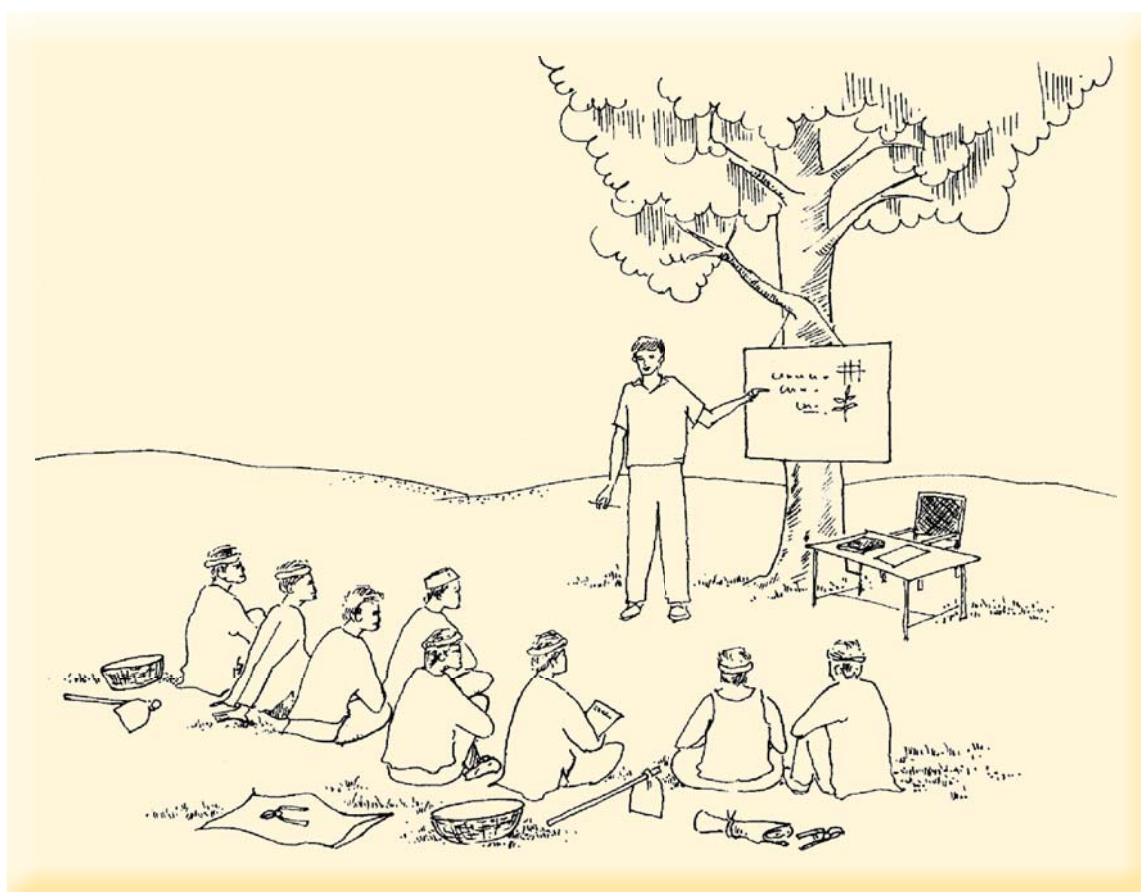


TRAINER'S MANUAL ON GOOD AGRICULTURAL AND COLLECTION PRACTICES (GACP) FOR MEDICINAL PLANTS



Enabling poor rural people
to overcome poverty



Trainer's Manual on Good Agricultural and Collection Practices (GACP) for Medicinal Plants

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PREFACE

Good Agricultural and Collection Practices (GACP) for Medicinal Plants are a set of guidelines for medicinal plant producers on how to improve the safety, efficacy and quality standards of raw materials used in the preparation of herbal medicines. The original guidelines were written in 2003 by the World Health Organisation (WHO) and were intended for a global audience, covering principles that apply to all medicinal plant producers, from tribal collectors in remote forests to hi-tech farmers in industrialised countries. With such a diverse target audience the guidelines inevitably cover topics that are not appropriate for all producers. One of the objectives of the guidelines was therefore to create a basis upon which further country or region-specific standards can be developed that are targeted specifically towards the farmers and collectors of that area.

With this objective in mind in 2009 the National Medicinal Plants Board, in collaboration with the WHO Country Office for India, developed Good Agricultural Practices (GAP) and Good Field Collection Practices (GFCP) guidelines and standards for cultivation and collection of medicinal plants in India. The GACP Trainer's Toolkit is part of an initiative taken by the Food and Agriculture Organization (FAO) in 2010 to develop training material that further simplifies the standards into a format that allows for easier comprehension and adoption by farmers and collectors. This Trainer's Manual provides instructions on how to use each of the training tools in the GACP Trainer's Toolkit.

The GACP Trainer's Toolkit has been developed by FAO in collaboration with the Directorate of Medicinal and Aromatic Plants Research of Indian Council of Agricultural Research under the IFAD funded project "Organic Production of Underutilized Medicinal, Aromatic and Natural Dye Plants Programme for Sustainable Livelihoods in South Asia (GCP/RAS/208/IFA)".

