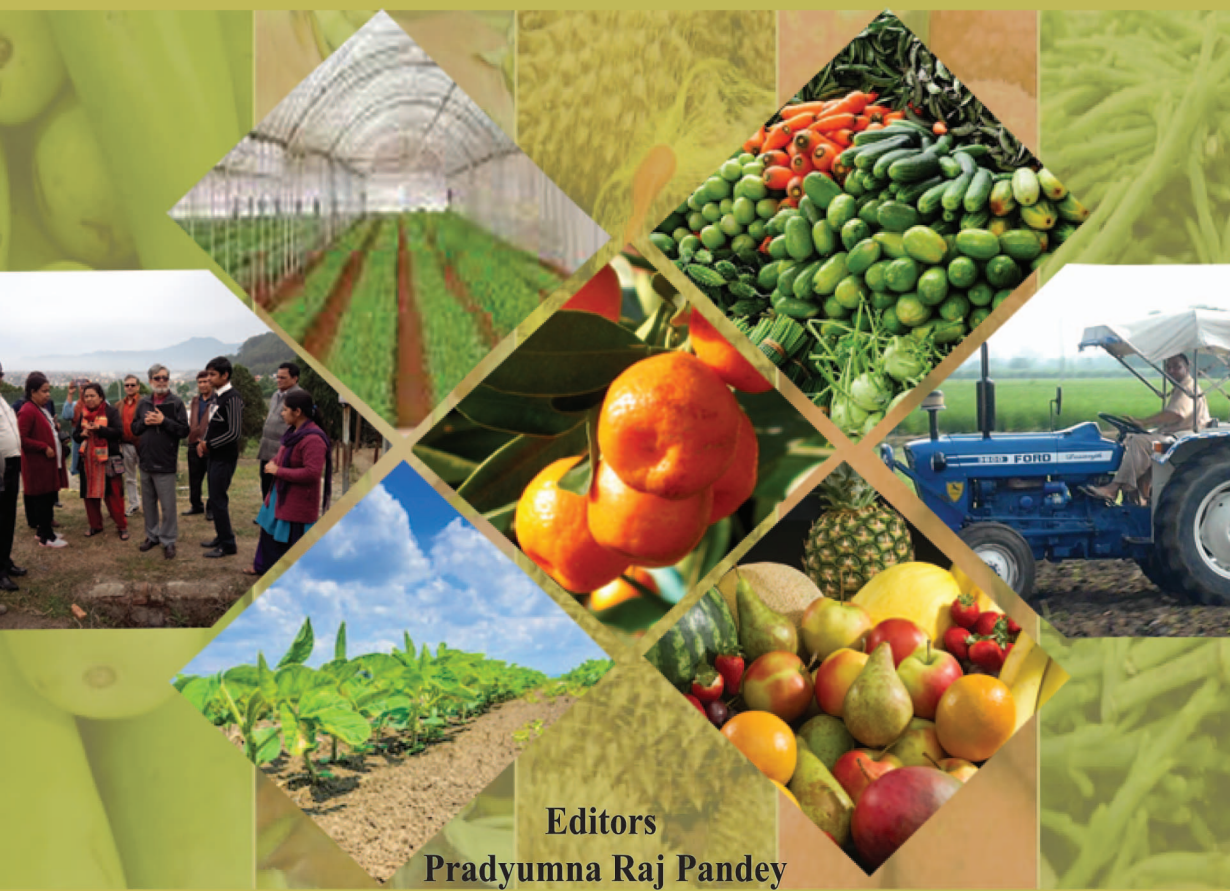
SAARC Good Agriculture Practices (GAP) for Vegetables and Fruits in South Asia:

Current Status and Future Opportunities



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SAARC Regional Consultative Meeting on Development of Country Specific Good Agriculture Practices (GAP) Standards and Harmonization of SAARC GAP for Vegetables and Fruits, held on 8th to 10th April, 2018 in Kathmandu, Nepal

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This book contains the papers and proceedings of the SAARC Regional Consultative Meeting on **Development of Country Specific Good Agriculture Practices (GAP) Standards and Harmonization of SAARC GAP for Vegetables and Fruits,** 8-10 April 2018 in Kathmandu, Nepal. The program was jointly organized by SAARC Agriculture Centre (SAC), Dhaka, Bangladesh, Ministry of Agriculture and Livestock Développement (MOALD), Food and Agriculture Organization of the United Nations, Regional Office for Asia and the Pacific, Thailand; Quality Council of India (QCI), Center for Environmental, Agricultural Policy Research, Extension and Development (CEAPRED), Nepal. The focal point experts represented the respective Member States. The opinions expressed in this publication are those of the authors and do not imply any opinion whatsoever on the part of SAC, especially concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries.

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Foreword

In SAARC countries, there are different forms of prescribed frameworks to handle the food safety measures at various governance levels. However, these may not be effective and adequate for standardization, certification and accreditation, especially for the primary production sector to handle issues of food safety and quality at regional level. In recent years, various levels of consumer and traders expressed the demand for adopting Good Agriculture Practice (GAP) certification for fresh agricultural commodities in the global market. As a result, most of the SAARC Member States are strongly promoting GAP at all levels beginning from production to the last actor of supply chain in order to ensure Sanitary and Phyto-sanitary (SPS) measures.

Nevertheless, very few members of the SAARC are able to issue the GAP certification so far. In light of the above perspectives, the current initiative has been taken by the Food and Agriculture Organization Regional Office for Asia and the Pacific (FAO-RAP), Bangkok, Thailand to prepare the guidelines, common regional policy of GAP and trying to implement in the field as a pilot SAARC GAP project in some of the SAARC Member States on the way of harmonizing it. The endeavor will also encompass GAP Certification for domestic as well as regional level of agricultural commodities among the SAARC Member States. This consultation meeting has been made an effort to reenergize the existing framework and infrastructure, which were already established by FAO-RAP and address the food safety and quality of primary products of fruits and vegetables among the SAARC Member States.

The SAARC regional consultation meeting entitled "Development of Country Specific Good Agriculture Practices (GAP) Standards and Harmonization of SAARC GAP for Vegetables and Fruits was held during 8th to 10th April, 2018 in Kathmandu, Nepal jointly by SAARC Agriculture Centre, Dhaka in collaboration with the Ministry of Agriculture and Livestock Dévelopement (MOALD), Food and Agriculture Organization Regional Office for Asia and the Pacific, Thailand, Quality Council of India (QCI), Center for Environmental, Agricultural Policy Research, Extension and Development (CEAPRED), Nepal. This book "SAARC Good Agriculture Practices for Vegetables and Fruits in South Asia: Current Status and Future Opportunities" is the collection of papers prepared by the experts from SAARC Member States and different national and international organization.

I would like to avail this opportunity to express my sincere appreciation to all the contributors particularly, Dr. Sridhar Dharmapuri, Senior Food Safety and Nutrition Officer, FAO-RAP, Thailand, Dr. Pradyumna Raj Pandey, Senior Program Specialist (Crops) for their hard work to put together the manuscript in this form. I am confident that this compilation will pave the way for further research and development on Good Agriculture Practices (GAP) of Standards and Harmonization of SAARC GAP for Vegetables and Fruits in South Asia.

Dr. S.M. Bokhtiar
Director
SAARC Agriculture Centre

Contents

Chapter 1

An Overview of SAARC GAP: Current Status and Future Opportunities

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Introduction

Food safety is an issue of primary importance for public health and trade. According to the WHO, one in ten people fall ill and about 420,000 people die as a result of consumption of contaminated food every year. Countries have committed to protect plant, animal and human health and life through the Agreement of Sanitary and Phytosanitary Measures (SPS) under the WTO. Such measures could sometimes acquire the form of a non-tariff barrier. Good practices, standards and their certification provide the means to overcome such barriers. A GAP standard and certification scheme provides the tool to implement good practices in agriculture and across the food chain ensures compliance with WTO requirements and reduces the risk of rejection of consignments and losses, both financial and reputational. Further, third party certification and accreditation, using internationally recognized assessment and verification processes, helps to ensure its credibility and acceptability globally. Some SAARC countries have not yet adopted GAP, and some do not have a national accreditation system in place (UNIDO, 2002). However, most of the SAARC countries do have a legal and regulatory framework for food safety. However, many of them are not fully effective in terms of standards, certification and accreditation especially in the primary production sector. In this context, the Regional Consultation Meeting on "Development of Country Specific Good Agriculture Practices (GAP) Standards and Harmonization of SAARC GAP for Vegetables and Fruits" was held in April 2018 to draw up the roadmap to ensure wider adoption of SAARC-GAP at regional level.

Potential of Agricultural Trade in South Asia

South Asia remains the least integrated region in the world, with just 5% of its trade being intra-regional. This compares poorly with the corresponding figures of 65% for the EU, 51% for NAFTA and 25% for ASEAN (Razzaque and Basnett, 2014).

In successive summit meetings, SAARC leaders have continuously asserted the importance of trade liberalization, the dismantling of non-tariff barriers and removing structural impediments to free trade. Reduced trade friction has the potential to raise India-Pakistan trade from USD 3 billion to USD 20 billion; to increase Bangladesh's exports to India by 300%; and to reduce prices in landlocked regions such as Afghanistan, Bhutan, and Nepal from Northeast of India (World Bank, 2016). The need to realize the full potential and accelerate trade liberalization is a high prioriy for SAARC countries.

Very little is known about the volume and nature of agricultural trade in the region, especially the part that is undocumented. The limited data available shows that the agriculture export trade of SAARC Countries grew to USD 32 billion from about USD 5.6 billion over the period 2010-1990. Another, study shows that about 53% of intra-regional import trade was excluded from tariff liberalization under SAFTA in 2006 (World Bank, 2016).

South Asia has the potential to obtain easy gains through domestic policy reform and the further opening of international markets to intra-regional exports. The sector's share in exports is reasonably high, though many of the countries are net food importers. While factors like lack of complementarities, diversification of export baskets and trade facilities are important barriers to trade, supply-constraints appear to be the most important barrier. It is often reported that informal agricultural trade among the SAARC countries takes place on a large scale. This trade has both positive and negative effects such as the impact of undocumented trade in livestock on the spread of trans-boundary animal diseases.

Current status of GAP in South Asia

GAP was introduced in most South Asian countries by AFACI and FAO. From 2014-16, FAO implemented the regional technical co-operation project titled 'Development of Standards and Scheme for Good Agriculture Practice (GAP) Implementation and Certification in countries of SAARC". Four of the eight SAARC Member States, Bangladesh, Bhutan, Nepal and Maldives have customized the SAARC GAP standard developed by the project. The standard has five modules - general requirements; food safety; produce quality; environmental management; and workers' health, safety and welfare. The project focused on developing the knowledge infrastructure in these countries including identifying the relevant bodies as Scheme Owner, Certifying Body and Accreditation Body. It developed capacities in the Governments to customize the scheme to national requirements and train personnel in inspection, audit and certification. This enabled the countries to operationalize the scheme albeit with limited scope and at pilot level. Through the consultation workshop in Kathmandu co-organized with FAO, the SAARC Agriculture Centre (SAC) took the initiative to review existing country specific GAP standards and commence the process of harmonisation of SAARC GAP among the Member States.

In the existing framework in each country, two institutions have been identified, one as the Scheme Owner (SO) and the aother as the Certifying Body (CB). The SO is responsible for developing and maintaining the country GAP Scheme while the CB has the role for third party certification. The FAO regional project conducted training programs, workshops on the standard and scheme in each country. It developed the operational and quality manuals for horticulture crops. Related training was also provided through AFACI-GAP projects in various SAARC countries. Most of the SAARC Member States where the scheme was piloted have adopted all five modules

Being a voluntary scheme, however, the implementation of GAP at the field level has not taken off. The key challenges for implementation of GAP are the insufficient number of trained personnel the lack of awareness among producers/farmers. One of the principal issues is the lack of incentives for farmers and buyers alike to invest in standards such as GAP as domestic consumers in SAARC countries are very price-sensitive and are unlikely to pay premium prices for GAP-certified products. Measures that could be rolled out include provision of information on the business benefits in the form of higher incomes for producers and the rolling out of extensive training programmes for farmers and value chain actors as well as professionals for auditing, inspection and certification. The linking of buyers and suppliers with producer groups implementing GAP and assuring good prices through a contract farming system is essential. Incentives such as provision of support for packaging and transportation of GAP certified products in the initial implementing period to enable GAP to take off could be provided.

Wider adoption and harmonization of SAARC GAP in the region requires the following:

- Establishing a regional network of GAP related institutions
- An efficient information network on sharing of practices related to perishable fruits and vegetables
- Skill development and capacity building programs in GAP
- Access to new technology and knowledge on fruits and vegetables production
- Improved technical knowledge of maturity indices, harvesting, grading, packaging, transportation, and sorting of fruits and vegetables
- Availability of good quality inputs like seed, fertilizer and pest and disease control agents
- Improvements on the supply-side through strategic investments in physical infrastructure and intra-country and intra-region

Way forward

SAARC could develop a common minimum protocol for its GAP standard that is acceptable to all stakeholders in the region and meets requirements of importing nations. The success of common minimum protocol would depend to a great extent on its strategy to secure and strengthen the livelihoods of small and marginal farmers of the region and creating new market opportunities for them. The standard and its certification scheme should have adequate codes of practice that can be understood and implemented by small and marginal farmers who are predominant in this region. This would allow them to progress to GAP certtification in a phased manner.

The SAC could initiate actions for development of the SAARC GAP Standard as a Regional Standard and Scheme through a consultative process involving all Member States, their CBs and SOs and the producers who have acquired GAP certification. Based on the mplementation of the scheme so far, the following recommendations are made:

- The SO and CB should be in different parts of the Government to avoid conflicts of interest; eventually, they should be in the private sector as befits a voluntary standard and scheme
- Building regulatory capacity especially in the concerned departments that make up the SO, CB and the three committees should be a priority
- Control points, as a part of verification mechanism of GAP implementation, if pertaining to regulatory requirement, should be necessarily categorized as “Critical” or “Major”.
- GAP logo may be applied on produce and/or package, if such logo application is supported with verification or testing at an accredited laboratory; alternatively, the package could bear the statement that it is from a GAP certified farm.
- There should be only one national standard on GAP in a country, developed through consensus and multilevel consultation process, preferably with involvement of the National Standards Body.
- Incentives and measures are needed to popularize country GAP schemes; these could include facilities such as low interest loans to farmers who are farming in newer agri-locations, if the farmers agree to abide by GAP requirements.
- Attracting private sector investment in GAP through Government support for contract farming schemes is important so that the certification scheme can take off and consumers are assured of affordable prices.
- Development of a harmonized SAARC GAP standard with an authorization body comprising all Member States will provide a credible and more recognized standard and certification scheme.

Conclusion

The systematic application of GAP in all stages of supply and value chain is important as food safety and quality is gaining importance globally, GAP needs to be mainstreamed as a pre-requisite intervention. The FAO project created and piloted the SAARC-GAP scheme and further necessary policy and institutional arrangements are ncessary to fully operationalize the scheme on the ground. The technical capacity of the field staff needs to be continuously enhanced and the scheme integrated with the existing value chain of different commodities.

SAARC nations and other stakeholders' viz., the retailers and the buyers recognize that if farmers in the region understand the importance of incorporating hygiene and food safety in their production system through Good Agriculture Practices (GAP) and cosnumer awareness is increased, access to new markets will open up. GAP standards in the region need to be further improved by drawing references from requirements already existing under the international regulatory frameworks such as the International Plant Protection Convention (IPPC), Codex Alimentarius Commission and World Organization for Animal Health (OIE).

The adoption of SAARC GAP is a major step forward to maintain and promote safe food and sustain the environment along with worker's health, safety and welfare. Therefore, adoption of SAARC GAP in all SAARC Member States would be a milestone for the economic prosperity of South Asia.

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Chapter 2

Good Agriculture Practices (GAP) standard and scheme in Bangladesh: Status, Challenges and Way forward

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Abstract

Good Agricultural Practice (GAP) addresses the environmental, economic and social sustainability issues for safe and quality food and non-food agricultural products. In Bangladesh, the lack of food safety has a serious impact on public health, marketing of agricultural produce and consumer's choice. In this paper, the current status, challenges and way forward to the GAP standards and harmonization of SAARC-GAP for fruits and vegetables in Bangladesh has been presented. Exports scenario declined with several rejections by the European Union due to Sanitary and Phytosanitary issues. In the response to this challenge, the government explored expansion of markets to Middle East, Singapore and Japan, improved practices for export to Europe and also increased the cargo facilities for carrying fresh vegetables.

Keywords: *Bangladesh, GAP, SAARC, Food safety.*

Introduction

Bangladesh is an agro-based country lying between 20.34^0 and 26.38^0 North latitude and 88.9^0 and 92.41^0 East longitudes. It is bounded by India in the North and West, South by Bay of Bengal and East by India and Myanmar. The country has a total area of 147570 Square Km with a population of about 150 million. Diverse eco system is present with hills, plains, coastal and wet lands. The climate is tropical and sub tropical Agro-ecologically the country is divided in to 30 AEZs (Better to put reference). Agriculture is predominant with a cropped area of 8.23 million hectare and 197% cropping intensity. However, a cropping intensities' are increased in last two decades and more. There is an ample scope and potentials to safe food production. Horticultural crops (vegetables and fruits) having high market potentiality can be grown on commercial scale in the field to meet the demand of domestic and export market. In Bangladesh, contribution to word vegetables trade is insignificant. Now it is the fastest growing export sector in Bangladesh. But market is confined to ethnic people and fetches low price due to supply of poor qualities and without maintain any standard. Recently the market has faced barrier of certification. Moreover, different exporters expressed the demand

for GAP certification for fresh agricultural commodities in the global market. For quality assurance the government is promoting Good Agricultural Practices (GAP) from production to supply chainfor ensuring Sanitary and Phyto-sanitary (SPS) measures during production, processing and marketing. But till now there is no GAP certification standard in Bangladesh except the initiatives taken by FAO-RAP and Asian Food and Agriculture Corporation Initiative (AFACI).

Food safety is a key driver of the adoption of voluntary standards such as GAP in Bangladesh. The food chain approach to food safety and quality recognizes the responsibility for the supply of safe food. Under the Food Safety Act, 2013 and its regulations, it is an obligation of all operators across the chain (producers, processors, exporters, importers, etc.) to ensure that food available to the consumer is safe and wholesome. GAP evolved in Europe in the 1990s primarily address the concerns of different stakeholders on food safety, quality and environmentally sustainable production methods. These stakeholders include governments, food retailing industries, farmers and consumers. GlobalG.A.P. previously known as EuroGAP, which was initially developed as a private sector standard for the European supermarket. It has now grown into a global standard for the certification of agricultural product around the globe. More and more producers, suppliers and buyers are harmonizing their certification standards to match and documented agreements containing technical specifications or other precise criteria to be used consistently as rules, guidelines to ensure that materials, products, processes and services are fit for their purpose. The standard helps producers comply with Europe-wide accepted criteria for food safety, sustainable production methods, worker and animal welfare, responsible water use, compound feed and plant propagation materials. BanglaGAP was developed as part of the FAO-implemented SAARC-GAP scheme. The scheme owner (SO) is the Bangladesh Agricultural Research Council (BARC). The Department of Agriculture Extension (DAE) is the certifying body (CB) by the name of Bangladesh Agricultural Certification Body (BACB) and it will be accredited by the Bangladesh Accreditation Board (BAB).

Agricultural Land Use

Bangladesh occupies 147570 square kilometer area where agricultural land area is 13.7 million hectare but available cultivable land area is only 8.55 million hectare (BBS, 2017). According to the World Bank, before liberation, land use in Bangladesh was 70.63% but after liberation it was increased and reached in to 80 percent in late Eighties.

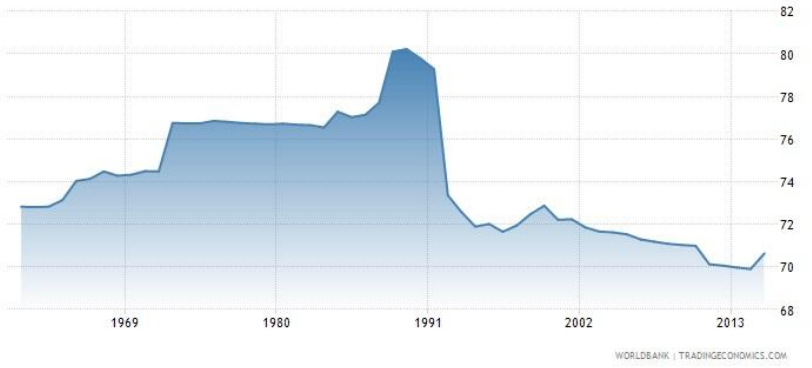

Figure 1: Land use trends under different crops in Bangladesh since 1969-70 to 2013

Source: BBS, 2015

Area and Production status of common Fruits and Vegetables crops

The area, production and productivity status of vegetables and fruits in Bangladesh is showing in figure 2. At present in Bangladesh 0.4 million hectare area under vegetable cultivation and production is 3,88 MT(BBS, 2015). About 165 types of vegetables are identified in Bangladesh. Productivity of temporary fruit (Banana, Pineapple) is high due to quick harvesting time compare to permanent fruit (Mango, Jackfruit). Figure 3 & 4 present area and production of different vegetables and fruits in Bangladesh.

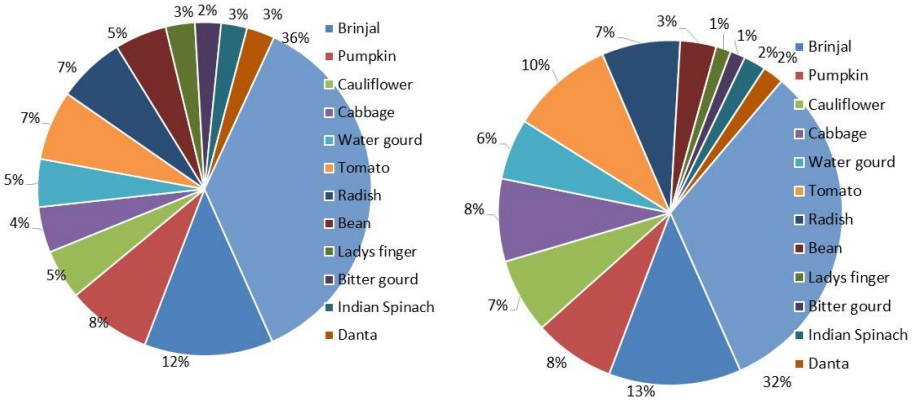

Figure 3. Area and production of different vegetables in Bangladesh (%)

Source: BBS, 2015

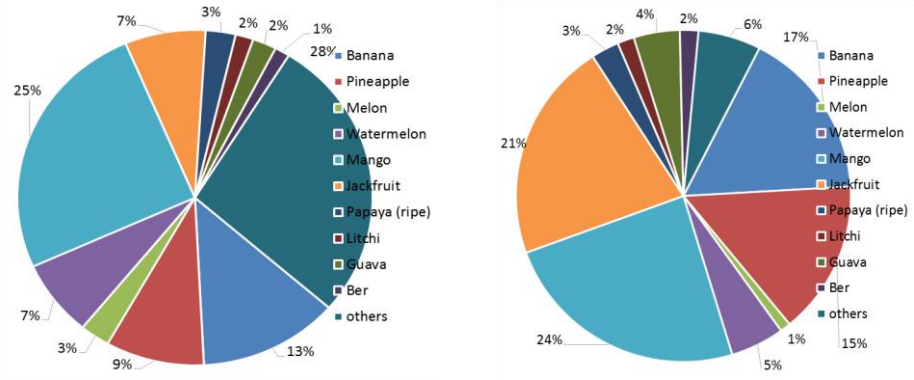

Figure 4. Area and production of different fruits in Bangladesh (%)

Source : BBS,2015

Current production and value addition technologies

Subsistence farming is the regular practice in Bangladesh. At Present commercialization and modernization has been increasing in vegetables and fruits area by using high tech farming like - use of net house, shade house, green house, protective culture, hydroponic, high yielding variety, modern management, grafting technology etc. Moreover, postharvest handling and processing in still not satisfactory. At present 25-40% postharvest losses are occurring in this area due to lack of storage facilities. Bangladesh has already generated some technology of value addition products - jam, Jelly, pickle, juice in various fruits and vegetable. Recently ready to cook and vegetable meats are introduced. Storage facilities of vegetables and fruits are mostly satisfactory except potato. But, large amount of tomato, carrot, jackfruit, mango, pineapple are spoilage due to lack of storage facilities. Now a days, NGOS, private companies and personal levels developed facilities on fruits and vegetables storage in small scale.

