

Good Agricultural Practices

for sustainable food and nutritional security

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Producing quality food and safeguarding the environment is very important for sustainable growth and development. Across the globe, demand for safe and quality food, produced through prescribed sanitary and phyto-sanitary procedures is increasing over the years. Good Agricultural Practices (GAPs) are practices that need to be adopted on-farm to guarantee food safety during pre-production, production, harvest and post-harvest. Implementation of GAPs will help in achieving sustainable growth and development, meeting National and International environment and social development objectives. When GAPs are put in practice in true spirit, it can be assured that the food will meet the required quality and safety standards. However, small scale farmers will not be able to seize export market opportunities unless they are adequately informed, technically prepared and culturally organised to meet this new challenge.

Keywords: Good Agricultural Practices, Food security, INDGAP

THE growing population demands improvement in agricultural productivity. India is witnessing the adoption of modern improved crop production technologies for more than five decades and achieved food security. However, many problems like land degradation, climate change, biodiversity loss, depletion and pollution of water resources, and increasing production costs threaten the sustainability of agriculture. Also the evidence for increasing hazardous chemicals load/residue in food produces especially in horticultural produce like fresh vegetables, dry chilli, cardamom, etc., is increasing globally due to excessive use of pesticides, unauthorized chemicals, indiscriminate use of fertilizers, use of poor quality irrigation water and release of industrial waste in agriculture fields. As a result, demand for quality and safe food is growing around the world. It is important to emphasize here that, inappropriate

handling, transportation and processing of food produce are also equally responsible for adding hazardous chemicals/organisms. All this inappropriate process leads to poor quality food produce and entry of hazardous chemicals into the food chain. Thus, it is imperative to ensure the safety and quality of farm produce at all stages of production. Harmony in food security and its safety is the need of the hour.

To solve these problems and ensure food safety, the concept of optimizing technologies and resources for sustainable agriculture and food safety through Good Agricultural Practices (GAPs) for agricultural and horticultural crops was initiated by Food and Agricultural Organisation. GAPs are practices that need to be adopted on-farm to guarantee food safety during pre-production, production, harvest and post-harvest. In many cases, such practices also help to protect the environment and safety of the workers. It is a systematic

approach which aims at applying available knowledge to address environmental, economic and social sustainability dimensions for on-farm production and post-production processes, resulting in safe and quality food and non-food agricultural products. GAPs provides maximum emphasise to traditional agricultural practices like crop rotation, summer ploughing, use of biotic/abiotic stress-resistant cultivars, use of good quality organic and green manure crops and some Indigenous technical knowledge (ITK). These practices are usually environmentally safe and ensure that the final product is appropriately handled, stored and transported. Thus, GAPs is the best way to achieve sustainable agricultural growth.

Four pillars of GAP

GAPs stands on four pillars (Fig. 1). GAPs encourages optimum utilization of inputs (pesticides, fertilizers) and resources (water) and eco-friendly agriculture. Its social

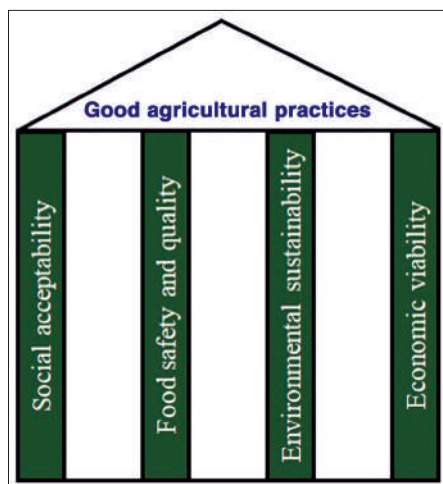


Fig. 1. Four pillars of GAP

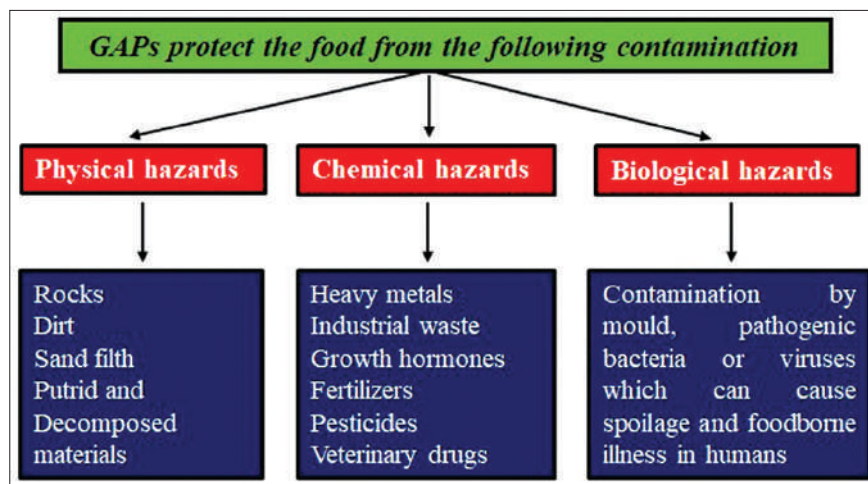


Fig. 2. GAPs protect the food from contamination

dimension would be to safeguard the health of agricultural labours from negligent handling of farm chemicals and pesticides. GAPs would have an advantage in terms of safety, better quality that would add value to the product to reach wider markets. The opportunity to access export market will provide economic benefits to the producers.

