective National committees of SLCARP, where research priorities in the subject area on Postharvest Technology have been identified.

The name of the National Committee, title of the priority document, name of the coordinator and contact details are given belowfor reference purposes

Name of the Committee	**Title of the Priority Document**	**Name of the Coordinator**	**Contact Details**
National Committee on Aquatic Resources	National Research Priorities in Aquatic Resources 2017-2021 ISBN No: 978 955 9224 60 0	Dr SKDFF Niranjan	011-2697103 (ext 260)
National Committee on Livestock and Poultry	National Research Priorities in Livestock and Poultry 2017-2021 ISBN No: 978 955 9224 59 4	Dr SKDFF Niranjan	
National Committee on Floriculture Research and Development	National Research Priorities in Floriculture 2017-2021 ISBN No:	Dr SMP Chandra Padmini	011-2697103 (ext 140)
National Committee on Agricultural Mechanizatio n	National Research Priorities in Agricultural Mechanization 2017-2021 ISBN No:	Mr S Dissanayake	011-2697103 (ext 240)

Acknowledgement

The National Committee on Postharvest Technology and Human Nutrition, highly appreciates all the present and previous members ‘for their contribution to prepare this priority document.

The Management of the SLCARP and the Committee acknowledges all participants of the Workshop on National Priorities in Postharvest Technology and Human Nutrition for their immense contribution.

Dr (Mrs) Shanika Jayasekera
Coordinator
National Committee on the Postharvest Technology and Human Nutrition.

Annexure-1

Issues, Gaps Severity and Possible Impact of the Issues and Gap

The issues,gaps,severity and possible Impact of the Issues and Gap in the thematic areas identified are discussed.

Issues, Gaps Severity and Possible Impact of the Issues and Gap on Pre and Post harvest Losses of the Food Crop Sector

(Paddy, Grains, Fruits, Vegetables, Plantation Crops, Spices and Condiments)

Issues and Gap	**Severity of the Issues and Gaps**	**Possible impact of the Gap**
1. Technical issues related to pre-harvesting and post – harvest (fruits & vegetables) Products not harvested at optimal stage of maturity -Tools used to harvest produce are not suitable and contribute damage and loss of produce Standards are not being to sort or grade products Packaging used do not protect the products	High	Fruit quality Deteriorates and results in heavy economic and nutritional losses Loss of market share in export market
2. No Facilities to extend storage and maintains quality of fresh produce. • Humidity and temperature problems • Storage problems • Transport problems	High	Direct impact on physiology of the fruits, leads to total quality deterioration and reduced shelf life
3. Inadequate phyto-sanitary requirements	Moderate	Strengthening of sanitary measures and modern facilities for this purpose

4. Information problems Lack of market information flow in the system	Moderate	No demand driven organized production Growers and consumers both face economic loss Wide supply gaps in market intensity of price fluctuation is wide Lack of information for organized production identified markets Poor quality produce
5. Pre harvest issues ▪ Resistant ▪ Growing & climatic conditions	Moderate	Pest attracts & disease outbreaks yield lost
6. Postharvest Harvesting of Paddy and other grains (High Moisture in machine harvesting)	High	Problems in drying storage
7. Storage structure	High	Improper storage conditions & insufficient capacity
8. Storage pest problem	High	Destruction of produces affecting local imports.
9. Quarantine pest problems	High	Introduction new pests into Sri Lanka

Issues, Gaps Severity and Possible Impact of the Issues and Gap on Processing and Value Addition of the Food Crop Sector

(Paddy, Grains, Fruits, Vegetables, Spices and Plantation Crops)

Issues and Gap	**Severity of the Issues and Gaps**	**Possible impact of the Gap**
Use of some of the new harvesting machinery lead to increases in poor quality wet-grains (harvested with high humidity) in the open market	Moderate	Post harvest loss
High cost of drying, in particularly electricity costs are very high	High	Cost of Production
Unavailability of facilities for drying storage and clearing	Moderate	High post harvest loss. Reduced quality.
Farmers do not harvest at correct maturity, mainly due to heavy market demand.	Moderate	Excessive post harvest loss and low nutritive value.
Capital requirements for the processing machinery are very high	High	Post harvest loss

Issues, Gaps Severity and Possible Impact of the Issues and Gap on Nutrition Based and Food Safety Theme of the Food Crop Sector

(Paddy, Grains, Fruits, Vegetables, Spices and Plantation Crops)

Issues and Gap	**Nature of Gap Severity of the Issues and Gaps**	**Possible impact of the Gap**
1. Nutrition loss during food processing	High	Waste of Nutrition
2. High prevalence of nutritional deficiencies	High	Mal Nutrition
3. Wide spread of non communicable diseases	High	Health Risks
4. Food borne illness (Infection & intoxification)	Moderate	Health Risks
5. Contaminants {Traces of agrochemicals, heavy metals, Poly Aromatic Hydrocarbon (PAH), antibiotic residues, hormones}	High	Health Risks
6. Food adulterants	High	Health Risks

Annexure-2

National Committee in Postharvest Technology and Human Nutrition

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