Potentiality of fruits and vegetable Trade in SAARC Countries and beyond the SAARC

Bangladesh enjoys a comparative advantage in fruits and vegetables production, thereby having the potential to export significant quantities of fresh fruits and vegetables to international markets at competitive price. The country has been exporting 68 different types of vegetables and 35 different types of fruit to EU, USA and Middle East (www.hortexfoundation.org). The ethnic community is the consumers of the exported commodity. Bangladesh is not exporting fruits and vegetables in the SAARC countries. The quantity of vegetables and fruits export was highly dependent on production. (Saha, 2000). The total quantity of fruits and vegetables exported was around 29.1 thousand Metric tons at USD 46.4 million worth. The export has surprisingly

increased up to 92.7 thousand Metric tones valued 209.4 million USD during 2013-14. The products of Bangladesh could not able to fulfill the SPS (EPB, 2018). But, it may be noted that the demand for fruits and vegetables is steadily rising at home and abroad. Thus, Bangladesh should take advantage of export potentials in horticultural crops.

So far, the development of fruits and vegetables export, the government has under taken some decision such as (i) to establish some "Export villages" and identify the selected fruits and vegetable growing areas; (ii) to explore markets in the countries of Western Europe, Middle East, Singapore and Japan for export of fresh vegetables; (iii) to increase cargo space capacities for carrying fresh vegetables, especially by the Biman Bangladesh Airlines and other airways; (iv) to ensure availability of international standard packaging materials and its use for the interest of maintaining quality of fresh fruits and vegetables; (vi) for charging airfreight at lower rate for exports of all vegetables including fruits and all other commodities; (vii) withdrawal of royalty from foreign airlines extending cargo services.

Bangladesh imports about 1.58 million kilograms of fruit every day according to statistics of Bangladesh Bank. The majority of the imported fruits are apples, grapes, Mandarins, and pomegranate. The demand for local fruits is also increasing. Papayas and bananas are grown throughout the year. Despite that, the supply of local fruits falls between January and September. During this period, a limited number of fruits including guava, palm are available. As a result imported fruits dominate the local market in this period. Out of the imported fruits, apple is in highest in the list. In the fiscal year 2016-17, 239 million kg apples were imported.

Current Status of GAP Standards and Harmonization in Bangladesh

Assuring food safety is one of the most important challenges in Bangladesh. With a view to assure the availability of safe food through proper practice of scientific procedures through coordination of food production, import, processing, storage, supply, marketing and sales related activities, establishment of an efficient and effective authority by repealing related existing acts and reframing act the Food Safety Act, 2013 of Bangladesh has been enacted. As per act, “Food Safety Management System means the acceptable management of Good Agricultural Practices, Good Aqua-cultural Practices, Good Manufacturing Practices, Good Hygienic Practices during food production, processing, preparation and sale of safe and healthy foods, hazard analysis, traceability, food safety emergency response, national food control plan and food safety auditing system, and practice of relevant subjects which is existing in the approved guidance or directives of the relevant Act on specified standard and compliance”.

Horticultural produce are important food items and rich sources of various phytochemicals (vitamins, minerals, antioxidants) and proteins, respectively. Currently, assuring safety and controlling quality of food including fruits, vegetables produce has become one of the most challenging issues in Bangladesh. Often consumers are dissatisfied with poor quality and unsafe produce due to the perceived health risk. The issue of food safety has been emerged as the most serious threat in the context of food security and public health of the country. There are huge concerns in the rank and file of the society over the mishandling and use of harmful chemicals during production and postproduction stages. The main concerns are related to the presence of chemical residues (pesticides, growth regulators, ripening chemicals, antibiotics, preservatives, coloring agents, etc.) and microbial contamination. To safeguard public health, interventions are required to stop malpractice during production and postproduction stages and marketing of food. The recently enacted Food Safety Act 2013 is an important way forward from the Government of Bangladesh to deal with the deep-rooted concern of food safety.

Apart from laws, extensive training and awareness programme are needed so that relevant stakeholders can adopt improved practices to maintain quality and safety of produce along the supply chains. Consumption of good quality, nutritious and safe food can only be assured if quality and safety control can be started right from the production (manures, fertilizers, livestock feed, waters, pesticides, growth regulators, etc.) through post production stages (sorting, grading, washing, packaging, transportation, storage, processing and marketing). Assuring food safety is interdisciplinary and complex and therefore strong coordination among various groups including producers, traders, processors, policymakers, law enforcing agencies, researchers, physicians, civil society representatives, and other relevant GOs and NGOs is needed to prevent malpractice and thereby improve quality and safety situation in the horticulture and livestock chains of Bangladesh. Adoption of standard practices at various stages of food chain is needed so that contamination (chemical and microbial) can be reduced or eliminated. This would minimize time, money and energy, for instance, inspecting final products where no measures could be taken but to destroy or withdraw food items which have been produced at the expense of significant amounts of inputs. So, a great deal of attention is needed to make adequate and need based intervention so that standard good practices like GAP (Good Agricultural Practices), GHP (Good Hygiene Practices), GHP (Good Husbandry Practices), GVP (Good Veterinary Practices), and so on can be adopted and supply good quality and safe produce to the consumer.

Key Policy Inputs for Safe Food Production and Enhancing International Trade

Government of Bangladesh has prioritized the safe food production. In this issue Good Agricultural Practice (GAP) is very much effective challenges. The incentive is another factor that may affect the adoption of GAP practice. Sustainability of GAP would be depend the government invests on the promotion of GAP. The following points are to be considered to harmonization of SAARC GAP -

- Skill development and capacity building of following GAP code on fruits and vegetables
- Access to new technology and knowledge on fruits and vegetables production
- Improve knowledge on maturity indices, harvesting, grading, packaging, transportation, and sorting of fruits and vegetables
- Develop protocol on quality inputs like seed, fertilizer and pesticides
- Support for the development of alternate supply chain for exporting frozen fruits and vegetables to increase volume of export through ocean bound vessels
- Create common understanding of food safety among the stakeholders of SAARC countries for enhancing export growth
- Assist in stabling a data base on market information of perishables fruits and vegetables.
- Update policy through dialogue among SAARC countries
- SAARC countries need to improve supply-side capacity through strategic investments as well as in physical infrastructure.

Key Strategies

GAP introduced in Bangladesh by AFASI and FAO project. In 2014-16 FAO has implemented a TCP project titled Development of Standards and Scheme for "Good Agriculture Practice (GAP) Implementation and Certification in countries of SAARC". This SAARC-GAP standard for Fruits and vegetables were internalized in Bangladesh as BanglaGAP. Under this project, the GAP Standard, organogram of Scheme Owner (SO) and Certification Body (CB) including all required documents for certification process were approved by the Technical and Steering Committee of the Project. For building quality infrastructure and institutional capacity in the country a training was also provided to the personnel of scheme owner and certification body on development of auditing and inspection skills. Scheme owner and GAP Certification Body has been formed under SAARC GAP project and the accreditation process by Bangladesh Accreditation Board (BAB) is going on.

The process of Accreditation of the Certification Body is underway according to ISO: 17065:2012. Bangladesh GAP Logo also been developed for approval. Under AFASI, GAP codes for some horticultural crops like cucurbits, mango tomato were developed; manuals were prepared on mango and tomato both in Bangla and English languages. Identification of a pilot area for GAP implementation, establishment of a certification system, preparation of training manuals and training of trainers and farmer on GAP standard and implementation were also conducted under AFASI. The BangladeshGAP Standard have been adopted as following mmodules- i) Food safety module , ii) Environmental management module, iii) Worker health, safety & welfare module, iv) Produce Quality module,V) General Requirements Module. Moreover following suggestion can strength the GAP standard:

- Identify the agency responsible for GAP policy management in each country and make a plans by identifying where policy development may be required to meet future needs
- Develop a GAP project focusing 2 - 4 crops (fruits and vegetables) by setting a common standards for those crops, identify the problem and sort the possible solution and take necessary action
- Information gathering and sharing in a common platform for strengthen the GAP program in SAARC region
- Consultation and coordination of exiting policy, identify the drawbacks and make solution

Challenges and Way forward

Challenges

- Absence of independent research bodies on food safety especially on fruits and vegetables.
- Inadequate production and market information compliance of small holders.
- Inadequate processing and storage knowledge.
- Formulation of dynamic trade policy of member countries.
- Inadequate research and development activities to exploit the value added technology.

Way forward

- Strategic for development of infrastructure of human and operational capacity
- Strengthening to build risk awareness among stakeholders

- Addressing GAPs related to food safety standard in SAARC countries
- Strengthening risk-based approaches for food safety systems.
- Increase transparency and accountability of food safety measures, which can increase trust between customers, suppliers, and regulators.
- SAARC Common Principles guide for developing and harmonizing food control systems across the SAARC countries.
- The key principles include integrated farm-to-table approaches, risk analysis, transparency, and regulatory.

Challenges and Way forward for implementation of SAARC GAP

Challenges

- Lack of GAP policy, standards, accreditation and certification in the individual member and SAARC region
- Lack of independent authority for implementing GAP
- Numerous formalities for GAP
- Stakeholders are not aware on GAP

Way forward

- Develop GAP policy, standards and accreditation and certification in the individual member and SAARC region.
- Set a common lab for each country for effective risk communication and to build up risk awareness among stakeholders.
- Addressing GAPs related to food safety standards and trade in the SAARC countries and requires value chain approaches among all stakeholders.

Conclusion

- GAP known as BanglaGAP implementation and promotion would be sustainable through safe food production and create friendly environment as well as workers health. Moreover, following suggestion would be given for the success of BanglaGAP- such as BARC, Hortex and private companies
- Identify policy management agency for each country to streamlining , updating and functioning GAP at SAARC region
- A common standards, certification for GAP need to be formulated across the SAARC region
- Scientific collaboration is required for capacity building through networking

- A pilot project should be initiated on GAP involving the member countries
- An accredited food safety and quality laboratory need to be established in each country
- Initiate SAARC GAP logo for free trade in the SAARC region

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Chapter 3

Status of Good Agriculture Practice (GAP) in Bhutan

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Abstract

Bhutan has developed the BhutanGAP standard for fruits and vegetables which promotes food quality, safety as well as environmental and occupational health. The Department of Agriculture (DoA), Ministry of Agriculture and Forests (MoAF) is the Scheme Owner and is responsible for developing and maintaining the BhutanGAP Scheme and Bhutan Agriculture and Food Regulatory Authority (BAFRA) is identified as the third party Certification Body (CB). Three fruit crops – apple, mandarin and hazel nut - and one vegetable potato – have been identified for the initial implementation of the BhutanGAP standard.

Keywords: *BhutanGAP, MoAF, Food safety, Crops, Environment*

Introduction

Bhutan is a small mountainous country located on the southern slopes of Eastern Himalayas. The country has a total geographical area of 38,394 Square Kilometers with a population of 745,600 people. Only 2.93 percent out of a total of 7.8 percent arable land can be cultivated (Table1; MoAF, 2016). Agriculture is the main source of livelihood for 69 percent of the population. The majority of Bhutanese farmers are small land-holders with an average farm size of 3 acres and practice self-sustaining subsistence integrated farming systems.

Most farmers follow one of rice, maize and potato-based farming systems. However, to sustain themselves, many have adopted multiple cropping to enhance the total production from small land holdings. Among the crops, horticulture contributes a significant part as a cash crop and plays an important role in household income and food and nutrition security of the Bhutanese farmers.

To facilitate export of horticulture crops, implementation of GAP has become essential and inevitable requirement. As such, the development of BhutanGAP standard for fruits and vegetables was initiated through assistance from FAO under SAARC-GAP scheme to assist the member countries to produce safe and quality agriculture products and increase trade at regional and global level.

Table 1. Agriculture land use

Category	Types	Hectares	Percent	Total
Agriculture land	Wet Land	31,911	0.83	
	Dry Land	68,255	1.78	2.93%
	Apple orchard	2081	0.05	
	Mandarin orchard	5488	0.14	
	Cardamom plantation	3600	0.09	
	Areca nut plantation	1199	0.03	
	Other Horticulture	16	00	

Source: RNR statistics, 2016

Area and production status of common fruits and vegetables

Bhutan's vegetable production and export has seen significant increase over the years**.** However, achieving self-sufficiency in vegetables has been hindered by seasonality and low productivity. Bhutan produces a surplus of vegetables in summer and a deficit in winter due to water scarcity and harsh temperatures. The deficit of vegetables is supplemented with imports from India.

Table 2: Cultivated Area and Production of Vegetables

Crop Name	Cultivated Area (Hector)	Production (MT)
Asparagus	168.9	239
Chilli	2242.9	9,907
Cabbage	1108.9	6,685
Cauliflower	612.4	2,082
Carrot	245.8	1,276
Radish	1162.8	6,490
Turnip	649.2	10,499
Beans	1370.9	4,409
Peas	322.0	1,014
Tomato	140.5	455
Broccoli	293.6	1,004
Eggplant	165.2	585
Lady's Finger	17.4	42
Green leaves	590.5	1,937
Onion Bulb	179.0	414
Garlic	570.6	1,176
Potato	5928.4	58,820

Source: RNR statistics, 2016.

Table 3: Fruit Production (Year 2016)

Crop Name	Production (MT)
Apple	6,587
Mandarin	42,700
Areca nut	9,467
Mango	644
Pear	852
Peach	972
Plum	376
Walnut	152
Jackfruit	775
Guava	665
Papaya	282
Pomegranate	83
Litchi	134
Persimmon	49
Banana	3076
Sugarcane	345
Passion fruit	120
Pine apple	67

Source: Agriculture Statistics, 2016.

Current Production Technology

Subsistence agriculture farming in Bhutan is being gradually replaced by commercial farming. Farmers are becoming more oriented towards cash crop cultivation such as fruits and vegetables. High quality seeds along with recommended fertilizers and judicious use of chemicals for controlling insect pests and diseases and use of farm machinery to overcome the labor storage are being adopted. However, the uses of chemical inputs are regulated as the country is aware of the harmful effects of chemical inputs. The National Plant Protection Centre (NPPC) under Department of Agriculture (DoA) oversees the import and distribution of chemical pesticides. Likewise, the National Seed Centre (NSC) in the Department of Agriculture, MoAF is responsible for chemical fertilizers and seeds. Private importers are not allowed to import chemical pesticides on their own in order to curb the entry of chemicals that could be of inferior quality and present threats to health and environment.

Potential of fruit and vegetable trade with SAARC countries

The main cash crops grown in Bhutan are apple, mandarin, cardamom, potato and fresh vegetables. India and Bangladesh are the two major countries that import fruits and vegetables from Bhutan. Surplus vegetables produced during the summer are exported to India through auction system. The total quantity of 18800.37 MT worth Nu.547.55 million of Fruits and 3048.05 MT worth Nu.64.04 million of vegetables were exported in year 2017 (RNR Statistics, 2017). The DoA has prioritized around 17 vegetables including broccoli, carrot, and cauliflower based on agro-climatic suitability to meet increased export demand (Agriculture Statistics, 2016).

GAP in Bhutan

Bhutan has developed the BhutanGAP standard and certification scheme. The development of the standard was initiated by FAO through assistance for the SAARC GAP Scheme. The DoA within MoAF has been identified as the Scheme Owner and is responsible for developing and maintaining the BhutanGAP Scheme while Bhutan agriculture and Food Regulatory Authority (BAFRA) has taken on the role of third party certification. The DoA has identified three fruits plant such as Hazelnut, apple and mandarin and one vegetable (potato) for the initial implementation of the standard. The training programs, workshop on BhutanGAP Standard and Scheme were conducted with FOA-RAP support and development quality manual for identified crops and other related training has been conducted also through AFACI-GAP projects.

Being a voluntary scheme, however, the implementation of GAP at the field level has not taken off. The key challenges for implementation of GAP are the lack of trained personnel to promote GAP requirement at the field level and the lack of awareness among producers/farmers on the importance. The DoA in collaboration with Department of Agriculture Marketing and Cooperatives (DAMC) needs to identify further market opportunities and build a demand for GAP certified produce from Bhutan. Measures that could be rolled out include provision of information on the business benefits in the form of higher incomes for producers and the rolling out of extensive training programmes for farmers and value chain actors as well as professionals for auditing, inspection and certification. The linking of buyers and suppliers with producer groups implementing GAP and assuring good prices through a contract farming system is essential. The Government should develop policy on incentive program such as such a providing of packaging and transportation of GAP certified products in the initial implemental period to enable GAP to take off.

Conclusion

In view of the commercialization drive in agriculture and strong program on organic agriculture, a systematic application on GAP in all stages of value chain is important. Further, as food safety and quality is gaining importance globally, GAP needs to be mainstreamed as a pre-requisite intervention. While the initiative of FAO-RAP has helped Bhutan to successfully pilot the SAARC-GAP scheme, it was observed that lack of necessary policy and institutional arrangements are vital to fully operationalize the scheme. A very crucial player in the scheme is also the technical capacity of the field staff to comprehensively implement the scheme. Integrating the GAP scheme with the existing value chain of different commodities will also be necessary, to ensure application of GAP principles at all stages.

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Chapter 4

Current Good Agriculture Practices (GAP) Standards and Harmonization in India

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Abstract

India's basic strength lies in agriculture. For farm produce to be internationally competitive, innovative farming practices incorporating globally accepted Good Agricultural Practices (GAP) standards within the framework of commercial agricultural production for long-term improvement and sustainability is essential.. The India Good Agricultural Practices (INDGAP) standard takes into account not only the quality and quantity of the produce obtained from a unit area but also actions taken in integrating pre-harvest practices like soil & water management, nutrient management and pest management, harvesting, post-harvest handling and other logistics. The focus of INDGAP is to ensure food security by addressing sustained supply of produce of the desirable quality and safety.

Introduction

Agriculture provides the largest source of livelihood in India and remains a key driver national economic growth. During 2017-18, India recorded a food grain production of 279.51 million tonnes, while production of horticulture crops was estimated at 307.16 million tonnes (MT). India is the second largest fruit and vegetable producer in the world. With rising incomes and awareness about nutrition, demand for fruits and vegetables has been increasing. There is also a growing demand for safe and quality produce, which shall be a major challenge for all stakeholders of the value chain of fruit and vegetable industry in the future. With trade in agriculture and horticulture going global, harmonizing local production systems with the standards and requirements of international markets can be achieved through the implementation of GAP standards. In addition to improving the yield and quality of the products, GAP standards also have environmental and social dimensions. Implementation of GAP promotes optimum utilization of inputs such as pesticides, fertilizers, water, and eco-friendly agriculture. For the implementation of INDGAP, it was necessary to define certain minimum

standards with a well-defined certification and accreditation mechanism as described in this paper.

Agricultural land use

With a population of 1.27 billion India is the world's second most populous country. It is the seventh largest country in the world with an area of 328.7 million hectares. India's climate varies from humid and dry tropical in the south to temperate alpine in the northern reaches and has a great diversity of ecosystems. According to the recent statistics (Annual Report 2016-17 of DAC&FW), 141.4 million hectares is the net sown area and 200.9 million hectares is the gross cropped area with a cropping intensity of 142 %. An estimated 82 percent of farm holdings are small and marginal.

Area and Production status of common Fruits and Vegetable crops

Horticulture is considered as a major driver of increasing farm productivity. It generates employment and enhances export earnings and currently accounts for 30% of total agricultural output in India. A voluminous growth in horticulture production - both in terms of area expansion and productivity, was observed during the last two decades. During 2016-17, the production of horticultural crops was 295.2 million tons from 24.9 million ha. The total fruit production was estimated at 88 million tons and vegetables at 175 million tons during 2016-17.

Current production technology, post-harvest handling, processing, value addition and storage of fruits and vegetables

Several technological interventions have fuelled the growth of horticulture in terms of both quantity and quality. These include the adoption of appropriate rootstocks in fruit crops; the tapping of hybrid vigour and commercial production of hybrid seed in vegetables; emergence of vegetable quality seedling nurseries as rural enterprise; adoption of precision farming techniques such as drip, mulching and fertigation in peri-urban cultivation of vegetables; the use of plastic crates for handling of fruits and vegetables and national schemes for establishment of cold storage facilities. The Indian food industry is poised for huge growth, increasing its contribution to world food trade every year due to its immense potential for value addition, particularly within the food processing industry. The Indian food and grocery market is the world’s sixth largest. The Indian food processing industry accounts for 32 percent of the country’s total food market.

Current GAP for production of fruits and vegetables in India

Good Agriculture Practices as per FAO comprise of sequence of activities and choices in the production process including pre-planting measures, production measures and post harvest measures.

In the Indian context, standards have already been developed by QCI (INDGAP) and another in advanced stages by BIS (IndiaGAP). Of these, INDGAP is gaining popularity with accreditation body in the form of NABCB, which is already functional and is also recognized by Global GAP secretariat. The INDGAP standards for fruits and vegetables have been grouped into critical and major criteria at five production stages (choice of variety or rootstock, soil and substrate management, irrigation/fertigation, harvesting and produce handling) required to be followed by the grower or a grower group as well as by the certification bodies for verification purposes (INDGAP, QCI). The Tamil Nadu Agricultural University (TNAU), Coimbatore has come up with major principles underlying these standards in its Agritech portal. The salient principles as highlighted are reproduced below with minor modifications:

Pre-Planting Measures

Site selection

Land or site for fruit and vegetable production should be selected on the basis of cropping history, previous manure applications and crop rotation. The field should be away from animal housing, pastures or barnyards. Farmers should make sure that livestock waste should not enter the produce fields via runoff or drift.

Manure handling and field application

Livestock manure can be a valuable source of nutrients, but it also can be a source of human pathogens if not managed correctly. Proper and thorough composting of manure, incorporating it into the soil prior to planting, and avoiding top-dressing of plants are important steps towards reducing the risk of microbial contamination.

Manure storage and sourcing

Manure should be stored as far away as practical from areas, where fresh produce is grown and handled. Physical barriers or wind barriers should be erected to prevent runoff and wind drift of manure. Manure should be actively composted so that high temperature achieved by well-managed, aerobic compost can kill most harmful pathogens.

Timely application of manure

Manure should be applied at the end of the season to all planned vegetable or fruit fields, preferably when soils are warm, non-saturated, and cover-cropped. If manure is being applied at the start of a season, then the manure should be spread two weeks before planting, preferably to grain or forage crops.

Selection of appropriate crop

Farmers should avoid growing root and leafy crops immediately after manure is applied to a field. Manure should be applied to perennial crops in the planting year only. The long period between application and harvest will reduce the risks.

Production Measures

Irrigation water quality

Ideally, water used for irrigation or chemical spray should be free from pathogens. However, potable water or municipal water is not feasible for extensive use in crop production. Hence, surface water used for irrigation should be quarterly tested in the laboratory for contamination. Farmers can filter or use the settling ponds to improve water quality. Fruit and vegetable crops should not be side-dressed with fresh or slurry manure. If side dressing is required, well composted or well-aged (greater than one year) manure should be used for the application.

Irrigation methods

Drip irrigation method should be used, whenever possible to reduce the risk of crop contamination because the edible parts of most crops are not wetted directly. Plant disease levels also may be reduced and water use efficiency is maximized with this method.

Field sanitation and animal exclusion

Farmers should stay out of wet fields to reduce the spread of plant or human pathogens. Tractors that were used in manure handling should be cleaned prior to entering produce fields. Animals, including poultry or pets should not be allowed to roam in crop areas, especially close to harvest time.

Worker facilities and hygiene

Ideally, farm workers should be provided clean, well-maintained and hygienic toilet facilities around the farming areas. Farmers should get proper training to make them understand the relationship between food safety and personal hygiene. These facilities should be monitored and enforced.

Worker Hygiene

Hands can contaminate fresh fruits and vegetables with harmful microbes. Packing area should be cleaned and sanitized. Liquid soap in dispensers, potable water, and single-use paper towels for hand washing should be made available.

There should be separate toilets (even mobile will do) for use of workers in the field. Workers should be properly educated about the importance of toilet use and proper hand washing. Encourage proper use of

disposable gloves on packing lines. Sick employee should not be given food-contact jobs.