Stakeholders in GAP

- (i) Governments
 - Adequate infrastructure creation
 - Formation of regulatory authority, standards, and procedures
 - Creation of sufficient scientific and technical manpower resource
 - Fixing of certification charges, and import/export tax rates
- (ii) Farmers
 - Execute GAP
 - Record keeping
 - Formation of producer groups and implementation of group system
- (iii) Processor (Food processing industries)
 - Making safe food
 - Proactive dialogue with regulatory bodies
 - Up-grade and modernize design, facility and system
- (iv) Consumers
 - Request safe food product
 - Following directions for storage and use

GAP Focus at two levels

Farm level focus

Practices related to pre-harvest preparation, production and harvesting including transport to the

pack-house:

- (i) Environment hygiene include soil, water, waste disposal, etc.
- (ii) Hygienic production: Providing irrigation, fertigation and pesticide spray according to the schedules. Proper storage and handling of planting materials, agro and non-agro chemicals etc.
- (iii) Maintain food safety during handling, storage and transportation (Fig. 2).
- (iv) Cleaning of pack-house/storage site, maintenance of fertigation system and pesticide equipment and personal hygiene.

Pack-House focus

Post-harvest handling process like washing, grading, packing, storing, etc., and including transport to the customer are included in this level:

- i) Design of Pack-House
- ii) Control of Operations
- iii) Maintenance and Sanitation
- iv) Personal Hygiene
- v) Transportation
- vi) Product Information
- vii) Training

In Indian agriculture, post-harvest loss is one of the major problems which needs more attention to reduce the losses. The harvest and post-harvest losses in India during 2006 were estimated to be worth ₹ 92,561 crore, which was almost thrice that year's budget for the agriculture sector. Lack of market information, infrastructure, storage and transportation facilities, inadequate food processing and cold chain facilities lead to significant harvest and post-harvest losses. Addressing

the post-harvest loss problem is very important before the successful implementation of GAPs. Many State and Central government programmes were implemented across the Country to create adequate facilities to reduce the harvest and post-harvest loss. Though the creation of infrastructure facilities to reduce harvest and post-harvest losses is started in India, it needs rapid implementation across the country to tap the full benefits of GAPs.

Basic requirement in GAP

- Site selection - Risk assessment and management plan
- Soil conditions/management - Soil health and nutrition status
- Seeds and propagation material - Purity, health, treatment
- Crop management for cultivation
- Manures and fertilizers - Organic preferred, biofertilizers
- Irrigation - Water quality, drainage
- Weeding and intercultural operations - Biological control
- Crop protection - Preventive, biological control, IPM, dosage, residue analysis
- Harvesting - Maturity determination, devises, containers
- Primary processing - Washing, cleaning, drying and handling, processing area, temperature control, sorting
- Packaging, storage and transport - Packaging material, container, storage
- Identification - Product labelling, traceability
- Personnel and equipment training; Safety and hygiene awareness;

calibrations; equipment cleanliness and placement; safe material equipment

- Workers' health, safety and welfare – Risk assessment of working conditions; safety and hygiene policy; competence; health and safety training; First aid training; and trained person
- Hazards and First Aid – Emergency response procedures, display and communication; warning signs; and protective clothing.
- Waste and pollution management, recycling and re-use
- Environment and conservation – Wildlife, avoid habitat damage, local community; increase in biodiversity.
- Complaints
- Record-keeping and internal self - Assessment/ internal inspection–corrective action
- Traceability
- Visitor's safety

Additional features are:

- Approved sources of hybrid seeds/ propagation material
- Use of GMO, approved by GEAC (Genetic Engineering Appraisal Committee)
- On-farm nursery
- Fertilizer application machinery
- Use of human sewage/sludge is not allowed
- IPM emphasised
- Pest control chemical application equipment
- Handling of empty chemical container

Scope of GAP in India

Pesticide consumption in India is very low (0.6 kg/ha) compared to the global average (2.6 kg/ha) and many agriculturally advanced nations like China, Japan, USA and Brazil (Fig. 3). Similarly, the consumption of inorganic fertilizers in Indian agriculture is low compared to the country like USA, China, etc., and use of organic manures are relatively higher due to large quantity of availability of organic manures. India is the World leader in bovine population and approximately 20% of the World livestock population. Since the consumption of inorganic fertilizers and pesticides are very low