Pack House Operations

The producer must provide an environment that reduces possible microbial contamination of product by field workers; sanitation of gloves, knives, baskets, use of chlorinated water for rinsing of product, etc. There must be an adequate number of field sanitation units. These units must be conveniently located and properly equipped and serviced. There must be an individual responsible for plant sanitation issues. Only food grade lubricants are to be used in the packing facility. Good sanitation practices, both inside and outside of facility, must be followed.

Wash water quality

Potable water should be preferably used in all washing operations. Clean water should be maintained in dump tank by sanitizing and changing water regularly. Water quality should be got tested for its suitability in use for fresh produce. Only chlorinated water should be used and other labeled/permitted disinfectants to wash fresh produce. Possible contamination of the site by adjacent sewage treatment the facilities must be prevented. Pest control measures should be adopted from time to time.

Sanitize packing house and packing operations

Loading, sorting, and all food contact surfaces should be cleaned and sanitized at the end of each day. Care should be taken to ensure that no animals, especially rodents and birds enter the packinghouse. Wash, rinse and sanitize the packing line belts, conveyors, and food contact surfaces at the end of each day to avoid buildup of harmful microorganisms. Packaging material should be stored in a clean area.

Pre-cooling and cold storage

After harvesting, fruits and vegetables should be quickly cooled to minimize the growth of pathogens and maintain good quality. Refrigeration room should not be overloaded beyond its cooling capacity. The cold chain should be maintained until it reaches the cold storage if the produce is meant for long-term storage. If ice is used in pre-cooling, it should be ensured that ice is made from potable water.

Packaging Material

The packaging material should be free from chemical and microbial contaminations. It should not have contamination of rodent or bird excreta, etc.

Transportation of produce from farm to market

Contamination during handling of horticultural produce is a major issue that needs serious attention (Lee et al., 2009). The risk of microbial

pathogens and reduced quality can increase during transportation if proper temperatures are not maintained. In fact, temperature abuse anywhere along the food-chain can turn a small problem into a large problem due to rapid growth of bacteria. Another important factor to consider is vehicle cleanliness. Proper cleanliness of the transportation vehicles should be ensured before loading. Farmers have to make sure that fresh fruits and vegetables are not shipped in trucks, which have carried live animals or harmful substances. If these trucks have to be used, they should be washed, rinsed, and sanitized before transporting fresh produce. For traceability norms, it must be ensured that each package leaving the farm can be traced to field of origin and date of packing.

Traceability

Producers must have a system for tracing product from the field to the first buyer (Matsuda, 2005). The tracking system must identify:

- The specific grower
- The specific field or farm of production
- The date of packing
- The date of harvest

Compliance for Certification

The documentation of all the operations of production and post-production phases with suitable control points and remedial measures will ensure the compliance of certification requirements.

Potentiality of fruit and vegetable Trade in SAARC Countries and beyond the SAARC

Chand (2010) presented the SAARC Agricultural Vision 2020 highlighting the commonalities of farming scenarios among the nations in the region and emerging challenges that need shared attention. According to a WTO report in 2017, India is the 10th largest exporter of agricultural products in the world with a share of 2.1 per cent (US$ 38.21 billion in FY2018). During 2016-17, India exported fruits and vegetables worth Rs. 103.7 billion/ 1,552.26 USD Millions, which comprised of fruits worth Rs.44.48 billion 667.51 USD Millions and vegetables worth Rs. 59.21 billion/ 884.75 USD Millions.

Mangoes, walnuts, grapes, bananas, pomegranates account for large portion of fruits exported from the country while onions, okra, bitter gourd, green chilles, mushrooms and potatoes contribute heavily to the vegetable export basket. The major destinations for Indian fruits and vegetables are UAE, Bangladesh, Malaysia, Netherland, Sri Lanka,

3. Common brand building for South Asian produce
4. Establishing a information network for improving trade and handling efficiencies for perishable fruits and vegetables in region and
5. Adoption of common Standard operating protocols for quarantine across the region

Challenges and way forward for Research, Development and Implementation of SAARC GAP

SAARC may come up with a common minimum protocol of GAP that is acceptable to all stakeholders in the region and meeting requirements of importing nations. The success of common minimum protocol would depend solely on its strategy to secure and strengthen the livelihood of small and marginal farmers of the region and at the same time creating new market opportunities for farmers and exporters

SAARC-GAP should be tailor made to suit the needs of the small and marginal farmers, who form the majority in this region, allowing them to move up to the International GAP (Global GAP) in a phased manner. There is a need for developing institutional framework and engage in extensive extension services to create awareness and promote GAP in these regions as a policy.

Conclusion

India aims to achieve the ambitious goal of doubling farm incomes by 2022. The agriculture sector in India is expected to generate higher growth in the next few years due to increased investments in agricultural infrastructure such as irrigation facilities, cold chain and value addition. Exports will be crucial if India is to achieve its targets, which would be possible only by institutionalizing GAP standards and their certification mechanisms. Farmers have to opt for GAP for their produce to have access to new markets and meet safety demands consumers. Further, the farmer would directly benefit from increased farm revenue and sustainability. Similar socio-economic conditions among farmers prevail across the region. Cooperative and collective strategies among the nations for improving the farm practices and trade would benefit the farmers of the region. In this regard, ASEAN-GAP should be seen as an example of regional cooperation that can be emulated for mutual economic benefit.

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Chapter 5

MaldivesGood Agriculture Practices (MGAP): Strengthening Food Safety in Maldives

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Abstract

Food and Agriculture Organization have recently mentioned in the drafted Agriculture Policy framework for the next ten years, it is essential to transform the agriculture sector into an ensemble of market-oriented and integrated value-chains that contribute to socioeconomic growth, food security and sustainable management of natural resources. Agriculture Policy and the National Development Plan (2019-2029) ensures that stakeholders of the agriculture sector prioritize activities that are environmentally sustainable Research, select and promote technologies, tools and infrastructures that can sustainably increase access to clean water, including efficient irrigation systems, in order to foster Good Agricultural Practices (GAP). The Government of Maldives adopted SAARCGAP guidelines developed by FAO for a Maldives GAP Scheme to ensure implementation of the food safety, quality, environmental management, workers health, safety and welfare aspects. Maldives considers the MGAP to be a potent tool to stop sub-standard trade in fruits and vegetables that hampers the tourism sector.

Keywords: *Maldives, island, MGAP, tourism*

Introduction

Republic of the Maldives is a sovereign archipelagic nation positioned in the Indian Ocean. It is located between latitude 70 6’ 35” North to 00 42’ 24” South and longitude 720 33 19 East to 760 43 13 west about 480 km south of India and 720 km west of Sri Lanka. The Maldives, are located on top of a vast underwater mountain range consists of around 1190 islands and sandbanks. The pearl string like islands covers a land area of only 298 km2. The total population of the country is 298,000 people spread over 197 islands. The per capita income of the Maldives is US$ 8980 in year 2017 and serious poverty or malnutrition cannot be observed in Maldives. The principal livelihoods include tourism, fisheries and agriculture. There is a gradient in the rainfall from south to north of the archipelago. The southern part receives about 3050mm rainfall while the northern island experience

1840mm average annual rainfall. There are two rainy seasons "Hulhangu Moosum" may to September and "Iruwai Moosum" (October to January). Hulhangu Moosum is the major season for cultivation in all parts of Maldives. The contribution of the agriculture sector for gross national production has dropped during the last two decades and present it is only 20%. Maldives heavily depends on the food imports as the domestic agriculture production meets less than 10% of the national food requirements.

Maldives is a member country of the SAARC region that comprises of Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan, and Sri Lanka and is broadly classified as low income or low middle-income category in global parlance. The SAARC Agriculture Vision 2020 document has reported that a majority of population in the region lives in rural areas and depends upon agriculture for livelihood and sustenance. In view of the above, it is felt strongly that the agriculture sector has the potential for further development to enable Maldives to become self-sufficient in selected vegetable and fruits, save foreign exchange as well as to provide an incentive to the farming population of Maldivians who are now migrating from agricultural sector to non-agricultural jobs.

Background of SAARC GAP

Most of member countries in the SAARC region are principally agrarian economies, they face multiple challenges in their agricultural sector. On one hand, there are challenges due to conventional ways of farming (FAO) and, on the other is the overwhelming lack of confidence exhibited by the markets in terms of food safety and quality of their farm produce due to lack of structured approach to farming (Karki TB, 2002).

It is thus imperative that all the facets of agricultural production are managed judiciously so that issues of food and nutrition security, economic stability and securing livelihood of majority of population are aptly handled. The time is opportune for SAARC member countries to develop and put in place a mechanism of good agriculture practices in line with changing consumer and trade demands.

Maldives identified the need of having a standard that will make them to be better placed to put their produce in the market and enhance farm incomes. To address issues of food safety and quality, it becomes important to address the entire food chain including primary production. This realization set in couple of years ago, when concerns regarding microbial contamination, and residues of chemicals and heavy metal that have plagued the food processing industry, started being expressed (CDCP, 1982; Rejesus, 2009).

The increasing concerns of food safety and hygiene, including in the farming system, have led stakeholders to build structured or certifiable systems, so

that products with residues and contaminants beyond acceptable levels do not enter the food system at any point in the food chain.

The Government of Maldives, one of the members of SAARC is aware of the issues plagued in this part of the world and opportunities that exist in form of standard and certification systems. It regularly faces imports of sub-standard fruits and vegetable. The prices received by the farmers are adversely affecting the local producer's livelihood. Moreover, since there is no quality check in the process, it is difficult for the government to restrict sub-standard imports. This is further compounded with a lack of standards for either the farmer or the marketers as benchmarks of quality and safety.

Maldives apex body in agriculture the Ministry of Fisheries and Agriculture (MoFA) realized that there is a need to bring in culture of food safety, enhanced produce quality, optimization of human and natural resources in agriculture. They approached FAO for assistance them to build an appropriate knowledge based system. FAO, through its technical co-operation programme built the quality infrastructure by developing the SAARCGAP framework and then deputing a consultant to adapt and adopt the framework with specific reference to Maldives. The Government of Maldives acted promptly by identifying a Scheme Owner, the then Ministry of Food and Agriculture and a Certification Body, Maldives Drug and Food Authority or MFDA to introduce and regulate MGAP.

It is a particularly opportune time to promote GAP when the second generation of reforms in agriculture are focused on the agro-processing industry – both being important stakeholders in the sector. A common GAP standard in the SAARC region will promote regional trade in the coming times. It includes food safety, quality, environmental management and workers health, safety and welfare modules which can be implemented individually or in combination. It is hoped that this will encourage not only increased safety of produce in domestic markets but also increased regional and global trade.

Rationale of Maldives Good Agricultural Practices (M-GAP)

The Government of Maldives realized that now was the time to intervene to improve the current agricultural practices in Maldives. It was felt that by putting in focussed effort it could help in addressing the issue of agriculture practices including issue of food safety in primary production. The best way to address the issue was to institutionalize a mechanism that will improve the practices in agriculture.

The intervention of introducing GAP is seen as an effective step for upgrading and expansion of the agriculture which will not only help Maldives to save foreign exchange but will also help in alleviating poverty amongst farmers, sustaining the interests of rural youths in farming,

achieving greater self-sufficiency in essential food supplies and effectively creating a barrier for sub-standard imports of fruits and vegetables that are landing in the ports of Maldives.

The Scheme stands implemented, where the operationalization and pilot cases have been already undertaken with certificates granted to farms. To make the activity sustainable an elaborate plan of quality infrastructure that includes certification and testing component is designed to stabilise the Scheme.

Framework of M-GAP

The MGAP Scheme in Maldives has been designed and developed through a multi-stakeholder consultation that involved all the major stakeholders. These included participants from MFDA, different departments of Ministry of Health (PIH, HPA, QAID and others), Ministry of Fisheries, Marine Resources & Agriculture, Ministry of Tourism, Indira Gandhi Memorial Hospital, Ministry of Foreign Affairs, Environment Protection Agency, Maldives Airports Company Limited, Fisherman's Association, Maldives Seafood Exporters and Processors Associations, Ministry of Islamic Affairs, Maldives Customs Services. A host of queries on issues related to food safety, quality parameters, imports, voluntary mechanism, logo, declaration in retail packing, domestic production and export potential of key fruits were addressed during all the committee meetings.

The MGAP Scheme was adapted from the SAARCGAP Scheme by reviewing each clause and sub clause with respect to the agricultural scenario of the country. Some of the clauses where re-designated to either critical, major and minor based on the relevance they had on the agriculture of Maldives. The important changes made were with respect to the slopes, the chemical inputs and the transportation aspect since these where majorly done through shipping vessels along with road transportation. The entire framework of the MGAP included the Scheme, the technical standard, certification criteria, certification process and requirement of the certification bodies.

The Scheme in itself had documentation that included formats for the accreditation body, certification body and producer requesting certification. The mechanism ensures that there is clarity for the producer and the requirements for the certifying body are clearly enunciated. In addition to the documentation, a training manual was designed in the local language for assisting the stakeholders to understand the requirements.

Implementation of M-GAP Scheme

The implementation of the MGAP Scheme was done through a structured process that included a series of sensitisation programmes for each of the

major stakeholders including the government officials, certification bodies, farmers, consultants etc. The focus of the sensitisation programme was towards capacity building of all the important stakeholders.

A separate module was designed to expose the personnel of the audit team and the SO team to have hands-on experience on the requirements of the audit and the importance of record keeping. The auditors from the MoFA were given training on auditing techniques in order to observe management on the field and collect evidence for recording compliance.

Similarly, modules were designed to inform the farmers of the requirements to achieve MGAP certification through the Scheme. The producers were explained the various kinds of records, its importance and ensuring compliance of the existing documents with the Scheme requirements. The MGAP also introduced the requirement of testing of produce to validate that the crop has been grown as per the requirements of MGAP. Sampling methodology for this was developed along with documentation which was aligned with the certification process. Issues such as the requirement of testing laboratories, modalities of sampling, turnaround time for issuance of reports, types of testing, volume/weight of sampling and report formats were finalised and pilot testing completed.

Current Status

The FAO project on 'Implementation of Good Agricultural Practices in SAARC countries: SAARC GAP Scheme" was initiated on January 2015 and was successfully completed in December 2017.

Maldives utmost priority is to address the current issues and concerns relating to the harmful or inappropriate agricultural practices. Audio-visual recordings are being prepared on the GAP scheme for raising awareness among the general public and promote the scheme to help producers to adopt the scheme..

Maldives, under this project has adapted the GAP standard through the Technical Committee meetings that were later endorsed in by the Steering Committee. The standard was implemented by carrying out series of trainings and awareness programs relating to GAP in various islands that culminated with undertaking pilots in selected islands that practiced agriculture. A series of workshops have been carried out in Laamu Atoll with participants from Thaa Atoll (L. Gan, L. Isdhoo, L.Kalhaidhoo, L. Dhanbidhoo, Thaa .Kinbidhoo), Gn. Fuvahmulah, Ha Atoll (Ha. Kelaa, Ha. Filladhoo).

The Ministry has recorded a total of about 8000 farmers registered from various islands within the country. In addition, about 50 uninhabited islands have been leased for agricultural activities and an additional 6 agriculture cooperatives are working with IFAD under the FADIP project. The Ministry

approached the FAO for allocating funds for the pilot certification for field testing the farms for implementation and certification of the MGAP Scheme. The initial audit was carried out in one of the agricultural cooperatives working under IFAD -Bizzville Maldives, based in Ha. Hoarafushi by consultant employed by FAO. An elaborate audit report was prepared on the current findings in the farm along with recommendations. As is the usual trend, record keeping is minimal in the farms and was the most challenging to achieve in the certification of individual farmers as compared to the group certification.

Consequently, a series of visit by the certification body MFDA along with the Scheme Owner was organized atHanimaadhoo, Madidhoo, Ha. Hoarafushi and other islands. The visit was focused towards administrative facilitation and field observation visits in order to achieve the work plan submitted to the FAO. A series of meetings were held with Ministry of Fisheries, Marine Resources and Agriculture (Ministry) and Maldives Food and Drug Authority, (MFDA). Officers of the Agriculture Department from Ministry and the Food Control Division (FCD) of MFDA to brief them on the outcome of the visit.

Recommendations

The following recommendations are suggested:

- Development of a robust training calendar on MGAP for the farmers and certification bodies.
- Promotion of MGAP Scheme among commercial farming islands and also in international fora by the Ministry of Fisheries, Marine Resources and Agriculture to promote.
- Inclusion of MGAP in the Food Safety Programs of MFDA and as well as Food Security Program of Ministry to create a pull factor for the Scheme.
- Consideration of some incentives for farmers that are certified under MGAP
- Development of a pesticide residual monitoring plan to map the current pesticide load in the farming islands.

Summary and Conlusion

Summary

The policy makers in Maldives are aware that tourism and fisheries sector heavily contribute to the economy, however, the agriculture sector had seen a drop in its contribution to Gross Domestic Product (GDP) due to issues related to current agriculture practices such as food safety. The policy makers realized that the economy could further improve by strengthening linkages

between the tourism sector and other key economic sectors such as agriculture. It was also felt that while agriculture production falls short of the domestic consumption needs, the sector is always under the pressure to meet the food safety requirements of the continuous influx of foreign tourists especially for fresh agricultural produce.

In view of the above, it was felt strongly to introduce Good Agricultural Practices (GAP) in the agriculture. This not only will make Maldives self-reliant in agriculture production it will also strengthen food safety in primary production. The Maldivian apex body on agriculture, Agriculture Ministry of Fisheries, Marine Resources and Agriculture (MoFMRA) realized that the best way to introduce a culture of food safety, enhanced produce quality, optimization of human and natural resources in agriculture was by implementation of GAP. They approached Food and Agriculture Organisation of the United Nations (FAO of the UN) for assisting them to build an appropriate eco-system to address the above mentioned issues through a sustainable mechanism. A regional standard SAARC GAP in the horticulture sector was established that has mechanism for individual countries to adapt or adopt the standards and further implement it through a quality infrastructure

MoFMRA in various stakeholder consultations designated itself as the Scheme Owner and handed over the role of certification body to Maldives Drug and Food Authority (MFDA) as it had the expertise in conducting food safety inspections and reporting. Through this initiative the Maldivian Government was the first amongst the member SAARC nations to adapt and adopt the SAARC-GAP as Maldives GAP, assign a logothereby introducing the second generation reforms in agriculture. The farms in Maldives are now assessed for their implementation as per the MGAP to review components such as the food safety, quality, environmental management and workers health, safety and welfare modules.

This initiative has ushered an era of food safety in the island country, which in due course of time can be used as a tool to restrict the sub-standard imports coming to them which creates issue of food safety and dampens their influx of foreign tourist.

Conclusion

In general, efforts need to be concentrated in increasing farm productivity and lowering production costs through adoption of appropriate and innovative technologies that will expand the production frontier of the Maldivian agriculture. Adoption of GAP will assist in making domestic agricultural products competitive with imported products and pave the way for expanding opportunities for agribusinesses. The challenges currently being faced by SAARC region include the absence of standards for good

practices in the farming sector (SAARC, 2009) and these could be partly mitigated by the implementation of GAP in each member country. Most of the food safety standards are focused towards end-products, be it the mandatory technical standards or voluntary standards. SAARC nations and other stakeholders' viz., the retailers and the buyers recognize that if farmers in the region opt for hygiene and food safety in their production system through Good Agriculture Practices (GAP), they will enjoy access to guaranteed new markets. The GAP standards in the region need to be further improved by drawing references from requirements already existing under the international regulatory frameworks such as the International Plant Protection Convention (IPPC), Codex Alimentarius Commission, World Organization for Animal Health (OIE).

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• Bizville Maldives Cooperative Society- Ha. Hoarafushi

Chapter 6

NepalGAP: Evolved from and Evolving to SAARC Regional Standards

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Abstract

The paper elucidates the details of the Nepal GAP standard. It was developed by the Government of Nepal as a country specific GAP under the SAARC-GAP scheme developed by Food and Agriculture Organization (FAO). The documents of Nepal GAP and the SAARC GAP were carefully appraised, and they were also compared with other GAP schemes like GLOBAL G.A.P. and the USDA GAP. As country-specific GAPs is a customized version of SAARC GAP, a careful assessment of all country-specific GAPs needs to be done for harmonization. However, benchmarking of NepalGAP to GLOBAL G.A.P. or other internationally recognize GAP standards is only a distant possibility at this time.

Keywords: *NepalGAP, GAP, SAARC GAP*

Introduction

Agriculture is the major economic activity of Nepal (GC and Ghimire, 2018a). It contributes one third of the country's GDP and employs two thirds of its population (MoF, 2016). However, commercialization of agriculture is still not at an optimal level. The annual statistics of agriculture, published by the Ministry of Agriculture and Livestock Development (MoALD), covering more than 100 commodities (GC and Ghimire, 2018a) indicates that Nepal still practises subsistance farming on a large scale. Vegetable and fruits are the most grown crops after cereals.

There are 26 policies which are closely related to agriculture and among them 15 policies are directly implemented by the MoALD (MoALMC, 2018). Of these, the National Agriculture Policy, 2004 is considered as an umbrella policy (GC and Ghimire, 2018a).

Agriculture land use

Nepal has a total land area of 147,181 sq. km of which 51,817 sq.km is mountainous, 61,345 sq. km is hilly and rest (34,019 sq. km) is terai (MoAD,

2013). Nepal has 3,091,000 ha. of land under agricultural cultivation and 1,030,000 ha. is uncultivated agricultural land.

Current production technology and value addition of fruits and vegetables

Nepali farming practices are still of subsistence nature in general. However, in case of vegetable and fruits farming, commercialization and modernization has been increasing at a good pace. For example, use of high-tech vegetable farming, greenhouses, hydroponics and other technologies are rapidly growing. Neverthless, the focus on post-harvest handling and processing remains unsatisfactory. Due to sub-optimal post-havest handling and storage, post-harvest losses are significant.

Area and production status of common fruits and vegetable crops

Table 1 presents the area and production status of fruits in Nepal. Summer fruits are grown over far more area than winter and citrus fruits. Mango, banana, guava, papaya, jackfruit and pineapple are popular summer fruits whereas apple, pear, walnut, peach, plum and apricot are the major winter fruits.

Table 4: Status of Fruits Production in Nepal (2016/17)

SN	Crop	Area (ha)	Production (Mt)
1	Citrus	46,328	239,773
2	Winter Fruits	27,918	93,592
3	Summer Furits	88,414	684,942
4	Total Fruits	162,660	1,018,308

Source: MoALMC, 2018b

Nepal produces 3,749,802 Mt vegetables over an area of 277,393 ha.The production status of major vegetables as published in the statistical book (MoALMC, 2018b) are given inTable 2.

Table 5: Production Status of Major Vegetables in 2016/17

SN	Crop	Area (ha)	Production (Mt)
1	Cauliflower	35,974	534,141
2	Cabbage	29,373	485,199
3	Tomato	21,389	400,674
5	Radish	17,687	263,346
6	Broad Leaf Mustard	12,407	153,620
7	Carrot	3,354	37,525

SN	Crop	Area (ha)	Production (Mt)
8	Onion	19,600	237,017
9	Okra	10,694	113,676
10	Chilli	8,939	96,707

Source: MoALMC, 2018b

Good Agriculture Practices

Food safety a key public health and trade concern. According to the World Health Organization (WHO), more than 200 diseases are linked with unsafe food and one in 10 people fall ill every year from consuming contaminated food (WHO, 2016). Therefore, it is important to understand the sources and entry points of contamination along the food chain. The contamination of food can occur at any stage of the food chain from primary production to consumption (FAO, 2016). Hence, interventions to ensure food safety need to be implemented throughout the food chain. Food safety is a multi-sectoral and multidisciplinary area. It is integral to food security and globalization is making food safety more complex and essential (WHO, 2016).

The concept of Good Agriculture Practices (GAP) at the global stage evolved from the discussions on food safety and sustainability at the 17th session of the Committee on Agriculture (COAG) meeting (FAO, 2003). Retailers of "Euro-Retailer Produce Working Group" had already developed EUREPGAP in 1997 (GLOBALG.A.P., 2018). The first GAP certificate was granted in 2001 after EurepGAP received the first ISO17065 accreditation for Fruits and Vegetables (GLOBALG.A.P., 2018).

FAO had cautiously welcomed GAP in its 17th session. The COAG recommended that GAP is the future way of agriculture but it should not create new barriers to trade which may otherwise undermine poverty alleviation efforts (FAO, 2003). Moreover, it was recognized as a voluntary and non-regulatory standard aligned with Codex, IPPC and OIE.

The principles for GAP have been categorized within 11 resource concerns and practices. They are – (1) soil, (2) water, (3) crop and fodder production, (4) crop protection, (5) animal production, (6) animal health, (7) animal welfare, (8) harvest and on-farm processing and storage, (9) energy and waste management, (10) human welfare, health and safety, and (11) wildlife and landscape.

The concept of GAP in Nepal is relatively recent. In the early years of introduction, it was heavily focused on the technical part as the best practices rather than a certification system. A regional project on "Development of Standards and Scheme for GAP Implementation and Certification in Countries of SAARC" was implemented by FAO and facilitated the development of a country-specific GAP standard and certification scheme (FAO, 2016).

Objectives of the GAP

The prime objectives are:

(i) **Food Safety**: The primary motivation of the GAP is safe food. In Nepal, concerns are focused on the excessive use of pesticide on vegetables (GC & Ghimire, 2018b) is growing and represent a major motivation for adoption of GAP in horticulture.

(ii) **Sustainability**: Sustainability is the collective function of optimum use of resources and socio-economic perspectives. GAP promotes rational use of natural resources as well as environmental and occupational health.

(iii) **Trade**: GAP provides a voluntary standard to facilitate imports and exports. It ensures that safety and sustainability requirements are met at both ends and provides a reference point.

Nepal GAP

NepalGAP was developed as a part of the SAARC-GAP scheme promoted by FAO in the SAARC countries. It is also guided by the National Agriculture Policy, 2004 (GC & Ghimire, 2018) and Agriculture Development Strategy (ADS – a twenty year vision documents of Nepal). NepalGAP has adopted the FAO definition of GAP which is the "Collection of principles to apply for on-farm production and post-production processes, resulting in safe and healthy food and non-food agricultural products, while taking into account economic, social and environmental sustainability".

Nepal GAP has five different modules: (1) food safety (2) produce quality (3) environment management (4) workers' health, safety and welfare and (5) general requirement. Certification under Nepal GAP will be awarded only after complying with requirements in all the five modules. Of these, the food safety and the general requirement modules are mandatory to obtain certification under given condition. However, if there is an agreement with producer and buyers to implement some of the modules, Nepal GAP certificate can be awarded for implementation of those specific modules. Nevertheless, the certificate must clearly mention the modules, which were considered for this purpose and it should also indicate the Nepal GAP logo so that no confusion will prevail.

100-90-50 criteria of NepalGAP

NepalGAP has a total of 243 requirements categorized into "Minor", "Major" and "Critical" as shown in Table 3. The requirements under "Critical" need a 100% compliance rate whereas those under the "Major" and "Minor" categories need at least 90% and 50% compliance respectively.

Table 3: Number of Requirements in NepalGAP with category

Module	Minor	Major	Critical	Total
Food Safety	25	59	10	94
Produce Quality	7	18	1	27
Environment Management	12	30	4	46
Workers' Health, Safety and Welfare	4	26	3	33
General Requirement	1	32	10	43
Total	49	145	28	243

Source: Nepal GAP Standard

Table 3 shows that majority of requirements fall under "Major" category followed by "Minor" and "Critical". The total requirements seem a large in number. However, there are five different modules with some repetition of requirements that has created some redundancies. It is also important to note that the same criteria under different modules could have a different objective. Nevertheless, combining the requirements in a single checklist may decrease though slightly, which still may not be comfortable for small and marginal farmers. The integration of the modules has been presented in Table 4.

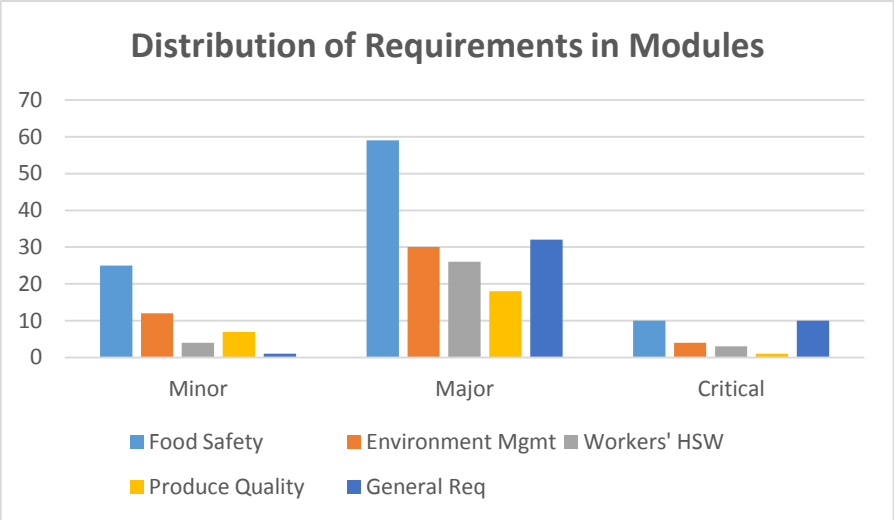

Figure 1: Distribution of Requirements in various modules of Nepal GAP

Source: Nepal GAP Standards

Figure 1 depicts the distribution of requirements in various modules of NepalGAP. It clearly shows that the density of requirements is significantly high in the "Major" Category followed by "Minor" and "Critical".

Table 4: Integration of Modules in NepalGAP

Standard requirement	Food Safety	Environmental Management	Workers Health Safety and Welfare	Produce Quality
Site history and management	X	X		
Planting material	X	X		X
Genetically Modified Organisms	X			
Soils and Substrate		X		
Fertilizer and Soil Additives	X			X
Water	X			X
Chemicals	X		X	X
Working conditions			X	
Personal hygiene:			X	X
Worker welfare			X	
Harvesting and handling produce	X			X
Quality plan				X
Waste Management		X		
Energy Efficiency		X		
Biodiversity		X		
Air/Noise		X		
Training		X	X	X
Documents and Records	X	X	X	X
Review of Practices	X		X	X
Sub Contracted Operations	X			
Traceability and Recall	X			X

Source: Nepal GAP Standards

Governing Structures for NepalGAP

The Ministry of Agriculture and Livestock Development (MoALD) (then Ministry of Agricultural Development) is the Scheme Owner (SO) of NepalGAP for fruits and vegetables. A Steering Committee, chaired by the Secretary of the Ministry, has been constituted, to develop, revise and implement various schemes under NepalGAP. It is also the apex body with

overall responsibility of NepalGAP scheme. To facilitate the Steering Committee, a Technical Committee has been formed under the leadership of the Joint Secretary of the Ministry. A Certification Committee has also been set up in the Ministry. On the same lines, a technical sub-committee has been instituted in each Department under the Ministry, i.e. Department of Agriculture (DoA), Department of Livestock Services (DoLS) and Department of Food Technology and Quality Control (DFTQC), to carry out respective preliminary work on Good Practices to support the Technical Committee. An impartiality committee has been established within the Certification Body (CB), the DFTQC, to review the process of certification from the impartiality point of view.

Certification of NepalGAP

Certification Bodies (CB) are the interface between the NepalGAP scheme and the producer or farmers. The CB can be a private or public sector body and current best practice dictates that it should be a third party and not linked to the SO. However, due to the lack of an accredited third part CB in Nepal, the Steering Committee has assigned the Department of Food Technology and Quality Control (DFTQC) as certification body for NepalGAP. Interested private organizations satisfying the terms and conditions of the certification scheme and possessing the necessary accreditation may apply to the SO to be designated as a CB.

The certification process is a crucial part of the implementation of any GAP scheme. For certification of NepalGAP, farmers or producer can apply to DFTQC. The process of certification consists of the following steps:

1. Application for NepalGAP Scheme at the DFTQC.
2. Obtain NepalGAP Registration Number (NGRN)
3. Collect necessary forms, documents and checklists from the DFTQC
4. Request for training and facilitation, if necessary
5. Prepare documents according to the checklist and review compliance; if not fully compliant, take necessary actions.
6. Fix an appointment with the NepalGAP auditor.
7. Field visit by NepalGAP auditor and auditing.
8. Awarding NepalGAP certificate upon compliance with all terms and conditions.

Relationship between NepalGAP and SAARC-GAP

Alterations have been made to the master version of the SAARC GAP standard and certification scheme in order to develop NepalGAP. A major change is the prohibition of the use of Genetically Modified Organisms

(GMO). While the SAARC GAP has not banned the use of GMO, existing regulations in Nepal do not permit the use of GMOs for food production. Minor changes have been made to some of the compliance criteria.

Challenges for NepalGAP

Marginal farmers are major constituents of the Nepali farming system. The marginal farmer is characterized as the resource-poor, deprived of an appropriate level of access to the government services and mostly uneducated. In this background, the implementation of NepalGAP is a challenge because it demands significant time and labour on farm data management. This poses a burden and challenge for the farmers who would like to implement NepalGAP. In Thailand, the adoption rate of Q-GAP was 62% (Oo, 2016), which indicates that ensuring easy access and education plays an important part.

Market incentives are another important factor that affects the adoption of NepalGAP. If the market does not provide a premium price for GAP certified products as opposed to non-GAP products, the sustainability of the standard would remain in question. Likewise, harmonizing NepalGAP with the SAARC GAP and other regional GAP standards is crucial. The multiplicities of GAP standards create challenges for developing countries to enter importing markets but also create opportunities for improvement (Pierre, 2007). This process is applicable to the other customized country GAP standards developed under the SAARC-GAP scheme including for Bangladesh, Bhutan and Maldives.

The costs associated with GAP certification will not directly attract the farmers. Instead, they need to be organized first into producers' groups and preferably contracted by a private sector entity who can arrange the required training in GAP modules and apply for certification. Currently, the government bears all associated costs of NepalGAP certification which may not a viable solution.

Conclusion

Food safety and sustainable practices across agriculture production and the food chain is driving the adoption of GAP globally. The SAARC-GAP scheme is an effort to address the concern of individual countries in South Asia of their ability to meet its requirements. The advantage of the scheme is that it can be customized to individual countries of the region which can then can be harmonized with more stringent voluntary standards like Global GAP and USDA GAP. While the NepalGAP scheme has been established with a SO and a CB, the lack of awareness of its utility, limited number of trained auditors and the relatively high costs of certification are drawbacks that need to be addressed if small farmers are to buy into and benefit from this scheme.

Way forward and Recommendation

The adoption of NepalGAP is a major step forward to maintain and promote safe food and sustain the environment along with worker's health, safety and welfare. The following actions are suggested for encouraging adoption of NepalGAP and ensuring the success of SAARC GAP.

1. A massive awareness program is crucial for adoption of NepalGAP. Farmers and food chain actors need to be aware of pros and cons of its adoption.
2. Technical capacity development of the government officials especially those of the concerned departments, the SO, CB and the three committees.
3. Simplification of documentation and requirements including translation in the national language so that the scheme can be explained to key stakeholders especially the poor and uneducated farmers.
4. Attract private sector to invest in GAP through contract farming schemes and provide Government extension support initially so that the certification scheme can take off.

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Chapter 7

Current Status, Challenges and Way forward of Good Agriculture Practices (GAP) Standards and Harmonization of SAARC GAP for Vegetables and Fruits in Pakistan

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Abstract

Agricultural sector in Pakistan is undergoing major changes. Pakistan's economy is largely based on its agricultural sector and it provides work to 45% of the country's labor force, in rural areas directly or indirectly engaged in the sector. Agriculture and horticulture play a significant role in driving the economy and providing employment, as well as in the development of agriculture-based industries. All this makes access to international markets crucial to sustaining economic growth. High standards are required to be attained to enable exports to be accepted abroad and for the health of nation. However, Pakistan does not have the institutional infrastructure for supporting the Good Agricultural Practices (GAP) standards at the farm level in terms of their implementation, certification and accreditation. Star Farm Pakistan, a GLOBALGAP (Global Good Agriculture Practices) Farm Assurer, has worked extensively on raising awareness on food safety and sustainability in Pakistan since it began operations in 2011 and their efforts have paid off. Farmers have become acutely aware of the need to move up the value chain and access premium high value markets such as Europe and the USA. Farmers need to fulfill high standards on food safety and sustainability, worker health and safety. The National Technical Working Group (NTWG) on Fruit and Vegetable Pakistan has initiated implementation of Good Agriculture Practices (GLOBALGAP), the worldwide standards. The group facilitated by Agribusiness Support Fund (ASF), Lahore consists of experts and stakeholders from the public and private sectors. The NTWG (F&V) of Pakistan is a platform to harmonies certification activities in Pakistan and create a direct link between the country and GLOBALGAP Secretariat Germany. In this paper Integrated Crop Management (ICM) being followed in Pakistan as Good Agricultural Practices for better quality production and reduced input use especially hazardous pesticides for fruits and vegetables were discussed.

Introduction

With international trade in food booming, consumers are increasingly concerned about food safety, how food is produced, and how it is handled within the supply chain. New pressures from consumers, retailers, and legislation have placed additional demands on farmers and producers. They are increasingly required to use production methods that reduce the impact of agricultural practices on the environment, to reduce their use of agrochemicals, and to make efficient use of natural resources (land and water), all while safeguarding the welfare of workers and conserving farm ecology. Good Agricultural Practices (GAP) represents a solution for producers seeking to address consumer concerns in domestic and foreign markets. Food safety begins right from the stage of the farm. It is therefore important to follow Good Agricultural Practices (GAP) at the farm level. Many countries do not have GAP standards or the institutional infrastructure for supporting the same in terms of their implementation, certification and accreditation infrastructure.

Agricultural sector in Pakistan is undergoing major changes. Pakistan's economy is largely based on its agricultural sector, which makes up 21% of the country's GDP with total area under agriculture being 79.61 mha. Agriculture provides work to 45% of the country's labor force, with 60% of the population in rural areas directly or indirectly engaged in the sector. Agriculture and horticulture play a significant role in driving the economy and providing employment, as well as in the development of agriculture-based industries. All this makes access to international markets crucial to sustaining economic growth.

Traditionally, Pakistan's small-scale farmers have mainly served less regulated low-value markets, which have resulted in low margins and profits for Pakistani producers along the agricultural supply chain. The situation is serious particularly in developing countries such as Pakistan, where there are poor production practices (i.e., good agricultural practice (GAP) & good harvesting practices (GHP) are not adhered to). With this on the other hand, farmers have become acutely aware of the need to move up the value chain and access premium high value markets such as Europe and the USA. Yet to do so, Pakistani farmers need to fulfill high standards on **food safety and sustainability, worker health and safety and animal welfare**. The keys to achieving certification are thus access to first-hand information and training on food safety requirements and individual support with the certification process. That's where the GLOBALGAP Farm Assurers come in to play by offering expert consulting and providing assessment preparation assistance. Farm Assurers help build a sustainable bridge between small-scale farmers and the global market.

The National Technical Working Group (NTWG) on Fruit and Vegetable Pakistan has initiated implementation of Good Agriculture Practices (GLOBALGAP), the worldwide standards. The group facilitated by Agribusiness Support Fund Lahore (ASF), consists of experts and stakeholders from the public and private sectors.The NTWG (F&V) of Pakistan is a platform to harmonies certification activities in Pakistan and create a direct link between the country and GLOBALGAP Secretariat Germany. Through this endeavor, it is expected that the process of certification and accreditation of GLOBALGAP in Pakistan will become easier and more achievable, thereby enabling growers and exporters to access European markets and boost export of fruit and vegetables from Pakistan.

Current Status of Agri-food regulators in Pakistan:

The Ministry of National Food Security and Research (MoNFS&R) along with its Department of Plant Protection (DPP) and Animal Quarantine Department (AQD) oversees Agri-food sector. The legislations are the Plant Quarantine Act, 1976, and the Pakistan Animal Quarantine Act, 1979. The SPS Measures are governed as per IPPC-ISPMs, OIE, and Codex Alimentarius. The standard body is within Ministry of National Food Security and Research, Islamabad. The inspection and certification system comprises of the Department of Plant Protection (DPP) which undertakes the inspection, treatment and certification of plants and plant products. The Animal Quarantine Department (AQD) and the Federal Seed Certification and Registration Department (FSC&RD) are part of the system. The accreditation system comprises of the Pakistan National Accreditation Council under Ministry of Science and Technology.

For implementation of GAP Ministry of National Food Security and Research, Pakistan Agricultural Research Council (PARC), Provincial Agriculture Departments (Extension and Research) and the Certification Bodies (CBs) are important stakeholders. The current system of instituting quality is the registration by Department of Plant Protection to ensure that the phytosanitary requirements of importing countries are met. During the assessment, check are carried out to ensure that appropriate measures are in place in the Orchards, Pack Houses, Hot water Treatment plants and approved chemicals are used for pesticides and fumigants.

Training Module:

Realizing the situation Government of the Punjab launched a Fruit and Vegetable Development Project. Integrated crop management (ICM) using non-formal participatory training methodology has been adopted for better crop management and reduces input use especially hazardous pesticides. Pesticide residues in food commodities are a fast growing global problem with serious repercussions on human health (Asmatullah, 1996). For ICM,

best agricultural practices are continuously being explored through on farm participatory research activities and implemented through Farmer Field School (FFS) approach. This model aims to help farmers to discover and learn about field ecology, integrated crop management including land preparation, seed selection, irrigation, application of fertilizers/pesticides, harvesting and marketing. Under these FFS, farmers learn how to utilize indigenous resources and implement natural resource management strategies in the best possible way based on financial input. Efforts are being made to reduce use of chemicals, increase net profit of farmers and conserve biodiversity and natural Agro-Eco-System. At present more than108 types of insecticides, 30 types of fungicides, 39 types of weedicides, 5 types of acaricides and 6 different types of rodenticides are being used in Pakistan (Anon., 2002) and the import of pesticides has decreased from 41,406 tons in 2003-04 to 20394 tons in 2006-07 (Anon., 2007). In the developed countries many reports are available on the monitoring of pesticide residues in fruits and vegetables detected above maximum residue limits (MRLs) of Codex Alimentarius Commission (Blasco, et al., 2005, Cesnik et al., 2006 and Zawiyah et al., 2007).

Present status and production technology of major fruit crops in Pakistan:

Pakistan being blessed with diversified agro-climatic conditions is growing all kinds of fruits in sufficient quantity to cater the needs of our population over an area of 810652 hectares land with 7024391tones of production (Fruit, Vegetables and Condiments Statisticsof Pakistan 2014-15). Out of this production after fulfilling our needs we are exporting 668.7 thousand tones of all fruits. Fruit crops and value added products thereof have a contributory share in exports. The export is mainly made to Asian, European and African countries. A number of new countries have been increasing with the passage of time for export of fruit. After exporting we have only 100gm per capita consumption available however; recommended per capita consumption for fruit is 300gm per day. High value fruits such as apple, mango, guava, date, citrus, peach and grapes are grown on thousands of hectare of land. Even small agricultural villages in Baluchistan and Sindh are producing some of the world's finest fruit such as chikoos, papayas, bananas, coconuts and dates.

Pakistan has great potential for export of fruit that enjoys comparative cost advantage in international markets. For boosting the production and export of fruit efforts are presently being made to encourage foreign investment and expertise for processing and marketing by offering different incentives. There is also a great potential for production of fruit juices for which the lucrative markets of Asian, European and African counties would have to be explored. It can help the farmers to improve the income, generate

employment, poverty reduction and foreign exchange earning through exports. The exports can be increased, if the marketing system for fruits is improved according to international requirements by reducing post harvest losses, which are largely due to lack of proper handling, storage, grading and packaging. Although very sophisticated and modern food industries (fresh and value added products) are operating in the country but these are unable to cater the needs of rapidly growing population; increasing trend of urbanization and to meet international demands. To overcome financial and management problems it is imperative to have sustainable development in fruit production and processing sector.

The Horticulture Research Institutes/Stations all over the country in Federal/Provincial set up are conducting the research activities in collaboration to improve yield and quality of all major fruit crops. The details of the Horticulture Research Institutes/Stations working on improvement of fruit crops include:

- Fruit Crops Research Program, HRI, NARC, Islamabad
- Horticulture Research Institute, AARI, Faisalabad
- Sindh Horticulture Research Institute, Mirpurkhas
- Horticulture Research Institute, Tarnab, Peshawar
- Horticulture Research Institute, Sariab, Quetta.

Major focus of the institutes is to enhance sustainable production of quality fruit per unit area with reduce input cost. Efforts are also being made to enhance production of quality fruit through international collaboration and establishing local collaboration– linkages as well.The fruit industry in Pakistan has made remarkable progress during the last four decades. The important fruit crops of the country are Citrus, Mango, Date palm, Apples, Pomegranate, Guava, Apricots, Peaches, Plums, Almond, Banana, Papaya, Ber, Pear, Falsa and Walnut etc.

CITRUS

Introduction:

Citrus is an important fruit crop of Pakistan which covers as area of 192832 hectare with the production of 239550 tones (Fruit, Vegetables and Condiments Statisticsof Pakistan 2014-15). The share of citrus in the total fruit production is about 30.97%. The province of Punjab produces about 95% of the total citrus production, out of which Kinnow share 70%. In Pakistan citrus export business is low as compared to other citrus producing countries. In Pakistan the main citrus growing areas are Sargodha, Faisalabad, Toba Tek Singh, Nowshera, Khanpur and Swat.

Recommended varieties:

- **Sweet Orange:** Citrus sinensis– Blood red, Musammbi, Sukri, (Malta) Valencia late, Torocco, Salustiana.
- **Mandarin:** Citrus reticulate– Kinnow, Feutrell's Early, Nagpuri(Sangtra)
- **Grape Fruit:** Citrus paradisie– Marsh Seedless, Duncan, Shamber, Star Ruby.
- **Lemon:** Citrus llimonia – Eureka, Chinese, Lisbon.
- **Lime:** Citrus limetiodies– Sweet Lime, Kaghgzi Lime.

Plant protection measures:

- **Aphids:** Spray systemic insecticide like Amidachloprid @ 3 gms per liter water during February and April.
- **Citrus leaf minor:** Apply Amidachloprid @ 3gms per liter water during July/August.
- **Lemon Butterfly:** Apply lambada @ 3 cc per liter water during April/May.
- **RootRot:** This is severe problem in poorly drained soils. Improve drainage and apply Bordeaux mixture at the collar end of the stem. Similarly, citrus White fly, Red seales, wither tip and citrus canker are the other problems.

Irrigation and Fertilizers:

- Apply FYM @40 to 80 kg per tree during December.
- Apply N:P:K @ 1.5kg per tree during Mid February
- Apply urea 1 kg per tree during mid July (Water is essential after application of chemical fertilizer)
- Prefers rainfall of 400 to 500mm. Annual crop water demand is 900-1200mm.
- Requires well drained, deep and fertile soils ranging from sandy loam to light clay soils.

MANGO

Introduction:

Mango is called king of the fruits. It is grown in Punjab and Sindh provinces. It is the second largest crop of Pakistan and is grown on 170714 hectare area with the production of 1716882 tones (Fruit, Vegetables and Condiments Statisticsof Pakistan 2014-15). Pakistan share in global production is 5.7% and sixth largest exporter in the world. The major growing areas in Pakistan

are Multan, Rahimyarkhan, Muzaffargarh, Khanewal, Sanghar, MirpurKhas and Tando Allah yar.

Recommended varieties:

- **Sindh:** Sindhri, Neelum, Gulabkhas, Baganpali, Chounsa.
- **Punjab:** Malda, Langra, AmanDuseri, Anwar Ratol, Chaunsa, FajriKalan, SamerBahisht.

Plant protection measures:

- **Aphids:** Spray systemic insecticide like Amidachloprid @ 3 gms per liter water during February and August.
- **Fruit Flies:** Use Pheromone traps for trapping male population, or spray Diptrex 80% @ 2.5 gms per liter water during May/June.
- **Mango stem Borer:** Place Fostex tablets in the holes between May to October.
- **Mango Scales:** Spray Amidachloprid @ 3 cc per liter water.
- **Mango Blight:** Spray Dithane M-45 @ 2.5 gms per liter water.