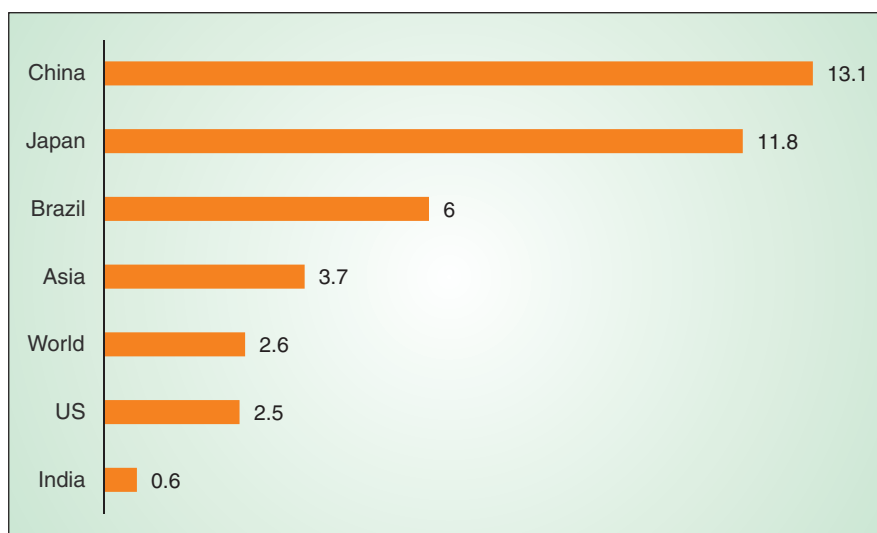


Fig. 3. Pesticide consumption by countries in 2017 (kg/ha).

in India and also there is large scope to reduce this consumption by following appropriate agronomic management practices. GAPs is different from organic agriculture, it does not strictly omit the use of Genetically Modified organisms (GMOs), fertilizers and pesticides in agriculture. GAPs permits the use of fertilizers and pesticides but the usage should be documented properly. Especially the rate, time, source and method of pesticides and fertilizer application. It does not encourage the use of highly toxic chemicals in agriculture.

Indian Good Agricultural Practices (INDGAP)

Indian Good Agricultural Practices (INDGAP) have been formulated to ensure the quality of our farm produce in the International market (Fig. 4). The Codex Alimentarius Commission (CAC) develops and adopts standards, guidelines and related texts on all aspects of food safety and quality reflecting consensus at an international level. Codex standards are reference points for developing and harmonizing national standards. Codex defines GAP in the use of pesticides to include nationally authorized safe uses of pesticides under actual conditions necessary for effective and reliable pest control. Quality Council of India (QCI) conduct voluntary certification scheme for INDGAP projects. INDGAP described certain minimum standards with a well-

defined system of accreditation mechanism and implementation of GAP. These standards are voluntary and non-discriminatory to the growers. INDGAP has different modules for all farms, crops, fruits and vegetables, combinable crops, green tea and coffee. In India, GAP certification is being adopted only in a few crops like mango, grapes, pomegranate, spices and plantation crops. Various institutions, viz. National Horticulture Board, APEDA, Spices Board, and National Medicinal Plants Board encourage certified GAP and offer training on GAP procedures to equip farmers for globalized marketing.

The main components of INDGAP are illustrated in Fig. 4.

Challenges for successful implementation of GAP

- *Fragmented land holding:* The average farm size in India in 2015–16 was 1.08 ha, which was 6% smaller than the average size in 2010-11. The average farm size in India has been decreasing gradually. In India, marginal and small farmers account approximately 80% of the operational landholding. Only 13% of farmers owned land sized bigger than 2 ha. Creating adequate awareness, and educating them to make technically strong to meet this new challenge is an uphill task.
- *Poor socio-economic status:* Majority of the Indian farmers are not in the position to reach export market opportunities due to poor socio-