Irrigation and Fertilizers:

- Apply FYM @ 80 to 100 kg per full grown tree.
- Apply N:P:K @ 2 to 2.5 kg per tree before flowering.
- Apply urea 2 kg per tree during March/ April after fruit set. (Water is essential after application of chemical fertilizer).
- Planting elevation ranging from 200 to 300m. Grows best in Punjab and Sindh.
- A hot and humid climate is suitable. Prefers rainfall of 500 to 1000mm. Annual crop water demand is 500-750mm.
- Requires well drained, deep and fertile soils. Salt effected soils are not good for cultivation.

PEACH

Introduction:

Peach is the most important among the stone fruits and is temperate in nature. It is traditional crop of northern areas of Pakistan and occupies the area of 13988 hectare with the production of 66792 tones (Fruit, Vegetables and Condiments Statisticsof Pakistan 2014-15). Quetta, Kallat, Peshawar, Swat valley and eastern parts of Kohistan hill are the main growing areas of Peach. It is delicious in taste and attractive in flavor and aroma. It contains 10-14% Sugar, 2% protein and riel in ascorbic acid, vitamin A and B, Besides Iron, Phosphorus and calcium.

Recommended varieties:

- **Khyber Pakhtunkhwa:** Early Grand, Florda King, 6-A, 8-A, NJ 241, A-69
- **Punjab:** Early Grand, Florda King, Local
- **Baluchistan:** Early Elberta, Red French

Plant protection measures:

- **Green Aphids:** Spray Lambda @ 3 cc per liter water at flower bud swelling stage.
- **Stem borer:** Inject Lambda and water 50:50 in the holes where woodsaw is oozing out during July/August.
- **Termites:** Apply termicide "chloropiryphos" @ 5 cc per liter of water around the tree trunk during July/August.
- **Fruit Fly:** Early varieties escape fruitfully damage. For late varieties use pheromone traps.

Irrigation and Fertilizers:

- Apply FYM @ 40-60 kg per tree during December
- Apply NPK @ 1.5 to 2.5 kg per tree during mid February.
- Prefers a rainfall of 500 to 600 mm.
- Prefers well drained deep and fertile soils, wet and heavy soils are not suitable.

BANANA

Introduction:

Banana is an important fruit crop of Pakistan cultivated over an area of 28171 hectare with annual production of 118044 tones (Fruit, Vegetables and Condiments Statisticsof Pakistan 2014-15). Bananas are one of the healthiest fruit, since it contain a combination of several important vitamin, including vitamin A, vitamin B and vitamin E. banana is export to Afghanistan and Iran. The major banana growing areas are Khairpur, Jhatta, Matiari, Nawabshah, Sanghar, N.Feroze and Tando Allah Yar.

Recommended varieties:

- **Sindh:**Basri, Willian Hybrid and local.

Plant protection measures:

- **Banana leaf and fruit beetle:** It attacks young leafs and fruits. Spray Malathion 57EC @ 20ml in 12 liters of water every 15-20 days.

- **Banana rhizome weevil:** Weevil bores the stem and eats tender tissues. Spray Diazinon 60EC @ 700ml per acre.
- **Panama Disease:** In early stages sudden yellowing of lower leaves is observed. Pathogen is soil borne and enters through injured roots. Rouge out infected plants, use disease resistant varieties and do not collect suckers from infected fields for at least 2-3 years.
- **Bunchy top:** Virus causes leaves to bunch together into a rosette at the top of the plant. Disease is transmitted by aphids. Spray Amidachloprid @ 3 cc per liter water to control the vector.
- **Mango Blight:** Spray Dithane M-45 @ 2.5 gms per liter water.

Irrigation and Fertilizers:

- Add liberal amount of FYM before planting i.e. 8 tons per acre.
- Apply N:P:K @ 160:40:70 kg per acre.
- Add half phosphorus and Potash before planting suckers in January/February.
- It is highly susceptible to frost and cold winds. Optimum temperature for Banana is 27°C. It needs deep fertile and well drained soil.

APPLE

Introduction:

Apple is an important fruit of Pakistan. It is cultivated over an area of 100246 hectares with the production of 616748 tones (Fruit, Vegetables and Condiments Statisticsof Pakistan 2014-15). It is a highly nutritive fruit containing essential food elements such as sugar 11%, fat 0.4%, protein 0.3%, carbohydrates 14.9% and vitamins A, B, C in a balance form. The important fruit growing areas are KilaSaifullah, Mastung, Zhob, Pishin, Killah Abdullah, Swat and Ziarat. The varieties which grown in low chill areas of Pakistan are Anna, Golden Dorset and Summer Gold whereas in high chill areas Red Delicious, Golden Delicious, Staring Delicious, Amri, Kulu, Sky spur and Mashadi are cultivated.

Recommended varieties:

- **Northern Punjab:** Red Delicious, Golden Delicious, Star king Delicious, Skyspur, Kashmiri Amri.
- **Khyber Pakhtunkhwa:** Golden Delicious, Red Delicious, Amri, Anna

Plant protection measures:

- **Codling Moth:** It is serious pest of Apple. It attacks the fruit in June/July. Spray Lambda or AmidaChloprid @ 3 cc per liter water thrice at 15 days interval.

- **Aphid and Mites:** Use AmidaChloprid @ 3 gms per liter of water when infestation occurs.
- **Aphid Scab:** It is serious fungal disease. Use Dithane M-45 @ 3 gms per liter of water.

Irrigation and Fertilizers:

- At full bearing stage apply FYM during December @ 40 kg per tree whereas 1.5 to 2 kg NPK per tree is applied during February before flowering.
- Apple requires a cooler climate than all of the other fruits. An annual rainfall between 25 to 30 inches evenly distributed through-out the year is desirable. Deep rich, well drained fertile loam soils are desirable.

Present status and production technology of vegetable crops in Pakistan:

Vegetable crops had always been neglected in the past decades, in spite of their higher yield potential, low cost of production and higher nutritional value added attributes. Vegetables are comparatively rich source of vitamins and minerals. These essential nutritional requirements are for the maintenance of good health and resistance against some degenerative diseases.

Pakistan is blessed with a diverse climate, so it is possible to cultivate many kinds of vegetables. There is substantial inter provincial trade of vegetables. At present large quantities of winter vegetables like onion, turnip, peas, potato, cauliflower and carrot are grown and transported to different markets. Summer vegetables especially okra, muskmelon, water melon, bitter gourd and bottle gourd are grown early in southern frost free area of Sindh province. Vegetables like pepper, tomato, cauliflower, coriander and carrot are grown in mild climate of the hilly areas and sold in the plains at high prices.

The total crop area of Pakistan is about 2245000 hectares. Out of which vegetables and condiments are grown on 273425 hectares, respectively which is about 2% of total crop area (Fruit, Vegetables and Condiments Statistics of Pakistan 2014-15). Punjab contributes its share in area by 54 %, Sindh 15 %, Khyber Pakhtunkhwa 16 % and Baluchistan 15 % of the total area under vegetable crops.

Although area and production of vegetables increased in past, however the demand for a productive variety for food is increasing day by day but it is very important that the productivity level is not increasing accordingly (Table1).

Province-wise average yields of important vegetables is given in table 1.

Table 1. Average yield (t/ha) of important vegetables (province-wise)

Vegetable	Punjab	Sindh	Khyber Pakhtunkhwa	Baluchistan	Mean
Onion	7.24	13.35	16.28	18.89	13.94
Chilies	1.62	2.37	1.3	1.15	1.61
Tomato	12.8	7.5	9.5	12.1	10.47
Garlic	8.02	5.30	12.12	8.82	8.56

Source: Fruit, Vegetables and Condiments Statistics of Pakistan 2014-15 (Provincial crop reporting service centers)

Despite the fact that in the past, vegetables remained low priority crops but still a considerable progress has been made during the last 20 years. The area under vegetables has expanded, giving 2.13 times increase in the production. Pakistan is the 7th most populous country of the world and its population is rising at the rate of more than 3 percent per annum. The production trend has also to catch up with the fast growing population. Even the average per hectare yield of vegetables has increased by about 34.68 % but it is still far below than that of agriculturally advanced countries.

Crop yields in Pakistan are low and a substantial gap exists between the potential yields and the yields at the farm level (Table 2). Production can be increased either by bringing more area under crops or by increasing productivity per hectare.

Table 2. Production gap of important vegetables in Pakistan

VEGETABLE CROPS	AREA (HA)	PRODUCTION (Tons)	AVG. YIELD	*EXPT. YIELD	DIFFERENCE	GAP %
OKRA	14855	112983	7.60	17	9.4	115.76
SQUASH	10527	96379	9.15	25	15.85	163.36
CUCUMBER	3426	52766	15.40	20	4.6	39.98
RADISH	9769	160265	16.40	30	13.6	85.49
TURNIP	15167	262507	17.30	25	7.7	42.74
CARROT	13381	227075	16.97	30	13.03	71
CAULIFLOWER	12487	217559	17.42	30	12.58	74.38
PEAS	21620	139233	6.44	10	3.56	50.82
TOMATOES	60671	566043	9.33	30	20.67	176.48
ONION	130532	1671012	12.80	30	17.2	114.04
GARLIC	7973	72987	9.15	20	10.85	136.08
CHILI	62456	139687	2.23	3	0.77	4.21

Source: Fruit, vegetable and condiments statistics of Pakistan (2014-15), *Annual report of experimental stations

Vegetables rank next to cereals as a source of carbohydrates. Vegetable plants store reserve food in roots, stems, leaves and fruits, which are eaten fresh and or cooked, pickle and used along with the staple food like wheat and rice. The nutritive value of vegetables is tremendous, because of the presence of nutrient packed food containing mineral salts and vitamins. Pakistan grows a large variety of vegetables of tropical, sub-tropical and temperate groups. According to experts dealing with human nutrition, a balanced diet requires 100 g of vegetable per person day. The vegetable crops could thus be used to substantiate the cereal crops. The some of the important vegetables grown in the country are: Potato, Onion, Cabbage, Cauliflower, Turnip, Radish, Carrot, Pea, Bean, Soybean, Sweet gourd, Bitter gourd, Lady's finger, Pumpkin, Cucumber, Snake melon, Bitter gourd, Squash, Bringal, Tomato, Sweet pepper, Chilli, Spinach, Sugar- beet, Sweet potato, Drumstick, Bathua, Lettuce, Mint, Garlic, Ginger, Fenugreek.

ONION

Onion (*Allium cepa L*) is one of the important condiments widely used in all households all the year round. Onions are used in soups, sauces and for seasoning foods. The small bulbs are pickled in vinegar. Onion bulb is rich in phosphorus, calcium and carbohydrates.

Current National Problems:

- Suitable varieties for long and short days, high yield with better storage quality need to be identified.
- Inadequate supply of good quality seed except in the province of Balochistan. Therefore, the yield is low.
- Hoeing and weeding for control of weeds in onion crop in very expensive.
- Considerable damage is done to onion crop by thrips, purple blotch and downy mildew.
- Phosphorus and potash fertilizers are rarely used by the farmers. As a result the bulbs have very poor storage quality.
- Crop is seriously affected by high rainfalls.
- Marketing of surplus produce of onion during the year of over production is a great problem.

Varieties:

Onion varieties vary in color, shape, flavor and keeping quality as well as in limit of physiological maturity. Sariab Red and Chiltan-89 are commercially grown varieties of onion in Balochistan. These red skin cultivars are comparatively more pungent with good keeping quality for storage. These

varieties can also be used as green bunching onion if harvested at the proper stage. The other varieties grown in the country are Phulkara, Swat-I and Desi Red, Thana Bola Khan and Ghotki.

Manuring and Fertilizing:

Although onion has limited root system but is very responsive to manures and commercial fertilizers. Well-rotten farmyard manure @ 10 tons per acre should be ploughed down at the time of land preparation at least one month before land preparation. Before transplanting 3 bags of super phosphate, one bag of ammonium sulphate and one bag of potassium sulphate per acre should be thoroughly mixed in the soil. This should be followed with a supplementary dose of one bag of ammonium sulphate per acre one month after planting. Another dose of one bag of ammonium sulphate may be applied at the time of bulb formation.

Harvesting and curing:

Onion bulbs should be harvested at appropriate stage of maturity. After 50 percent of the crop showing neck fall, the onions may be lifted out of the soil. Bulbs should be left on the surface of the ground for field curing until tops are fully dry. Generally, 3-4 days of warm and dry weather for field curing is desirable to improve the storage life of onion.

Storage:

Storage is likely to lead to loss instead of gain unless onions are properly handled and cured and is free from diseases. Cultivars with more dry matter content tend to be long storing types. Onions should be stored at a temperature as near 0 ^{0}C as possible and the relative humidity maintained at about 65 percent with good air circulation through the piles.

Insects

Onion thrips:

Onion thrips (*Thripstabaci*) are small, yellowish sucking insects, which feed on the foliage of onion plants. Thrips are most injurious during dry weather. Spraying Methamedaphos at weekly interval as soon as thrips appear on the plants has given excellent control.

Diseases

Downy mildew:

The downy mildew of onion (*Peronospora destructor*) is a fungal disease of onion grown in cool moist conditions. In humid weather, fungus develops as white or purplish downy growth over the leaf surface but in dry weather,

only white spots are seen. Dithane M-45 or any other copper based fungicide can be used to control the disease.

Purple blotch:

Purple blotch (*Alternariaporri*) is a serious fungal disease of onion that occurs at temperature range of 25-30 ^{0}C with 70-90 percent relative humidity. The leaves and flower stalks show whitish flecks with purple color center, which on further development form dead patches. Spray the crop with Dithane M-45 at fortnightly interval before appearance of the disease. Keep the crop free from the weeds.

Future strategies:

- Research on identification of suitable varieties for different zones should be carried out.
- Seed Corporations should take up multiplication of good quality seed.
- Highly productive cultivars, resistant to pest and diseases should be introduced
- Pest forecasting service should give timely warning for spraying the crops against pests and diseases.
- There is need to strengthen the storage and market research to solve the problems of glutting and low prices.
- Control on bulb sprouting during storage.
- Pollination studies for increasing seed setting.
- Seed packaging and storage studies for improving viability.
- Perfection of seed production techniques.
- Plant population studies to increase bulb yield and quality.

TOMATO

Tomato belongs to Solanaceae family. It is one of the very popular vegetables in Pakistan. It is widely used in salad as well as for culinary purposes. The popularity of tomato and its products continue to rise as it contains significant amount of vitamin A and C.

Current National Problems:

- Tomato crop is very susceptible to viruses (TMV, TYLCC) and diseases, especially when the crop is transplanted early during the months of August-September. Activity of virus vector especially whitefly is very high at that time of the year. Nematode problem is also becoming serious.

- Prevalence of high temperatures in Punjab limit the production period in summers.
- Tomato grown in Balochistan (Quetta Div), Khyber PakhtoonKhwa (Dargai area) and in Katha Sagral, Katha Misral and KotliDakhli villages of Khushab districts in Punjab are severely attacked by parasitic plant "Orobanchi. The farmers suffer heavy losses on account of this problem.
- The crop also suffers due to early and late blights, blossom end rot and bacterial wilt etc.
- Local hybrids are not available.

Time of sowing:

Due to varying climatic conditions, there is a wide range of sowing time of tomato in Pakistan. There are three main crops that are as under.

Early crop:

For early crop nursery is sown in July-August, transplanted in the field in August-September and the harvesting of the crop starts in November.

Mid season crop:

Nursery is sown in September, which is transplanted in October and harvested in December/January.

Main season crop:

Nursery is sown in mid-November, transplanted in February and the crop is harvested in May-June.

Seed rate and nursery raising:

100-125 g seed is required to prepare nursery for one hectare. Seed is sown on raised beds prepared with a growing media of compost and covered with thin polyethylene sheet. The seeds will germinate in 7-14 days. Remove polyethylene sheet after seed germination.

Transplanting:

The seedlings should be harvested to withstand the out-door conditions with as little shock as possible. The hardening may be accomplished by lessening water supply. The process may require 7 to 10 days. The seedlings are transplanted on the both sides of 1.5 meter wide beds with a distance of 50 cm on the rows.

Irrigation:

The plants are irrigated just after transplanting. Irrigation with an interval of 7-8 days is recommended. The irrigation interval can be decreased from 5-6

days when weather is too hot. Irrigation water should be given with care so that beds should not be submerged into water.

Manure and fertilizers:

In tomato crop, high yield can be obtained only if well balanced fertilizers and manure are supplied to the plants in time. Well rotten farm yard manure should be applied at the rate of 25-30 tons per hectare, at the time of land preparation for maintaining proper physical conditions and fertility status of the soil. General recommendation for chemical fertilizers is 75 kg of nitrogen, 60 kg of phosphorus and 60 kg of potassium. Half amount of all fertilizers and full amount of farm yard manure are incorporated into the soil at time of land preparation. Remaining half amount of fertilizers is split into two doses and applied as side dressing to the plants one month after transplanting and after first picking of fruit.

Harvesting:

The stage of ripeness at which the tomatoes are harvested depends upon the purpose for which they are grown. For canning and processing, the fruit is harvested when it is fully ripened on the vines. For local markets, it is harvested in the hard ripe and pink stages. For the distant markets, the fruit is picked in the mature green or turning pink stage. For the home use, tomato may be left on the plants until they are fully coloured.

Storage:

Tomatoes can be kept for storage for only a short period of 7-10 days. Fruits picked at semi-ripe stage and placed in well ventilated store with low humidity and at 1.1-2.2 ℃ will remain fit for human consumption for about three weeks.

Diseases

Fusarium wilt:

It is caused by the fungus *Fusariumoxysporium* f. *lycopercici*. It is characterized by a yellowing and drying of the leaves progressively from the base upward, and by discoloration of the vascular tissue. It is controlled by the use of diseased resistant cultivars and disease free seed. The planting should be done on disease free beds. The crop rotation should be followed and diseased plants should be disposed of.

Bacterial wilt:

It is caused by *Pseudomonas solanacearum.* The diseased plants wilt during the day and partially recover at night. Freshly cut stems exude a gummy, yellow mass of bacteria. It can be controlled by planting disease free plants, removal of diseased plants and following crop rotation.

Early blight:

Early blight is caused by *Alternariasolani,* the fungus that causes early blight in potatoes. To control it, sow only treated seed from disease free plants, practice sanitation by deep ploughing and follow crop rotation.

Damping off:

It attacks nursery seedlings at the surface of the soil, causing the stems to shrivel and the plants to topple over. Treat the seed with thiram and avoid over irrigation.

Viral diseases

The important viral diseases of tomatoes are tobacco mosaic virus and cucumber mosaic virus. The diseases are highly infectious and readily spread by insects and cultural operations. Sanitation and control of vectors can reduce the spread of viruses.

Future strategies:

- Tomato germplasm resistant to viruses and other diseases as well as high summer temperature should be introduced for the adaptation as such or for utilization in hybridization programme for developing new high yielding varieties.
- Research should be carried out in order to find suitable and effective ways of combating orobanchi problem in the affected areas.
- Seed Corporations in Punjab and Sindh should take up seed multiplication of "Roma" and other recommended varieties.
- Protected culture technology should be introduced so as to supply the produce during scarcity periods.
- Studies should be carried out on seed health and viability.
- Control of shoot/fruit borer.
- Selection of varieties for different seasons.
- Shelf life extension/post harvest-studies.

CHILIES

Chilli (*Capsicum annuum* L) of family Solanaceae is both a vegetable and a spice crop of significant economic value in Pakistan. Chilies account for 16% of the world spice trade, placing the commodity second after black pepper. The cash crop is one of the most valuable in Pakistan, where two varieties are grown, Capsicum annum and Capsicum frutescence. The share of chilies in the country's GDP is 1.5%. Pakistan was reported as the sixth largest exporter of chilies in the world (Abrar et al. 2009). Chili peppers are an

essential spice used as an enormously popular, basic ingredient of cuisines worldwide, which add tang, taste and color to food. Capsicum species are employed whole or ground, and alone or in combination, with other flavor ingredients (Kothari et al. 2010). It is a rich source of vitamin A and C. The area, production and average yield of chilies in Pakistan is given in table-1.

Current National Problems:

- Phytophthora or collar rot disease.
- Incidence of chili mosaic virus.
- Anthracnose which deteriorates fruit in chilies.
- After harvest Afflatoxin deteriorates the quality.
- Local hybrids are not available.

Manures and fertilizers:

Well rotten farm yard manure at the rate of 25-35 t/ha should be incorporated in the soil one month before seed bed preparation. Before transplanting 70-80 kg of phosphorus and 35 kg of nitrogen and 50 kg of potash per hectare should be thoroughly mixed in the soil. This should be followed with a supplementary does of 25 kg of nitrogen per hectare at the time of fruit setting. Large application of nitrogenous fertilizers should be avoided as it increases vegetative growth and delays maturity.

Irrigation:

The first watering is given immediately after sowing and transplanting. Thereafter chilies are usually irrigated every week in summer. Within 15 days of transplanting, it is necessary to apply at least 2 to 3 irrigations for the establishment of the seedlings after that subsequent irritations should be given at every 10 days interval. Irrigation interval can be increased or decreased according to climatic conditions.

Harvesting:

For drying, chilies should be picked when fully ripe and red in colour. After picking the chilies should be spread out in this layer on mats in the sun for during. Care should be taken not to heap up freshly harvested crop for a long time, as they are apt to rot.

Varieties:

Important varieties grown in the country are Longhi, Talhari, Gothki, Tatapuri, Narwala, GolaPeshawari and Qaisar. The area under cultivation in Sindh is about 86 % of total acreage under chilies in Pakistan.

Diseases

Chilies are subject to various pest and disease constraints to optimal production. The contamination of the crops with aflatoxin (AFs) from the growth of Aspergillus flavus and/or Aspergillus nominus is one of the most serious problems (Paterson2007). The European Union has set strict limitations on AFs levels in various foodstuffs, such as groundnuts, nuts, dried fruits, cereals, milk and spices, including paprika and chili (Commission Regulation, 2010).

The diseases may become very destructive. Seed treatment, crop rotation, seed bed sterilization and fungicide/insecticide sprays, are general control measures that should be followed.

Damping-off:

Damping-off is often very destructive to young seedlings, causing the stems to decay near the soil line. Usually it can be kept under control by planting treated seeds in rows 4 to 6 inches apart in a well drained bed.

Phytophthora blight:

The disease is characterized by a dark brown stem discoloration extending upward from the soil line accompanied by a sudden wilt of the entire plant without foliar yellowing.

Control:

- The collar-rot incidence can be reduced by growing plants on ridges that provide good drainage.
- Controlled irrigation can reduce the chance of the disease spread. Care should be exercised that water should not run over the ridges and touch the base of the plant.
- A crop rotation cycle of least 3 years should be followed. The scheme should not include tomato, brinjal, cucurbits and bean as these are also prone to the pathogen.

Viral diseases

Cucumber Mosaic Virus:

CMV is transmitted by aphid vectors. Infected plants exhibit mosaic mottling, blistering, narrowing and deformation of leaves.

Control: All the infected plants should be removed from the field. Spray suitable insecticide for the control of aphids.

Chili Leaf Curl:

The virus is transmitted by whitefly. Curling and yellowing of the leaves and severe stunting of the plants are characteristic symptoms.

The leaves are greatly reduced in size with their margins curled upward giving them a boat shape.

Control: All the infected plants should be removed from the field. Spray suitable insecticide for the control of aphids.

Future strategies

- Studies on collar rot incidence and breeding for developing resistant lines.
- Management of viral, bacterial and fungal diseases.
- Development of hybrids.

GARLIC

Garlic is the second most widely used cultivated Allium after onion. It has long been recognized all over the world as a valuable spice for foods and a popular remedy for various ailments and physiological disorders. It is grown throughout Pakistan and consumed by most of the people. It is used practically all over the world for flavoring various dishes.

Current National Problems:

- During certain years, garlic crop is attacked by downy mildew disease during the month of February when the weather is cloudy.
- Planting of garlic is very time consuming and expensive.
- High weed infestation.
- Productivity is low.

Time of planting and method of sowing:

Garlic is planted in single clove but bulbils are also used occasionally. In hilly area, this crop is planted in March-April whereas in plains, it is planted from September to October.

The quantity of planting material required per unit area depends on clove size and number of cloves per bulb. A distance of 15 to 20 cm (row to row) and 8 to 10 cm (plant to plant) is recommended.

Manuring and fertilizer requirement:

Garlic responds very well to organic manure, application of 16-20 tonnes/acre at the time of field preparation is recommended. Application of N:P:K @ 75:85:55 kg produces higher yield. At the time of planting, half of nitrogen along with full dose of P and K should be used, the remaining half of nitrogen be applied 30-45 days after planting.

Irrigation and inter-culture:

Garlic crop needs irrigation once in a week during vegetative growth and at 10-15 days interval near maturation. Garlic is a closely planted crop which requires 3-5 manual hoeing for higher yield.

Harvesting:

The crop is ready for harvest when the tops turn brownish and show signs of drying up and bend over. The bulbs mature in 4-6 months after plantation depending upon the climate.

Storage: Garlic bulbs can be best stored for 3-4 months in well ventilated room.

Future Strategies:

- Introduction and selection of high yielding varieties, resistant to diseases.
- Appropriate disease control measures should be determined and applied to garlic crop.
- Suitable planter should be developed for mechanical planting of garlic crop.
- Spacing studies for yield enhancement.
- Use of integrated weed management practices.

CARROT

Carrot (*Daucuscarota*) is a very poplar vegetable in Pakistan. It is rich in carotene, a precursor of Vitamin A, and contains appreciable quantities of thiamine and riboflavin. It belongs to the Umbelliferae family and is probably a native of Europe and British Isles.

Current National Problem:

- Narrow choice of cultivars, therefore, limited period of availability.

Time of sowing:

Due to varying climatic conditions, there is a wide range of sowing time in Pakistan. Four main seasons are as under:

Early crop:

It is planted in August and harvested in November / December.

Mid-season crop:

It is planted during September / October and is ready to harvest during December / January.

Late-Season crop:

It is planted during November and is harvested in February/March.

Summer crop:

The crop is raised in the hilly areas. It is sown in March/April and is harvested from June to July.

Seed rate and sowing method:

A seed rate of 20 to 25 kg per hectare is usually practiced. Carrot is seeded about 1/2 to 3/4 inch deep in the soil for better germination. The optimum distance between row-to-row should be 60 cm and plant-to-plant as 3 to 4 cm. Seed should be sown on both sides of ridges.

The seedbed must be kept moist during the germination period. The soils which crust badly are likely to prevent a good stand of carrot.

Irrigation:

There must be enough moisture in the soil at the time of seed sowing to facilitate better germination. The first irrigation may be needed five to six days after sowing and repeated again after five to six days till the completion of germination. Water should be applied gradually and moderately. To prevent curst formation, ridges should not be submerged in water. Thereafter, the crop should be irrigated after an interval of 15 to 20 days, depending on the weather conditions.

Manure and fertilizers:

Unfinished compost or manure used as a fertilizer for carrot induces rough and branched roots. These materials should be well composted before being added to soil where the crop is grown. Well rotten farm yard manure should be applied at the rate of 25 to 30 tons per hectare, at the time of land preparation for maintaining proper physical conditions and fertility status of the soil.

General recommendation for chemical fertilizers is 52 kg N, 45 kg of P_2O_5 and 62 kg of K_2O. The half quantity of N should be applied before seed sowing and remaining half of N should be applied four to six weeks after sowing with subsequent irrigation.

Harvesting:

Carrots for fresh market are harvested when the roots are 2.5 to 3 cm in diameter at the upper end. The field should be slightly irrigated a few days before harvesting. All the tops should be removed since they wilt and begin to decay first.

Storage:

Cold storage prolongs the life of carrot by slowing physiological changes. Topping and bagging the carrot in transparent film reduces the loss of weight and water during transportation to the market. Carrots can be kept in good condition for six months at a temperature of about 32°F with 90 to 98 percent relative humidity. However, it deteriorates in quality in storage owing to slow loss of sugar in respiration.

Recommended variety: T-29

Future strategies:

- Introduction of suitable varieties in order to prolong the availability period.
- Introduction of varieties with high carotene contents.

OKRA

Okra (*Abelmoschusesculentus* L.) is an important vegetable grown for its green tender fruits which are used as a vegetable in a variety of ways. It is rich in vitamins, calcium, potassium and other mineral matter. It can be fried and cooked with necessary ingredients. The tender fruit can be cut into small pieces, boiled and served with soup. Matured fruit and stems containing crude fiber are used in the paper industry.

Current National Problems:

- Crop is very susceptible to jassid and requires frequent spraying during harvesting period.
- Crop suffers heavily from okra mosaic virus
- Lack of seed of improved cultivars.
- Present varieties are tall growing and have short fruiting period.

Seed rate:

About 20 kg seed/ha is required for summer season crop whereas 10 kg seed/ha is needed for rainy season crop.

Method of sowing and spacing:

The seed should be sown on ridges with a distance of 60 cm between rows and 15-30 cm between plants.

Irrigation:

There must be enough moisture in the soil to facilitate better germination. The crop should be irrigated at an interval of 5-6 days in summer and whenever required in rainy season.

Manuring and fertilizing:

The land should be incorporated with well rotten farm yard manure @ 25 t/ha one month before bed preparation. Before sowing 25 kg each of phosphorus and potash and 25 kg of nitrogen per hectare should be thoroughly mixed in the soil. Another dose of 25 kg of nitrogen per hectare should be given at the time of flowering and fruit setting.

Harvesting:

The tender young pods should be harvested every alternate day. This will promote fruit development and yield. Delay in harvesting will result in poor quality produce due to an increase in crude fiber.

Recommended varieties:

Pusa Green

Future strategies:

- Breeding/introduction of varieties resistant to various pests and diseases.
- Evolve dwarf varieties with prolonged fruiting ability.
- Integrated pest management.
- Selection of varieties for quality and earliness.

CABBAGE

Cabbage (*Brassica oleracea* L. var. capitata) of family Cruciferae is a good source of vitamins and minerals.

Current National Problem:

- Narrow choice of cultivars for sequential ripening.
- Dependence on imported seed, especially of very early and late varieties.
- Susceptibility to high temperature.
- Damage due to head rot and cracking.

Seed rate, nursery raising, transplanting and spacing:

A seed rate of 200-500 g is enough for raising seedlings for one hectare. For production of seedlings, seed is sown in seed beds 4-6 weeks before transplanting in the field. The cultivars may be spaced at 30-40 cm between the plants and 50-60 cm between the rows.

Manuring and Fertilizing:

Well rotten farm yard manure @ 25-30 tones/ha should be thoroughly spread and ploughed down during land preparation. General recommendation for

chemical fertilizers is 100 kg N, 75 kg $P_2 O_5$ and 50 kg of K_2O per hectare. For better results, full quantity of P_2O_5 and K_2O and half quantity of N should be applied before transplanting. Remaining half of N should be applied four to six weeks after transplanting with subsequent irrigation.

Irrigation:

Seedlings should be watered immediately after transplanting and thereafter irrigation should be applied at fortnightly interval. Watering should be avoided at the time of head maturity since this causes splitting of heads.

Harvesting:

Harvesting should be done when the heads are firm. The mature heads should be cut with a knife along with some wrapper leaves.

Recommended varieties:

Golden Acre

Future strategies:

- Introduction/breeding varieties for sequential ripening, tolerance to higher temperature and resistance to head rot and cracking.
- Integrated pest management.
- There is possibility of seed production in various provinces especially in Punjab for second early and mid-season varieties, in Balochistan and Khyber PakhtoonKhwa for late varieties.

Conclusion, Challenges, Comparison and Way forward:

Agricultural producers, particularly small farmers, need to have their farms certified as GAP compliant to be recognized and accepted by the retailers of the high-end markets. Several countries have developed their own GAP standards and certification systems. However, the lack of harmonization between national GAP schemes among countries, multiple audit requirements by different retailers, and the scarcity of affordable certification systems have often led to increased confusion and higher certification costs for farmers and exporters. An understanding of the approaches, principles, and standards of GAP and benchmarking of local GAP schemes against globally recognized guidelines like the GLOBALGAP standard and the regional GAP standards like SAARC GAP are essential so that stakeholders in various member states and elsewhere can properly orient and guide small farmers in meeting established GAP standards.

A training module on Implementing GAP in fruit and vegetable sector, its certification and accreditation as per ASEAN GAP has already been developed

by FAO RAP. It covers four modules of compliance criteria: food safety; environmental management; workers' health, safety, and welfare; and produce quality. It is proposed to further use this as a basis for work in the SAARC countries for the development of SAARC GAP standard and the certification and accreditation system with the aims to keep up consumer confidence in food quality and food safety, to minimize detrimental environmental impacts of farming operations and optimize the use of inputs and to ensure worker's health and safety. Nevertheless, SAARC countries must remain in the process of benchmarking SAARC GAP scheme with GLOBALGAP too in order to receive international certification. Moreover, the implementation of the Certification Standards must enjoy political and financial independence from the public sector as well as from individual member influence and shareholder agendas. Farmers or farmer groups are certified against the SAARC GAP criteria by authorized Certification Bodies (CB).

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Chapter 8

Current Status, Challenges and Way Forward of Good Agriculture Practices (GAP) Standard in Sri Lanka

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Abstract

The agriculture sector is a leading part of the economy of the country; 26.1% of the population is employed in agriculture sector. The percentage contribution of agriculture to the Gross Domestic Product (GDP) in the year 2016 was 7.1%. Implementing effective policies and adopting standards for good agriculture practices such as the Sri Lanka-GAP could enhance trade in agriculture commodities.SL-GAP was started in 2015 with the objectives of providing safe and quality food for the domestic market and accessing global market opportunities by overcoming technical barriers for trade. Currently, 275 fruit and vegetable farm are certified under GAP.

Keywords: *Agriculture sector, SL-GAP, safe food, market opportunities*

Introduction

The global demand for sustainably produced food in accordance with socio-economic and food safety norms are increasing. Producers all over the world, as well as governments and policy makers are responding to this issue. In Sri Lanka, there is a growing concern about the contamination of agricultural produce by pesticides, heavy metals and other contaminants and adulterants. This is affecting consumer confidence in fresh agricultural produce. On the other hand, the fake labelling of food as organic and other incidents of food fraud is rising and negatively affecting the promotion of consumption of fruits and vegetables by the Government.

Agricultural Land Use

Sri Lanka, an island in the Indian Ocean has a total land area of 6,561,000 ha. Its climate is characterized as tropical with distinct dry and wet seasons. Due to the effects of climate change, the country now experiences unexpected weather conditions, which frequently result in crop losses. The average temperature usually varies between 28^0 to 33^0C and the rainfall varies from 900 mm in the driest parts to 5,000 mm in the wettest parts of the country. The central part of the country is mountainous; hence, the major factor affecting the temperature variation within the country is altitude.

Accordingly, the country is divided into 46 agro-ecological regions. Demographic features of the country are illustrated in Table 1.

Table 1: Demographic features of the country

Feature	value
Mid-year population (‘000 persons)	21,203
Population Growth (%)	1.1
Population density (persons per sq.km)	338
Labor force (‘000 persons)	8311
Employed Population (‘000 persons)	7948
Labor force participation rate (%)	
Male	75.1
Female	35.9
Unemployment rate (% of labor force)	4.4
Agricultural labour force employed (%)	27.1
Real GDP growth rate (%)	4.4

Source: Department of Census and Statistics, 2016

Sri Lanka is historically an agriculture based country. It still has 27.1% of its labour force engaged in this sector. The percentage contribution of agriculture to the Gross Domestic Product (GDP) in the year 2016 was 7.1%, which is a decline from 7.8% (contribution in 2015). Of this, rice, fruits and vegetables respectively contributed 0.6%, 0.8% and 0.5%. Destructive weather conditions, fragile demand and low prices for major Sri Lankan export commodities in importing countries were the major reasons for the contraction of the agriculture sector during that period.

Land use in Sri Lanka is shown in table 2. The table depicts the land usage in Sri Lanka. Total land area is about 6,561,000Ha, of which 53.88% is agricultural land.

Table 2: Land use in Sri Lanka

Land Use	Extent (ha)	%
Non-Agricultural lands		
Built up areas	60,062	0.92
Agricultural lands		
Home Gardens	1,450,849	22.11
Plantation Crops		
Tea	229,262	3.49

	Rubber	207,628	3.16
	Coconut	295,552	4.5
	Paddy	922,151	14.06
	Other field crops	146,181	2.23
	Chena Lands	284,025	4.33
Forest Lands			
	Forest	1,187,729	18.10
	Forest Plantation	63,525	0.97
	Scrub	779,604	11.88
	Water Bodies	488,028	7.44
	Other*	446,406	6.8
Total		6,561,000	100.0

Source: Land use and Policy Planning Department, 2015

Note:*Marsh, Mangroves & Roads, streams, etc.

The major crop produced is rice, which is the staple food of the population. Around 14% of arable land is under paddy cultivation. The country was almost self-sufficient in rice production until recently, when the rice production declined due to drought conditions in the rice growing areas in the last consecutive four seasons (2016-2017).

Fruits and vegetables are the most consumed food crops after rice. More than eighty different varieties of fruits and vegetables are grown in different agro-ecological regions in the island under diverse climatic conditions. Some fruits and vegetables are available all year round as they are grown in different climates in different regions. The varieties grown comprise of indigenous, traditional and those nationally developed by Department of agriculture as well as imported ones. Despite the diversity of fruits and vegetables, only a few of them mainly banana, mango, papaw, pineapple and some others are popular among consumers. Moreover, some of the indigenous and traditional varieties, identified as being rich in nutrients remain under-utilized.

Vegetable Production

In Sri Lanka, vegetables are produced all year-round basis and a large number of farmers are involved. Vegetables in the country can be classified into two groups according to their growing conditions. Vegetables which grow better in cool hilly areas are called ‘up-country’ vegetables and those growing in relatively drier areas in the plains are called ‘low country’ vegetables.

Up-country vegetables include carrot, leek, cabbage, beetroot, tomato, capsicum, cauliflower and broccoli. Examples of low country vegetables are pumpkin, cucumber, bitter gourd, snake gourd, luffa, okra, brinjal and ash pumpkin.

Table 3: Area and production of common vegetables in 2016

Vegetable	Area (ha)	Production (MT)
Carrot	3,808	82,037
Capsicum	3,469	30,433
Cucumber	2,986	38,290
Knolkhol	1,144	15,860
Leek	2,197	61,122
Bitter Gourd	3,835	42,101
Brinjal	10,296	127,194
Cabbage	4,443	123,365
Luffa	3,952	40,415
Radish	2,951	56,772
Red Pumpkin	6,982	98,303
Tomato	6,220	92,748
Snake Gourd	2,621	31,917
Beans	8,528	83,366
Beet Root	2,205	45,097

Source: Agricultural Statistics 2017

Present status

The total vegetable production increased by 1.3% to 1,648,501 MT in 2016. The volume index of the vegetable sector has been consistently increasing from 130.2 to 208.61 between 2007-2016. The average household monthly expenditure on vegetable roses from 2 dollars per day in 1985 to 10 dollars per day in 2016.

According to the food balance sheets of 2014, the per capita availability of vegetables including onions was 145g per day while that of roots and tubers exceeds 200g per day. The consumption of fruits and vegetables, however, remain lower than the WHO recommended limits. The marketing of vegetables is more complex than other commodities as they are perishables. In Sri Lanka, this is mostly handled by the private sector. Most of the time, the market price of vegetables have a negative correlation with the production. High production leads to low market prices and poor incomes for the producer and vice versa. Vegetable price fluctuations within a year can be observes as a result of low and bumper harvests.

In 2016, 21.1 million kg of vegetables worth SLR 3.9 billion were exported. Snake gourd, bitter gourd, chilli, gherkin, red onion, breadfruit, young jackfruit, moringa, pumpkin, okra, eggplant and leafy vegetables were most in demand. Vegetables for export are mainly grown by smallholder farmers,

who operate independently, selling their products directly to larger exporters or through collectors during the harvesting season. Larger fruit and vegetable exporters also outsource cultivation to farmers on a contract basis, who cultivate the assigned crop and deliver the required quantity after harvest.

Present status of fruit production

Fruits are cultivated in Sri Lanka over an area of 150,000 ha and the total fruit production in year 2016 is around 1,120, 900 MT. The majority of the production comes from home gardens. But their contribution to the national economy is lesser than commercial cultivations due to low harvest volumes and low quality of fruit. Overall, the production of fruits declined by 6% in 2016 compared to 2015. Orange, lime, mango, avocado and passion fruit production increased while banana, papaya, pineapple, rambutan, guava and melon production declined.

Sri Lanka exported 33,000 MT of fresh fruits worth SLR 5 billion during the year 2016 and imported 54,107 MT of fresh fruits, which cost SLR 7.3 billion. This is an increase of 19.8% over 2015. Apples, oranges, mandarins and grapes were the main imports.

Table 4: Area and production of common fruits in 2016

Fruit	Area (ha)	Production(MT)
Banana	47,958	652,740
Mango	32,207	151,464
Pineapple	4,775	50,424
Papaw	5,913	74,492
Passion fruit	508	1,484
Oranges	6,333	7,147
Rambutan	4,939	8,405
Mangostene	357	297
Avocado	2,588	20,774
Guava	1123	6487
Water melon	1214	12660

Source: Agricultural Statistics, DOA, 2016

External Trade

Value of fruits and vegetables and their preparations exported to world and to the SAARC countries are given in figure 1. Export values were gradually increased from 2001 upto 2014 and thereafter the values were declined.

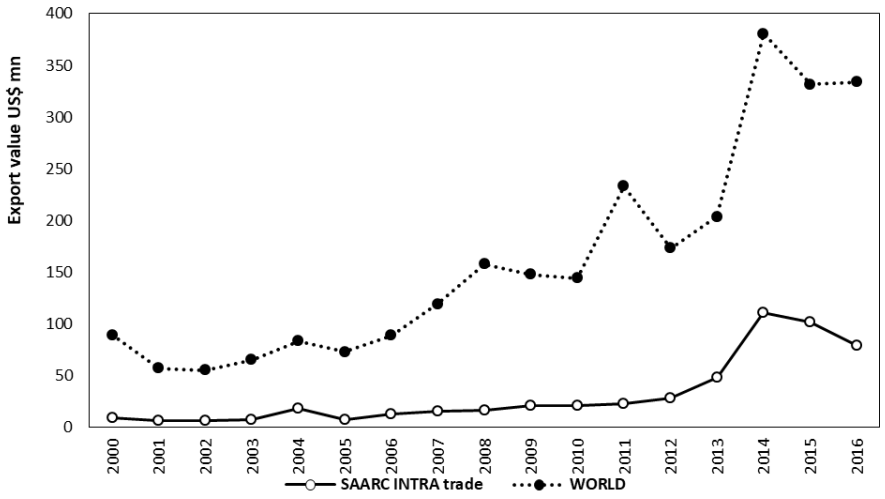

Figure 1: Export trend of vegetables fruits and preparations of vegetables and fruits from Sri Lanka to SAARC countries and to world from 2000-2016.

Source-UNcomtrade data, year2016

Fruits and vegetables account for nearly 3% of the total agricultural exports. The major importing countries are Maldives, United Arab Emirates, Switzerland, United States and the United Kingdom. Export earnings from vegetables and fruits and their processed products have been declining since 2014 due to lower amounts of exports.

Even though, there is a demand for local and tropical fruits in the export market, Sri Lanka is currently unable to address it as value/supply chains and linkages between the players such as producers, processers, traders, supermarkets and exporters, are weak. Development of contract farming, farmers' cooperatives and actions to establish direct links between producers, buyers and exporters are important in this respect.

Current Status of Good Agriculture Practices (GAP) Standards and Harmonization of SAARC GAP for vegetables and fruits

The overall policy direction of agriculture comes from the National Development Agenda, Sri Lanka Vision 2030, as well as the recent National Agriculture Policy that has identified food safety as a key strategic area. The demand for quality and safe food has increased in the past few years and there is a growing need for safety and quality-assured agricultural products in

the market. The Sri Lanka Good Agriculture Practices (SL-GAP) standard and certification scheme was initiated in the year 2015 as a measure to overcome non-tariff barriers to the export of fruits and vegetables to the EU. It was developed with the experiences gained from other neighboring country schemes.

SL-GAP is a government promoted voluntary standard. The Ministry of Agriculture is the scheme owner. The certification body has been established under the seed certification division of the Department of Agriculture. Certification body activities are based on ISO 17065 and the certification of fresh fruits and vegetables are done in accordance with SLS-1523. Farmers are able to apply for GAP certification as individual farmers or as groups/clusters. The SL-GAP logo and a QR code system for GAP certified farms were introduced and certified farmers are allowed to use those. The Sri Lanka Accreditation board (SLAB) is expected to obtain accreditation to certify certifying bodies for ISO17065 in the near future.

The Sri Lanka Standards Institution (SLSI) is the country's national standards body and is responsible for the formulation of standards for all sectors including food and agriculture. SLSI formulates agricultural standards under the authority of SLSI Act. Sri Lanka standard 1523 Part 1:2016 for Fresh fruit and vegetables has been prepared by SLSI in 2016. The GAP standard for rice has already been prepared and has been circulated for public comments. GAP standards for maize, soybean and onions are expected to be formulated in 2019.

The island-wide implementation of GAP is facilitated by the Agri-business Development and Information Service, Extension and Training division of the Department of Agriculture. A dedicated group of officers has been appointed for GAP implementation. They promote cultivation following GAP requirements as well as trade of GAP-certified products. A database is being developed to enable networking of all the stakeholders, for easy coordination, and for facilitation of trade. Codes of Practice for twelve different crops and a training manual on Good Agriculture Practices have been published. 275 farms have been certified (as at April 2017) under SL-GAP scheme and GAP Certificates have been issued. A specific field certification system for selected fruits and vegetables has been introduced and export rejections were reduced significantly with that program.

The scope of SL GAP is the sustainable production of fruits and vegetables that are legally compliant environmentally sound, socially acceptable and economically viable to ensure quality produce that is suitable for human consumption.

Requirements

1. Document requirements
    - Traceability
    - Record keeping
2. Primary production
    - Planting materials and rootstocks
    - Site history and site Management
    - Soil and substrate Management
    - Fertilizer Management
    - Irrigation and Fertigation
    - Crop Protection
    - Harvesting
3. Pesticide residue analysis of produce
4. Waste and pollution management, recycling and re-use
5. Worker's health safety and welfare
6. Environmental Issues
7. Record of Complaints
8. Internal Audit

Key Policy Inputs for Deploying Strategies

Importance of defined policy and a legislative backstopping for Good Agricultural Practices at the national level is recognized. Department of National Planning of Sri Lanka is playing a major role in this regard.

Challenges and way forward for SL-GAP

Several issues related to slower adoption of SL-GAP by farmers have been identified.

i. There is a lack of awareness among farmers and knowledge of the value and utility of GAP needs to be disseminated through the extension services.

ii. GAP standards conflict with conventional practices and require a change in behaviour. Farmer motivation through economic incentives such as subsidies and concessionary loan schemes could be useful.

iii. Producers expect a premium price for GAP certified products. However, the linkages between producers and buyers and suppliers are weak.

iv. Encouraging contract farming systems for supermarkets or special markets could be useful. This would help buyers to ensure consistent supply, saleable varieties and reduce the cost of storage and transport.

v. Consumer awareness needs to be built through education and to keep up the demand for safe food.

Challenges and Way forward for implementation of SAARC GAP for Fruits and Vegetables in South Asia

As realized from the Global Conference on Produce Food Safety Standards, the GAP standards and checklists used by the different organizations and different countries for Food safety audits appeared to be more than 95% the same(Gombas, D.E.,2010), and most of the times the standards are produced based on the globally recognized standards. Hence there is a possibility of harmonizing the standards.

Consequences of Harmonization of SAARC GAP standards:

- Harmonized SAARC GAP standard will help member countries to improve their systems of farming
- That will definitely promote inter regional trade opportunities. Prof Ram Upendra Das, professor at the research and information system for Developing Countries (RIS) said this move will be the first step towards creating a South Asian Value Chain.
- SAARC GAP will be more recognized by the world and that will be an instrument for trade beyond the region too.
- There are many food safety standards and audits widely used in the world, many with customer based additions. Many customers may become particular with certain audits, the audit companies will accept. But by the producer's side, they may have to pay for multiple audits and will create an unnecessary burden on farming. By 2007, this "audit fatigue" had become a big issue in the fresh produce industry as food safety. (Gombas D.E.,2010)The costs of these many audits were beginning to be felt by customers as well as suppliers. Harmonized SAARC GAP standard with authorization body comprising all five countries will provide a more valid, and more credible and more recognized standard and a common audit procedure that will overcome the above difficulties.