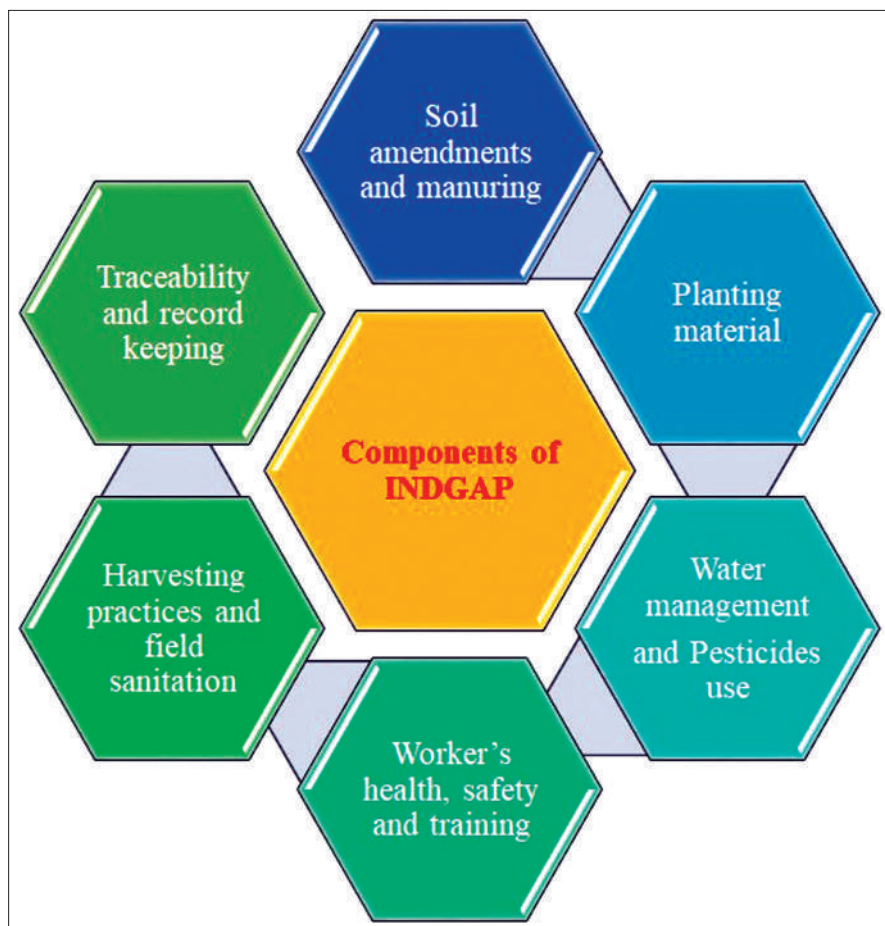


Fig. 4. Components of Indian Good Agricultural Practices

produced under the prescribed sanitary and phyto-sanitary conditions is receiving high preference across the globe. Serving quality food and safeguarding the environment is very important for sustainable development. Adaption of GAPs will ensure food and nutritional security while safeguarding the country's natural resources and environment. It also increases the credibility among the buyers and sellers and returns to the farmers through easy accessibility of the global market. Adoption of GAP will help to promote sustainable agriculture and contributes to meet National and International environment and social development objectives. India has huge potential to practice GAPs due to low consumption of pesticides and fertilizers compared to many agriculturally advanced countries. However, farmers still need support from the government like establishment of infrastructures including roads, cold storage, and certification organization. The process of certification should be transparent, easy and quick. When GAPs are put in practice in true spirit it can be assured that the food will meet quality and safety standards at the time of harvest. However, small scale farmers will not be able to seize export market opportunities unless they are adequately informed, technically prepared and culturally organised to meet this new challenge.

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economic status.

- It may increase the production cost in the beginning due to certification and export process.
- Increased confusion during certification process due to lack of harmonization between existing certification system and new GAP related schemes.
- Non-availability of GAP standards for many major and minor crops.
- Poor organizational setup and multiple responsibilities with a single institution ruin the efficiency of implementation.
- Use quality seeds of biotic and abiotic stress resistance varieties.
- Use pesticides including fertilizers as per approved directions (concentration, frequency, timing of use).
- Use of good quality water for irrigation after quality check.
- Use of appropriate on-farm harvesting, storing and handling techniques.
- Use suitable methods for transportation of produce to food processors/markets.

Some key points for adopting GAP

- Selecting appropriate land for food

crop production.

- Use quality seeds of biotic and abiotic stress resistance varieties.
- Use pesticides including fertilizers as per approved directions (concentration, frequency, timing of use).
- Use of good quality water for irrigation after quality check.
- Use of appropriate on-farm harvesting, storing and handling techniques.
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SUMMARY

Demand for safe and quality food,

Water

Even though households are relatively low consumers of water, population growth and expanded water use have outweighed the effect of water saving technology and behavior.

- Less than 3% of the world's water is fresh (drinkable), of which 2.5% is frozen in the Antarctica, Arctic and glaciers. Humanity must therefore rely on 0.5% for all of man's ecosystem's and fresh water needs.
- Man is polluting water faster than nature can recycle and purify water in rivers and lakes.
- More than 1 billion people still do not have access to fresh water.
- Excessive use of water contributes to the global water stress.
- Water is free from nature but the infrastructure needed to deliver it is expensive.

Courtesy: United Nations Environment Programme website – <http://www.unep.org/wed>