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Chapter 9

Design, Development and Implementation of Harmonized SAARC Good Agriculture Practices (GAP) Standards as a tool for Regional Trade

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Abstract

SAARC region comprises of Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka and is broadly classified as low income or low middle-income category in global parlance. The SAARC Agriculture Vision 2020 document has reported that a majority of population in the region lives in rural areas and depends upon agriculture for livelihood and sustenance. Despite rapid growth of some of the economies in the region, dependence on agriculture, as primary occupation, has witnessed marginal decline whereas future growth of agriculture sector is critical to eradication of poverty, livelihood security, reduction in hunger and promoting sustainable and inclusive growth of the regional economies. (SAARC 2004).

According to the World Bank, in the SAARC countries, agriculture employs about 60% of the labour force and contributes 22% of the regional GDP (World Bank, 2011). The Asian Development Bank (ADB) estimates that the largest concentration of the world's poor, around 40%, lives in South Asia (Srinivasan, 2012), while World Bank figures show that 76% of them live in the rural areas, contributing at least 65% of the agricultural labour force (World Bank, 2011). Among the contributing factors for the high incidence of poverty in these agrarian based economies is the lack of requisite know-how for institutionalizing hygiene and food safety mechanisms in agriculture, which is a critical pre-requisite to link agriculture with enhancement of trade in the region.

Today, there is increasing concern among consumers and retailers about hygiene and food safety Noting this, the SAARC Agricultural Vision 2020 mentioned the need for urgent interventions to comply with these international requirements to augment trade (SAARC, 2004) within the farm to fork scenario. Although FAO had been working on GAP since some time, not much had been done to assist countries to develop GAP standards and build up an infrastructure to certify the same. FAO through a Regional Technical Cooperation Programme (TCP) for the Development of Standards and Scheme for Good Agriculture Practices Implementation and

Certification in Countries of SAARC - TCP/RAS/3502 is supporting countries in the SAARC region to establish a system for GAP in the horticulture sector including development of standards and their implementation.

The paper presents about the initiative taken up by FAO and response received by SAARC member countries to ensure production of safe fruits and vegetables for domestic markets; facilitate regional trade through implementation of common GAP standards in the region; and ensure acceptability of fruits and vegetables in global markets.

Individual national GAP standards of Afghanistan, Bangladesh, Bhutan, Nepal and Maldives have already been created, and Maldives has also adopted it. The regional initiatives provides for a robust mechanism for implementing best practices by producers, particularly small and medium-sized ones and ensure availability of an internationally acceptable certification scheme to provide assurance that the producer has indeed followed the good practices laid down in the GAP Scheme.

This paper presents how with SAARC GAP's internalised quality infrastructure, the right government intervention, and policy and legislative reforms, soon all SAARC countries will have their own GAP Schemes. It is proposed that the SAARC Agriculture Council that has the mandate for handling issues related to agriculture can take up the issue with each of the member country to review the existing SGAP standard and initiate the process of harmonisation and reciprocity.

Introduction

SAARC region, comprising of Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka, is home to 1.567 billion people (23.7% of global population) in a mere geographic coverage of 3.95% of the global land mass. The region also has high incidence of poverty and hunger; the ADB estimates that about 40% of the world's poor live in these countries (Srinivasan, 2012). The principal reason for high incidence of poverty in the region is low per capita income and inequitable distribution of income. The majority of the population in South Asia lives in rural areas and is engaged in agricultural activities as the principal source of income and employment. Despite rapid growth of some of the economies in the region, dependence on agriculture, as the primary occupation, has witnessed marginal decline whereas future growth of agriculture sector is critical to eradication of poverty, livelihood security, reduction in hunger and promoting sustainable and inclusive growth of the regional economies (SAARC, 2004).

Since most of member countries in the SAARC region are principally agrarian economies they face multiple challenges in their agricultural sector. On one hand, there are challenges due to conventional ways of farming (FAO) and, on the other is the overwhelming lack of confidence exhibited by

the markets in terms of food safety and quality of their farm produce due to lack of structured approach to farming (Karki TB, 2002).

While globalization throws challenges, it also provides a window of great opportunity that was not available earlier. The challenges are intensified by changes in demand patterns, manifold increase in domestic as well as worldwide consumption and surge in value chains and supermarkets.

It is seen that consumer preferences for quality, variety and safety are rising rapidly (Henson et. al, 2000). The retail chains and buyers are demanding conformity to specified standards as well as an assurance of the same through the process of certification, as this helps in segregating product distribution to suit the requirement of suppliers and consumers and also helps ensure food-safety as well as other benefits of quality, environmental protection, workers' safety amongst others.

It is thus imperative that all the facets of agricultural production are managed judiciously so that issues of food and nutrition security, economic stability and securing livelihood of majority of population are aptly handled. The time is opportune for SAARC countries to develop and put in place a mechanism of good agriculture practices in line with changing consumer and trade demands.

This would eventually help individual economies to be better placed to put their produce in the world market and enhance farm incomes.

To address issues of food safety and quality, it becomes important to address the entire food chain including primary production. This realization set in couple of years ago, when concerns regarding microbial contamination, and residues of chemicals and heavy metal that have plagued the food processing industry, started being expressed (CDCP, 1982; Rejesus, 2009).

The increasing concerns of food safety and hygiene, including in the farming system, have led several developed countries to build structured or certified systems, so that products with residues and contaminants beyond acceptable levels do not enter the food system at any point in the food chain. This included establishing mechanisms of Good Manufacturing Practices (GMP) for processed food and pharmaceuticals. It was soon realized if the raw material produced, including fruits and vegetables, is not safe, a later intervention during the processing stage could not achieve much. The requirement of certification of good agriculture practice now has become a routine part of the business protocols within and outside in the global markets (FAO; FAO, 2004).

Even in SAARC countries, with the growing spending power of the middle class coupled with a sensitized consumer, the retail chains are now increasingly demanding mechanism of food safety as a prerequisite for procurements mostly in the form of certification (Walmart). Some retailers

have now started to seek statement of compliance to social and environmental consideration (Global Social Compliance Programme, Walmart). Further, large farmer groups or associations have seen adoption of good agriculture practices (GAP) as a successful business strategy that firstly, assists them in improving productivity, quality and farm level income and secondly, helps in gaining access to new markets that were hitherto out of bounds for non-certified entities, in optimization of resources, increasing farm value and bringing more knowledge, strength to farmers skill set (FAO, 2004).

While the developed nations have managed to put in place mechanisms both mandatory and voluntary to ensure food safety in their on-farm and processing, the developing countries including those in the SAARC region are still grappling with formulation of a mechanism that will address issues so that their produce is of a quality acceptable in international markets.

GAPs of various types have evolved over time, to cover several aspects of food production, processing and marketing. There are initiatives such as private industry supply chain GAPs, to cater to specific processors, exporters and/or retailers, industry group GAPs, national government-initiated GAPs such as INDGAP in India or regional initiatives that are championed by international agencies and may extend across multiple national boundaries in developing countries such as ASEAN GAP. All such programmes have been developed as an outcome of buyers' requirement for ensuring stronger food safety and food quality assurances. While the private ones are largely customized to the immediate buyer, the industry or national initiatives are instruments put in place to overcome the barriers resulting from increased globalization.

The Sanitary and Phytosanitary (SPS) Agreement allows countries to impose measures to protect the health and safety of their populations thereby implying that requirements for contamination from agricultural practices can be laid down, but these are not prescriptive and do not prescribe specific interventions at the country level. Developing countries therefore find it a challenge to internalize the international mechanisms into their national context (SAARC, 2009).

FAO had received requests for technical assistance for supporting countries in helping them establish National Schemes in relation to GAPs. The Regional GAP proposed is specifically aimed at initially upgrading the food safety and hygiene aspects at pre-farm gate to the level at which it could meet regional and global standards for boosting trade. Since the developing countries in SAARC find it difficult to incorporate various international standards and guidelines in their regulations given the state of their industry or agriculture, it is aimed at developing a voluntary mechanism with potential for being incorporated into their regulations subsequently and as needed.

Once a GAP standard has been formulated, it is essential to create a mechanism of certifying conformity to the standard and monitoring it. An independent third party certification helps the certificate holder validate its claim of maintaining systems that ensure food safety and quality of the produce, and gives confidence to the buyer and retailers.

The goal of this Project was to develop a voluntary regional mechanism that could be adopted by member SAARC countries to enhance food safety and quality of horticulture produce in the region. The protocols and processes of the mechanism would focus on the small and medium land holders who could join the Scheme to participate in the GAP oriented markets by upgrading the quality of produce to meet the requirements of the buyers.

It is hoped that with the implementation of this project, the region will be able to have a good infrastructure in place for the implementation of GAP for horticulture sector and supply safe and quality fruit and vegetable products while at the same time taking into account economic, social and environmental sustainability.

Sectoral Policy and Legislation:

Developing countries have some products and services that they could offer to the global community. However, instances of non-acceptance of test data or certification by overseas markets have been seen to be a technical barrier to trade (ILAC, 1996). The problem is further compounded when the developing country has no Scheme of conformity assessment meeting international standards, and no other mechanism to tackle the SPS issue often raised by the importing countries. The WTO Recognizes that developing countries may encounter special difficulties in the formulation and application of technical regulations and standards and procedures for assessment of conformity with technical regulations and standards, and is desiring to assist them in their endeavours in this regard (WTO, 2013).

While the WTO gives preferential treatment to the developing nations' trade within the SPS and TBT agreements, countries are greatly benefited by having a certification and accreditation programme in place. The lack of such a mechanism results in cost escalations by having testing done twice - once in the home country and the other while reaching the destination country (Standards Council of Canada). This makes international trade unviable. In order to remedy this, the best way to help developing nations improve their farmers' livelihood is to address the section 6.1.1 of the TBT agreement. This section mentions that if there is an adequate and enduring technical competence of the relevant conformity assessment bodies in exporting member which could be verified for instance through accreditation, with relevant guides or recommendations issued by international standardizing bodies, this shall be taken into account as an indication of adequate technical

competence. This broadly indicates that if a country has a quality infrastructure in place, the certification and accreditation component of this helps in reducing the possibility of goods being denied in the overseas market.

Alternately it is also agreed that certification and accreditation support the establishment of a well-structured national technical regulatory framework and could be used as an important tool for regulators in developing countries.

As this project is a technical collaboration programme, the focus is to initiate a process to establish a safe voluntary mechanism that shall lead to improvement in the quality and safety of the agricultural produce which is validated through internationally accepted mechanisms of conformity assessment.

Rationale of development of SAARC GAP

Problems/Issues to be tackled

With globalisation, food safety and quality are important requirements of both consumers and national governments. In addition, importing countries often use standards and conformity assessment issues to create trade barriers either to protect domestic markets, or to protect human or plant health or life, the basis for which are at times not justified.

This is possible due to the lack of an adequate mechanism to display the robustness of food safety and quality in developing countries including those in the SAARC region, which besides alienating them from international trade, has led to lost opportunities of promoting sustainable and inclusive growth of these economies. Developing GAP as a tool to implement good practices in agriculture, not only leads to compliance with WTO requirements, but also reduces the risk of rejection of consignments and saves them from associated losses in terms of dollar value and brand reputation. Further, a national system of third party certification and accreditation, carried out periodically at various levels of the inspection and certification system and using internationally recognized assessment and verification processes, helps to ensure credibility and acceptability globally.

Some SAARC countries have not yet adopted GAP in their agriculture, and some do not have a national accreditation system in place (UNIDO, 2002). The principal reason is the lack of a benchmarking tool. In each of the SAARC country there is some form of a food safety framework to handle food safety at various governance levels. However, these may not be fully effective in terms of standards, certification and accreditation especially for the primary production sector specifically to handle issues of food safety and quality.

It is therefore important to take up such initiatives in SAARC countries. A training module on Implementing GAP in fruit and vegetable sector, its certification and accreditation as per ASEAN GAP has already been developed by FAO RAP. It is proposed to further use this as a basis for work in the SAARC countries for development of the GAP standard and the certification and accreditation systems. Through this initiative, the framework and infrastructure to address food safety and quality of primary production is proposed to be strengthened especially in the pilot countries.

Stakeholder and Target Beneficiaries

The principle stakeholders in this TCP are all member countries of the SAARC, their ministry of Agriculture, ministry of Industries and Commerce, national quality infrastructure viz., their standardization, certification and accreditation bodies. The stakeholders also include various research and academic institutions, NGOs that are active in agriculture and rural development, farmers' groups, traders association, retailers and the consumers.

The ultimate beneficiaries are the farmers' groups, especially those having marginal or low land holding, women farmers with the additional burden of running their households and the farm workers that toil throughout the day with low or no remunerations due to conventional farming practices as they will reap the benefits of acceptance of their products due to GAP certification.

This project understands the importance of the stakeholder consultation process and has built in stakeholder consultation in almost all levels of project planning, monitoring and execution both at regional SAARC level and the national level. This will ensure the participation of various departments including representatives of marginalized population and/or their representation in the various level of execution of TCP.

The Framework

The overall goal of the project is to increased trade of F&V produce in the domestic, regional and global markets. The mechanism to achieve this will be by improving the safety, hygiene and quality of horticulture produce by implementation of good agriculture practices in primary production and introducing a system of certification to ensure credibility of the scheme. The indicators of success will be measured by the degree of increased farm incomes. Success of this initiative could also be assessed by the acceptability of produce by the SAARC member countries in the region and globally leading to increasing trade.

The impact of this initiative would be measured directly with the increase in farm incomes thorough adoption of good hygiene and production systems

that results in the enhancement of safety and quality of the fresh horticulture produce from farms.

Outcome and Outputs

The outcome of this initiative will be the development of Regional GAP Scheme for SAARC countries covering standards, certification and accreditation systems as benchmark tool for National Schemes for GAP in horticulture sector to ensure safe products as well as facilitate trade through a credible and internationally acceptable system. For achieving the above, 6 main outputs had been identified

Formulation of regional GAP standard: Formulation of a Regional GAP Scheme for SAARC countries – covering technical criteria, certification criteria and certification process, accreditation criteria and accreditation process.

National GAP Scheme adopted/adapted in identified countries: The regional GAP Scheme developed that will be discussed in identified countries and adapted/ adopted and national interpretation of the Scheme will be developed.

Study tour of the participating countries to certified GAP farm to study implementation of the GAP and the accompanying process of certification.

GAP Accreditation System established based on regional GAP standard guideline.

Trained scheme owner, accreditation and certification body staff and pool of trainers and consultants

Once the regional GAP Scheme is launched along with the national initiatives, a workshop for SAARC countries to be organized so that both regional as well country experiences are shared with other countries.

Sustainability

The entire project aims at long term sustainability. Sustainability has been built in various stages and each activity in itself strives to sustain the process. The activity of Scheme and accompanying Standards development by internalizing the quality infrastructure is aimed to sustain the programme. As discussed above, the Regional GAP will provide a benchmark for the member countries to adopt the Scheme, the driver being market requirements as well as ease of adopting into their country system.

The pilots and the regional workshops will help in understanding the steps of implementation.

The Scheme once adopted shall assist the farmer to farm in a sustainable manner which shall lead to the optimization of resources. The customers, buyers and other stakeholders shall experience the merits of this initiative and eventually demand for GAP certified produce. Once this is achieved, the

Scheme will be finally sustained by market drive which then would become the norm.

Implementation and management arrangements

The Regional Office for the Asia and the Pacific (FAO RAP) would be the project budget holder, responsible for general administration and financial supervision of the Project. RAP would be the nodal office for overseeing the entire project and responsible for overall coordination and monitoring including recruitment of international and national consultants, preparation of contracts, etc.

The Regional workshops/consultations will be handled by RAP with assistance of the contracting organization. At the country level a nodal agency will be nominated by each of the pilot countries with a focal person who would coordinate activities within each country. Regular consultations and reviews will be held with partners to ensure that the project is on schedule and ensure efficient implementation of activities.

The project will be implemented by putting together a team of international and national consultants under the direct supervision of Senior Food Safety Officer, FAO RAP who will be the Lead Technical officer.

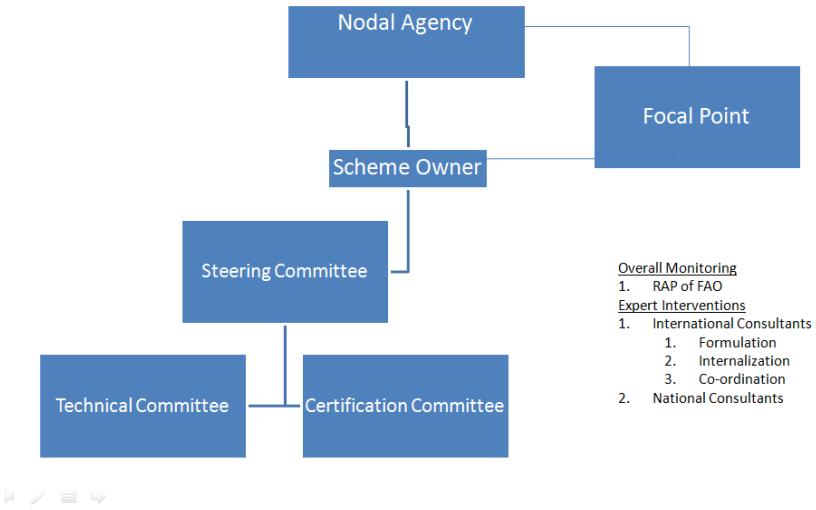
The task of development of the draft scheme will be contracted to an organization having experience in the subject and preferably from a SAARC country. This organization will also support in providing technical advice as detailed in Annex V.

Country level activities: At the country level, in the first instance a Scheme Owner that will be in-charge of the overall Scheme once it is ready for on-ground implementation will be identified in each pilot country by the nodal agency. The scheme owner would be responsible for setting up a Steering Committee. The Steering Committee will set up principally two committees' viz., the Technical and Certification Committees to develop the country interpretation and internalization of the GAP certification and accreditation system. The Technical Committee will develop the National Interpretation of the regional GAP technical standard. The Certification Committee will internalize the certification body certification process into the country's existing framework and the recognition/ accreditation criteria and processes and decide on the recognition/accreditation mechanism to be implemented in the country.

One International and one national consultant will be recruited to support the process nationally. They will facilitate and drive the process specifically at country level to ensure implementation of pilots in countries including facilitating the Steering, Technical and Certification Committee meetings, recording minutes and developing documents, organizing trainings and submitting all information, records and reports to FAO RAP as indicated for steering the activity.

Senior Food Safety Office, RAP will monitor the project and take part in all the major meetings to monitor the course as per the TCP objectives and take appropriate actions for course correction, if required.

Since the project is about technical co-operation on food safety and quality infrastructure external domain expertise will be sought, as needed and the same will be executed through individual consultants or organizational contracts. The same will be directly monitored by the budget holder.



Current Status of the SAARC GAP Scheme:

Under this project a Regional GAP Scheme for horticultural produce for the SAARC region has been developed along with the certification and accreditation framework as per the work plan. This has been developed through a regional consultation comprising representatives of all eight SAARC countries. This has resulted in a readily available benchmark Scheme complete with the certification and accreditation framework for adoption or adaptation by SAARC member countries to suit their local needs.

The project initially supported four pilot countries to adopt/ adapt the GAP Scheme which later on was extended to Afghanistan and Sri Lanka. This ensured the development of national Scheme based on international processes, guarantee reliable certification and strengthen quality infrastructure for GAP in the SAARC countries. This in due course shall result in recognition of their certification regionally as well as internationally. This national initiative will now also support local agro-industries meet their domestic regulations and consumer's requirements. During the course of the project, on requests by other members, some specific activities were executed under this project such as specific trainings and support in documentation development.

The Quality Infrastructure (QI) for GAP was attempted to be strengthened nationally but based on internationally acceptable norms. Quality infrastructure for GAP comprises of a network of standards development bodies, technical regulator, if needed, metrology, certification bodies, testing laboratories and Accreditation Body.

The regional initiative provides for a robust mechanism for implementing best practices by producers, particularly small and medium-sized ones and ensures availability of an internationally acceptable certification scheme to provide assurance that the producer has indeed followed the good practices laid down in the GAP Scheme. The ultimate objective of this initiative is that farmers' produce fulfils the food safety and quality requirements.

The documents designed and generated in this project is the Scheme documents, GAP technical standard, training manual, and individual national GAP standards of Afghanistan, Bangladesh, Bhutan, Nepal and Maldives, documents for the execution of Scheme by Scheme Owner, Certification Body and framer. The development of the GAP Scheme coupled by developing the Quality Infrastructure is a step taken to ensure the sustainability of the project in each of the pilot country. A training manual was developed, series of training programme and sensitisation workshops were conducted in all the participating countries of SAARC.

Further, the Scheme that was adopted by a country (Maldives) was further field tested in the farm. A holistic approach towards capacity building, exposing the Scheme Owner and Certification Body to auditing techniques, farm documentation and auditing of farms was undertaking during the extension of the project.

With this a full project cycle in terms of the creation of a Scheme documentation, capacity building, field implementation and auditing in farm field was achieved ensuring that the Scheme is now fully ready to be adopted by any country in SAARC. The implementation of Work Plan was carried out as planned and by setting up the Quality Infrastructure.

Lessons Learned

Lessons Learned – Elements Of Success

- The project adopted participatory approach for project implementation involving representation from different stakeholders, which was found to be effective.
- The countries of SAARC Region has proposed that all countries in the Region should adopt/adapt the scheme as SAARC GAP Scheme with the active intervention of the SAARC Agriculture Center, being the competent body.

- This could be achieved by harmonisation of the critical and major requirements across the participating SAARC member nations.
- It has also been proposed that memorandum of understanding should be framed amongst all 8 member States of SAARC for free cross-boundary movements of GAP certified produce.
- Training of producers with locally available resources will go a long way in sustainable GAP resulting in domestic and global market acceptances and ultimately alleviation of poverty in the farm sector.

Lessons Learned – Impediments/Constraints

- The principal impediment could be traditional resistance amongst the farming community to change. That is normal when new approaches are introduced to supplement existing practices (in this case conventional agriculture).
- In addition to GAP itself, which is science based for assuring food safety, the concerned resource persons need to explain the farmers that quantum of production will not be hampered. On the contrary GAP if judiciously practised, will result in increasing yield.
- The scientific acumen of Extension specialists shall be required for dialogues with farmers prior to full-scale onset of the scheme.
- There was no or low understanding of GAP concept especially in the farming sector.

Follow – Up Actions

i. The SAARC Agriculture Centre may initiate actions for development of the SAARC GAP Standard as a Regional Standard and Scheme through a consultative process involving all Member States, who are the major stakeholders. The consultative process may also involve use of electronic means with the producers already having GAP certification, the CBs and the SOs who are already in operation. Their experience and expertise may enrich the scheme making it robust to meet the international market demands.

ii. Scheme Owner and Certification Body, if possible, should be from different ministries to avoid any conflict of interest.

iii. Control points, as a part of verification mechanism of GAP implementation, if pertain to regulatory requirement, should be necessarily categorized as “Critical” or “Major”.

iv. GAP logo may be applied on produce and/or package, if such logo application is supported with testing in an accredited lab possibly through residues control/monitoring programmes implemented at

country levels. Alternatively, statement could be given on produce as an indication that the same is from a GAP certified farm.

v. In order to popularize country GAP, the government may give preference in procurement from GAP certified farm; assist in advertisements and awareness campaigns; accord preference in obtaining farm loans. The government may give preference to those applying to do farming in newer agri-locations, if the farmers agree to abide by GAP requirements in their endeavours.

vi. The food processing parks/zones may give preference to GAP produce in their procurements.

vii. There should be only one national standard on GAP in a country, developed through consensus approach and multilevel consultation process, preferably with involvement of the NSB (so as not to duplicate the efforts).

Government Attention

i. The major economic activity in countries of the SAARC region is agriculture. However, the concept of modern farming is not wide spread and conventional farming methods are prevalent. This has resulted in a low level interest shown by global market on the region's farm produce though a wide variety of fruits and vegetables are grown here. The global market is very concerned about food safety requirements as well as the quality criteria. The concept of GAP is relatively new for this region. There is tremendous proven potential in capturing world market through certified GAP implementation. One of the major requirements in this direction will to have trained manpower within the farming community. The governments can utilise its trained human resources including those in academic and research institutions (several reputed institutions are located in the SAARC region) for spreading awareness and skill on GAP among the farming community.

ii. Government can also widely publicise grant of incentives to GAP certified farmers as encouragement.

iii. Funds need to be allocated for the promotion of GAP in the country to enhance the consumer awareness that will result in the demand of GAP produce. This will in turn create a market demand of GAP produce.

iv. Pack houses, a vital link in the GAP chain, providing post-harvest support to farmers, can be established and maintained by the government at least in the initial periods. This will provide a tremendous impetus for the agricultural development in the region as a huge percentage of produce gets destroyed due to inept post-harvest handling.

v. Channels for domestic and global marketing and sales can be explored by the governments including subsidising storages and transportation, at least at the initial stages of development of the scheme.

Conclusion

Agriculture is the foundation of most of the developing countries today, and their competence and readiness to compete in the global market has a major impact on the future of their economy. With food safety and quality concerns on the rise, GAP has emerged as a tool to help these countries in establishing themselves as major players in the food business. SAARC GAP's approach of ensuring quality right at the farm gate, its sustainable quality infrastructure, and its regional approach allow it to become a catalyst to increase farm incomes.

Individual national GAP standards of Afghanistan, Bangladesh, Bhutan, Nepal and Maldives have already been created, and Maldives has also adopted it. With proper government intervention, legislative and policy reforms, combined with the learnings of GAP till now, soon all SAARC nations will be able operationalise their own GAP and boost trade. The SAARC Agriculture Centre that has the mandate for handling issues related to agriculture can take up the issue with each of the member country to review the existing SGAP standard and initiate the process of harmonisation and reciprocity.

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Proceedings of the SAARC Regional Consultation Meeting on Development of Country Specific Good Agriculture Practices (GAP) Standards and Harmonization of SAARC GAP for Vegetables and Fruits during 8 to 10 April 2018 in Kathmandu, Nepal

The concept of SAARC GAP has been introduced by FAO in 2014 in South Asia, which also launched a technical cooperation project (TCP) in Nepal, Bhutan, Maldives and Bangladesh. Under this TCP, the piloting countries established GAP structures including – the steering committee, technical committee, scheme owner, certification body and so on. Likewise, the project has also supported to produce Lead Assessor for the country GAP. During this process, the countries have departed from the common framework in some criteria and checklist to make it suitable to their context. However, this kind of customization in the country GAP may yield unacceptability among member states which ultimately will fail to facilitate the regional trade.

Therefore, to harmonize the national GAP, SAC has taken initiative a three-day SAARC Regional Consultation Meeting on Development of Country Specific Good Agriculture Practices (GAP) Standards and Harmonization of SAARC GAP for Vegetables and Fruits was conducted during 8 to 10 April 2018. The meeting was organized by SAARC Agriculture Centre (SAC), Dhaka, Bangladesh in collaboration with Ministry of Agriculture, Land Management and Cooperatives (MoALMC), Government of Nepal, Food and Agriculture Organization of the United Nations (FAO), Quality Council of India (QCI) and Centre for Environmental and Agricultural Policy Research, Extension and Development (CEAPRED) in Kathmandu, Nepal. GAP experts from seven SAARC Member States; Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka had participated in the consultation meeting.

The program was inaugurated in the chairmanship of Dr. S M Bokhtiar, Director of SAC and in the presence of Dr. Dilli Ram Sharma Director General of Department of Agriculture (DoA), Nepal as the Chief Guest. Dr. Pradyumna Raj Pandey, Senior Program Specialist of the SAARC Agriculture Center (SAC) and the coordinator of the program shed light on the following objectives of the program along with welcoming all distinguished guests and participants;

- To review the past activities under country specific GAP as well as SAARC GAP;
- To promote standards and harmonization of country specific GAP for SAARC Member States.
- To establish GAP network for SAARC Member States in coordination with QCI and SARSO.

- To publish outcomes of the consultative meeting for future guideline of the GAP implementation in SAARC Member States to enhance regional trade.

Likewise, Dr. Hari K Upadhyaya, the Executive Chairperson of the Centre for Environmental and Agricultural Policy Research, Extension and Development (CEAPRED), expressed his sincere gratitude to SAC for providing the opportunity for co-organizer. He put forward the scope of collaboration and the non-governmental perspective of the GAP. He also welcomes all distinguished guests and country focal points in Nepal and wished for all the success of the program. As well as, Dr. Matina Joshi, Deputy Director General of the Department of the Food Technology and Quality Control (DFTQC) of Nepal also highlighted the need of the GAP in the region. She briefly summarizes the current status of the Nepal GAP as the DFTQC is entrusted as the Certification Body for Nepal GAP. She stress on regional collaboration for the trade facilitation and technology transfer in the GAP. Likewise, she also thanks SAC for taking this initiative. At the same session, Ms. Ishrat Jahan, Director (Agriculture and Rural Development) of the SAARC Secretariat also took chair of special guest. She expressed her overwhelming pleasure and thanks SAC along with all organizers including the Ministry of Agriculture, Land Management and Cooperatives, FAO, QCI and CEAPRED for organizing such a crucial event. Likewise, she wished her best regards for all success of the program on behalf of herself and on behalf of the SAARC Secretariat.

As a chief guest Dr. Dilli Ram Sharma, Director General of the Department of Agriculture, Nepal expressed his immense pleasure to be the Chief Guest of the opening session. Finally, closing remarks was given by Dr. S M Bokhtiar, Director of SAARC Agriculture Center (SAC). During the technical sessions country papers were presented by Focal Point Experts from SAARC Member States and Mr. Gopal Prasad Shrestha and Dr. Manish Pande were presented on behalf of non-governmental sector as well as development of GAP in the world and South Asia. At the final stage Dr. Manish Pande, QCI and Dr. Pradyumna Raj Pandey, SAC jointly presented with flowing recommendations and way forward.

- SAC to take ownership of SAARC GAP from FAO and seek nomination from member countries for their focal points with a commitment of a fixed tenure
- SAC to develop a technical co-operation project for harmonization of SAARC GAP in member countries and create pilots for implementation with appropriate funding assistance by donor agencies.
- SAC to create a SAARC GAP Consortium inviting member countries and certain special invitees and launch an e-Portal for dissemination of information
- SAC to take up benchmarking with global standard (GLOBALG.A.P) for creating more opportunities for the SAARC farming sector

- SAC to present SAARC GAP as a instrument for regional trade in SAARC Agriculture Ministers meeting

Closing Session

The chair of the closing session was taken by Dr. B.N. Mahato, Executive Director of Nepal Agriculture Research Council (NARC) and Dr. Yubak Dhoj GC, the Secretary of the Ministry of Agriculture, Land Management and Cooperatives, Nepal was invited as the Chief Guest of the session. Ms. Mariyam Vishama, Director, Ministry of Fisheries and Agriculture, Maldives and Dr. Hafeez-ur-Rahman, Director, National Agriculture Research Center, Pakistan were invited to expressed their impression of the program and to suggest the way forward regarding harmonization of the SAARC GAP.

Mr. Jaya M Khanal, Executive Director of CEAPRED was made his remarks on the program. Following him, Dr. M S Bokhtiar, Director of SAC, congratulated all participants for successfully completing the program and also committed to take all necessary action in order to make the SAARC GAP function. He also extended sincere thanks to all co-organizers – Ministry of Agriculture, Land Management and Cooperatives, Nepal, FAO, QCI and CEAPRED. He expressed his delightedness for warm hospitality.

Dr. Yubak Dhoj GC, Secretary of MoALMC and Dr. S M Bokhtiar, Director of SAC jointly awarded Certificates to the participants for successfully accomplishing the program and also handed over the token of love to each participant and the guests.

Dr. Yubak Dhoj GC, Secretary of MoALMC, congratulated all participants and extended sincere thanks to SAARC Agriculture Center and other co-organizer for valuable program. He also encouraged country focal points for continual and meaningful networking in order to implement the GAP and expressed his commitment to make the SAARC GAP functional. Finally, Dr B.N. Mahato, Executive Director of Nepal Agriculture Research Council and the chair of the session put remarks on importance and scope of GAP and extended sincere thanks to the SAC and all organizers.

Field Visit

The third day of the program was dedicated to the field visit. Since, Nepal has not implemented GAP yet; the team visited one private farm doing organic farming in Pasikot, Kathmandu. The farm owner briefed about her inspiration for organic farming and current status. After brief presentation from the organic farm owner, an open discussion was organized among participants and farm owner. The discussion was followed by farm visit. Similarly, the team also visited Horticulture farm in Kirtipur. This is one of the government farms in the Kathmandu valley. A briefing was done by the Horticulture farm followed by the farm visit. Participants enthusiastically asked questions regarding various aspect of farm and happily responded by the officers from the horticulture farm.

accreditation especially for the primary production sector specifically to handle issues of food safety and quality. Through this proposed meeting, the framework and infrastructure which are already established by FAO-RAP will be continued and address food safety and quality of primary production. This meeting is proposed to be strengthened the existing infrastructure and established harmonized SAARC GAP in coordination with SARSO, QCI and other potential partners.

The purpose of this meeting is to lay down Good Agriculture Practices to be implemented by fruits and vegetables producers to improve the safety and quality of produce while at the same time protecting the environment and safeguarding health and safety of the worker. After implementation of the country specific GAP the horticulture farms can be produced with certified harmonized SAARC GAP and enhance inter and intra regional trade significantly.

Objectives

- To review the past activities under country specific GAP as well as SAARC GAP.
- To promote standards and harmonization of country specific GAP for SAARC Member States.
- To establish GAP network for SAARC Member States in coordination with Quality Council of India (QCI) and SARSO.
- Publication of outcomes of the Consultative meeting for future guideline of the GAP implementation in SAARC Member States to enhance regional trade.

Expected outputs

- Update the domestic GAP mechanism in SAARC Countries and Establish SAARC regional GAP network/Forum.
- Initiate GAP as a pilot project in each Member States and improvement of GAP modalities.
- Harmonized and facilitate regional GAP for intra and inter regional trade with the help of concerned national, regional and international agencies.
- Publication the outcomes of the meetings for future guidelines.

Tentative Schedule

- 7th April- All participants arrive in Kathmandu, Nepal
- 8th April – Inaugural and Technical Session-I (Country presentation)
- 9th April- Technical Session-II (Breakout and brain storming Sessions) and Closing Ceremony

- 10th April- Field visit of GAP practiced field and GMP applied industries (if possible)
- 11th April- All participants leave to their respective destinations

Target Participants: 23

- 8 experts of Good Agriculture Practices (GAP) (1 each from 8 SAARC MSs- Ministry of Agricultural Development, NARS systems)- coordinated by SAC
- 5 from Nepal (NARC, MoAD and DoA/Horticulture and Vegetable Directorate)
- 5 from Potential development partners and Private institutions (FAO-RAP, CABI, IFPRI, CEPREAD and potential private company)
- 3 (2 from SAARC Agriculture Centre) and 1 from SARSO
- 2 Resource Person (QCI and FAO)

Schedule: 8-10 April 2018

Venue: Kathmandu, Nepal

Collaborating Institutions

- SAC
- FAO-RAP
- SARSO
- DoA/MoALMC, Nepal
- NARC, Nepal
- CEPREAD, Nepal
- QCI (Quality Council of India), India

Outline for the Country Report/Presentation

Title: Current Status, Challenges and Way forward of Good Agriculture Practices (GAP) Standards and Harmonization of SAARC GAP for Vegetables and Fruits in _____ (Respective SAARC countries)

- Introduction
- Agricultural land use
- Area and Production status of common Fruits and Vegetable crops
- Current Production technology, post-harvest handling, processing, value addition and storage of Fruits and Vegetables
- Potentiality of fruits and vegetable Trade in SAARC Countries and beyond the SAARC (intra and inter regional trade).

- Current Status of Good Agriculture Practices (GAP) Standards and Harmonization of SAARC GAP for Vegetables and Fruits
- Key policy inputs for deploying strategies aimed at harmonization of the SAARC GAP for safe food production and enhancing international trade.
- Key developments and strategies for benefitting SAARC GAP harmonization and Standardization in respective country and south Asia.
- Challenges and Way forward for research and development of SAARC GAP for Fruits and Vegetables in South Asia.
- Challenges and Way forward for implementation of SAARC GAP for Fruits and Vegetables in South Asia.
- Conclusion
- References

Coordinator:

Dr. Pradyumna Raj Pandey, Senior Program Specialist (Crops), SAARC Agriculture Centre (SAC), Dhaka, Bangladesh, (E-mail: pandeypr4@gmail.com, Cell: +880-1763708514)

Program Agenda

07 April 2018 (Saturday)	
	Arrival of participants in Kathmandu, Nepal Billeting and briefing about the workshop

Day 1: 08 April 2018 (Sunday)

Inaugural Session: Hotel Park Village, Budhanilkantha, Kathmandu Chair: Dr. S M Bokhtiar, Director, SAARC Agriculture Centre (SAC) Chief Guest: Dr. Dilli Ram Sharma, DG, Department of Agriculture, Nepal Rapporteur: Dr. Chandra Dhakal, DoLS MC: Mr. Arun GC and Ms. Sumi Bhattarai		
09:30-10:00	Registration	
10:00-10:10	Welcome Remarks and Objective of the program	Dr. Pradyumna Raj Pandey, SPS, SAARC Agriculture Centre (SAC)
10:10-10:15	Remarks	Hari K Upadhaya, PhD, Executive Chairperson, CEAPRED
10.15-10:20	Remarks	Dr. Binod Shah, FAOAR, Nepal
10:20-10:25	Remarks	Dr. Matina Joshi, DDG, DFTQC
10:25-10:30	Remarks	Ms. Ishrat Jahan, Director (ARD), SS
10:30-10:35	Inauguration (Lighting the lamp and cultural mantra chanting by Sanskrit students)	All Dignitaries
10:35-10:45	Inaugural address by the Chief Guest	Dr. Dilli Ram Sharma, DG, DoA
10:45-11:00	Closing remarks by Chair	Dr. S M Bokhtiar, Director, SAARC Agriculture Centre (SAC)
11: 00-11:30 : Group Photo Session and Tea Break		

Technical Session- I: Country Presentations – Set A Venue: Hotel Park Village, Budhanilkantha, Kathmandu		
Moderators: Dr. Dilli Ram Sharma, DG, DoA (TBC) Facilitator: Dr. Pradyumna Raj Pandey, SPS, SAC Rapporteurs: Dr. Surendra Lal Shrestha, NARC		
11:30-11:55	Country presentation **(Bangladesh)**	Dr. Ferduse Islam Ivy, Pricipal Scientific Officer Horticulture Research Centre, Gaizipur, Bangladesh Contact No. +8801714004303 Email: ive_bari@yahoo.com
11:55-12:20	Country presentation **(Bhutan)**	Ms. Yeshi Lhamo Regulatory and Quarantine Officer BAFRA, Bhutan Email: ylhamo96@gmail.com
12:20-12:30	Discussion	
12:30-13:30	Lunch break	

Technical Session-III: Country Presentations - Set B Venue: Banyan Hall, Hotel Park Village		
Moderator: Dr. Ramita Manadhar, Program Director, DoA Facilitator: Dr. Pradyumna Raj Pandey		
Rapporteur: Mr. Shalik Ram Adhikari, DoA		
13:30-13:55	Country presentation **(India)**	Dr. T. Janakiram, Assistant Director General (HS-II), Ministry of Agriculture, ICAR, New Delhi Contact No.+91-9013201615 Email: tolety07@gmail.com/janakiram.kab@gmail.com
13:55-14:20	Country presentation **(Maldieves)**	Ms. Mariyam Wishama Director, Ministry of Fisheries and Agriculture Contact No. +960 3339246 Email: mariyam.vishama@fishagri.gov.mv
14:20-14:45	Country	Mr. Tek Prasad Luitel, Senior Agricultural

	presentation **(Nepal)**	Economist, MoALMC, Government of Nepal Email: luiteltp@gmail.com
14:45-15:00	Discussion	
15:00-15:25	Country presentation **(Pakistan)**	Dr. Hafeez-ur-Rehman Director (HRI) National Agricultural Research Centre, Pakistan
15:25-15:50	Country presentation **(Sri Lanka)**	Ms. D.S. Rathnasinghe, Principal Agriculturist (Food and Nutrition), Department of Agriculture, Peradeniya, Sri Lanka Contact No. +94-718143744 Email: disnarath@yahoo.com
15.50-16:00	Discussion	
16.00-16:25	Non-Governmental Perspective on GAP	Mr. Gopal P. Shrestha Senior Horticulturist, CEAPRED Nepal
16:25-16:50	Practices and Development of SAARC GAP	Dr. Manish Pandey, Joint Director, QCI, New Delhi, India Contact No. +91-8527285303 Email: manish.pande@qcin.org
16:50-17:00	Discussion and closing remarks	
17.00	Tea break	
Day-2 (9 April 2018) **09:30- 13:00** **Brainstorming session: Policy and Technological Interventions for SAARC GAP :Challenges and way forward** Moderator: Dr. Manish Pandey Facilitators: Dr. Pradyumna R. Pandey, SPS, SAC Rapporteurs: Mr. Mohan Krishna Maharajan, DFTQC and Mr. Arun GC, MoALMC		
9:30-9:45 Explain about the modality of Group work		
9:45- 11:00 Group division and group discussion		
11:00-12:00 Group presentation		

12:00 -13:00 Discussion, Way forward and closing of the SAARC GAP
Lunch: 13:00 – 14:00

Closing Session		
Chief guest: Dr. Yubak Dhoj G.C., Secretary, Ministry of Agriculture, Land Management and Cooperatives, Government of Nepal Chair: Dr. B.N Mahato, Executive Director, Nepal Agriculture Research Council Rapporteur: Mr. Ramjee Devkota, Department of Agriculture, Nepal		
15:30-15:45	Summary of Technical and Brainstorming session	Dr. Manish Pande, QCI
15:45-15:50	Remarks by participant	Ms. Mariyam Vishama, Director, Ministry of Fisheries and Agriculture, Maldives
15:50-15:55	Remarks by participants	Dr. Hafeez-ur-Rahman, Director (HRI), National Agricultural Research Centre, Pakistan
16:00-16:10	Remarks	Mr. Jaya M Khanal, Executive Director, Center for Environmental and Agricultural Policy Research, Extension and Development (CEAPRED)
16:10-16:20	Remarks	Ms. Ishrat Jahan, Director (Agriculture and Rural Development), SAARC Secretariat
16:20-16:30	Remarks	Dr. S M Bokhtiar, Director, SAARC Agriculture Center (SAC)
16:30-16:40	Certificate and Token of Love awarding	Chief guest, Dr. Yubak Dhoj G.C., Secretary, Ministry of Agriculture, Land Management and Cooperatives, and Dr. S M Bokhtiar, Director, SAARC Agriculture Center (SAC)
16:40-16:55	Remarks by Chief Guest	Dr. Yubak Dhoj G.C., Secretary, Ministry of Agriculture, Land and Cooperatives
16:55-17:10	Closing Remarks	ED-NARCDr. Baidya Nath Mahto

17.10-17:20	Vote of Thanks	Dr. Pradyumna Raj Pandey, SPS (Crops), SAARC Agriculture Center (SAC)
	Social Networking and sideline meetings	
18:00	Conference Diner	

Day 3 (10 April 2018) Tuesday

07:30 – Hotel to Swayambhunath

10:00 - Organic Farm Visit at Pasikot

12:30 – Lunch

14:30 – Kirtipur Farm

17:00- Thamel Visit

18.30: Dinner with cultural night, Bhojan Ghriha, Dillibar, Kathmandu (http://www.bhojangriha.com/)

Day 4 (11 April 2018) Wednesday

Departure from Kathmandu, Nepal

Coordinators:

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2. **Mr. Arun GC,** Agriculture Extension Officer, Ministry of Agriculture, Land Reform and Cooperatives, Nepal, Mob: +977-9841476195, E-mail: gcarun88@gmail.com

Participant List

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Bhutan	Ms. Yeshi Lhamo Regulatory and Quarantine Officer BAFRA, Bhutan Email: ylhamo96@gmail.com
India	Dr. T. Janakiram, Assistant Director General (HS-II), Ministry of Agriculture, ICAR, New Delhi Contact No.+91-9013201615 Email: tolety07@gmail.com/janakiram.kab@gmail.com
Maldieves	Ms. Mariyam Wishama Director, Ministry of Fisheries and Agriculture Contact No. +960 3339246 Email: mariyam.vishama@fishagri.gov.mv
Nepal	Mr. Tek Prasad Luitel, Senior Agricultural Economist, MoALMC, Government of Nepal Email: luiteltp@gmail.com
Pakistan	Dr. Hafeez-ur-Rehman Director (HRI) National Agricultural Research Centre, Pakistan
Sri Lanka	Ms. D.S. Rathnasinghe, Principal Agriculturist (Food and Nutrition), Department of Agriculture, Peradeniya, Sri Lanka Contact No. +94-718143744 Email: disnarath@yahoo.com
CEAPRED Nepal	Mr. Gopal Shrestha Senior Horticulturist, CEAPRED Nepal

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Local Coordinator	**Mr. Arun GC,** Agriculture Extension Officer, Ministry of Agriculture, Land Reform and Cooperatives, Nepal, Mob: +977-9841476195, E-mail: gcarun88@gmail.com

Local Participants and Guests

1. Dr. Ramita Manandhar, Vegetable Development Directorate, Nepal
2. Mr. Ramji Devkota, Fruit Development Directorate, Nepal
3. Dr. Surendra Lal Shrestha, Nepal Agriculture Research Council
4. Mr. Shalik Ram Adhikari, Department of Agriculture, Nepal
5. Dr. Chandra Dhakal, Department of Livestock Services, Nepal
6. Mr. Mohan Krishan Maharjan, Department of Food Technology and Quality Control, Nepal
7. Ms. Kiran Ghimire, National Plant Quarantine Program, Nepal
8. Mr. Gopal P. Shrestha, CEAPRED
9. Mr. Arun GC, Ministry of Agriculture, Land Management and Cooperatives, Nepal

Chief Guests and Special Guests of the Program

1. Dr. Yubak Dhoj GC, Secretary, Ministry of Agriculture, Land Management and Cooperatives, Government of Nepal
2. Dr. BN Mahato, Executive Director, Nepal Agriculture Research Council
3. Dr. S M Bokhtiar, Director, SAARC Agriculture Center, Dhaka
4. Dr. Dilli Ram Sharma, Director General, Department of Agriculture, Nepal

5. Dr. Matina Joshi, Deputy Director General, Department of Food Technology and Quality Control, Nepal
6. Ms. Ishrat Jahan, Director, SAARC Secretariat
7. Dr. Manish Pande, Joint Director, Quality Council of India
8. Mr. Arjun Thapa, Food and Agriculture Organization (FAO) Nepal
9. Mr. Hari K Upadhyaya, Executive Chairperson, CEAPRED
10. Mr. Jaya M Khanal, Executive Director, CEAPRED
11. Mr. Rejaul Karim, Desk Officer, SAARC
12. Mr. Suraj Kuwar, Media Person
13. Mr. Baikuntha Bhandari, Media Person

Photo Gallery

Participats with Dr S.M. Bokhtiar, Director, SAC, Dr. Pradyumna Raj Pandey, Senior Program Specialist (Crops), SAC

Participats and guests during inagural session with Chief Guest Dr Dilli Ram Sharma, Director General, Department of Agriculture, Ms. Ishrat Jahan, Director, Agriculture and Rural Devleopment, SAARC Secretariat, Kathmandu, Nepal, Dr S.M. Bokhtiar, Director, SAC, Dr. Pradyumna Raj Pandey, Senior Program Specialist (Crops), SAC.

Ms. Ishrat Jahan, Director, Agriculture and Rural Devleopment (ARD) delivering her inaguaral speech

Participants during group work in Kathmandu, Nepal

Participants are enjoying the field visit in Kathmandu, Nepal

Field visit at Central Horticultre Farm, Kritipur, Kahtmandu

Dr T. Janakiram, participants from India is receving certificate distributed by Dr Yubak Dhoj GC, Secretary, Ministry of Ministry of Agriculture, Land Management and Cooperatives, Nepal at the closing ceremony in Kathmandu, Nepal