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PART 1: AN OVERVIEW

1.1 What is GACP?

Good Agricultural and Collection Practices for Medicinal Plants (or GACP for short) are a set of guidelines developed in 2003 by the World Health Organisation (WHO), aimed at improving the quality of medicinal plant material being used in herbal medicines in the market.

The main objectives of the GACP guidelines, as stated by the WHO, are as follows:

- To contribute to the quality assurance of medicinal plant materials used as the source for herbal medicines to improve the quality, safety and efficacy of finished herbal products;
- To guide the formulation of national and/or regional GACP guidelines and GACP monographs for medicinal plants and related standard operating procedures; and
- To encourage and support the sustainable cultivation and collection of medicinal plants of good quality in ways that respect and support the conservation of medicinal plants and the environment in general.

This GACP Trainer's Toolkit aims to translate WHO's guidelines into simple training tools for medicinal plant farmers and collectors, thereby making it easier to implement GACP at the grassroots level.

1.2 Why is GACP Training Required?

In very simple terms *Good* Agricultural and Collection Practices for Medicinal Plants have been developed because of the growing concern of the amount of medicinal plant material being produced using *Bad* Agricultural and Collection Practices.

In recent decades there have been a number of widely publicised cases of consumers suffering adverse health effects caused by poor quality herbal medicines. In many of these cases the cause of the problems has been linked to the quality of the raw materials used to make the medicines.

The growing demand for herbal products has also led to over-harvesting from the wild, causing concern over the long-term environmental impact and availability of certain medicinal plant species if they are not collected in a responsible manner.

As a result of these concerns the herbal industry has come under increasing pressure to provide consumers with assurance that herbal products in the market are safe to use and do not have a negative impact on the environment. Some countries have responded to this pressure by creating new laws, requiring herbal manufacturers to adhere to stricter regulations, both in the manufacture of medicines as well as in the sourcing of raw materials.

The call for greater quality assurance has highlighted the need to improve the quality standards of the medicinal plant growers, collectors and processors. It is in this context that the WHO developed the GACP guidelines, aiming to address quality issues in the initial stages of the supply chain. WHO did acknowledge, however, that the guidelines were only the first step in achieving this aim and that they would need to be further adapted to meet the specific requirements of different countries and regions. They also acknowledged that widespread training would need to be given to farmers, collectors and processors if the guidelines are to make an impact.

Following the publication of WHO's GACP guidelines several countries and regions, including China and the European Union, developed their own GACP standards and guidelines. In 2009 the National Medicinal Plants Board of India (NMPB) followed suit and developed a set of standards known as Good Agricultural Practices (GAPs) and Good Field Collection Practices (GFCPs) for medicinal plants. The training material in this GACP Trainer's Toolkit is based primarily on the guidelines developed for India by the NMPB.

Despite various minor differences in the regional guidelines the underlying principles of GACP are more or less the same wherever the medicinal plants are being produced. The key concerns that are addressed by the guidelines are as follows:

Hygiene and Cleanliness

Many manufacturers of herbal medicines test medicinal plant material in a laboratory before buying them; if they are found to contain more than the permitted levels of bacteria and fungi they will be rejected. It is alarmingly common for medicinal plant materials to be contaminated with microbes such *Escherichia coli* (E-coli) or Salmonella, the cause of which is usually due to basic lack of hygiene and cleanliness during harvest and primary processing. Preventing microbial contamination through improved hygiene and cleanliness is therefore a central theme throughout the GACP guidelines.

Prevention of Contamination

Medicinal plant material can come into contact with many sources of contamination during its journey from field to shelf. Of particular concern are the risks of contamination with heavy metals, pesticides and other chemicals. If any of these contaminants find their way into herbal medicine products they can cause serious adverse health effects to the consumer.

Identification

There have been a number of cases in recent years in which incorrect plant species have been used in herbal medicines, leading to adverse health effects to the consumer. GACP places emphasis on ensuring that medicinal plants are correctly identified and that systems are in place to provide buyers with assurance that they are buying the correct species.

Efficacy

If medicinal plants are not cultivated in a suitable environment, if they are harvested at the wrong time of year or if they are processed incorrectly, then the active ingredients of the medicinal plant material is likely to be less, leading to the manufacture of ineffective herbal medicines. GACP guidelines explore the main principles that should be followed by farmers and collectors to ensure that they are producing medicinal plant materials with maximum levels of active ingredients.

Production and Income

'Bad' Agricultural and Collection Practices not only affect the end quality of the herbal medicines, they can also reduce the production and income of the farmers and collectors. GACP aims to provide guidance on how to optimise both the quality and production of medicinal plant material as well as to maximise income for the farmers and collectors.

Sustainability

Increasing numbers of medicinal plant species are becoming threatened or endangered due to unsustainable collection methods in the wild. One of the key themes of the GACP guidelines is to ensure that medicinal plants are collected in a manner that allows the plants to regenerate year after year. In this way the long-term availability of the plant species will be ensured, the medicinal plant collectors will have a regular source of income and the herbal industry will have a long-term supply of medicinal plant materials for manufacturing herbal medicines.

Documentation and Traceability

If medicinal plant growers and collectors do not keep records of their activities it is impossible to trace the medicinal plant material back to its origin. Traceability is an essential part of GACP; it means that problems

can be traced back to where they occurred and measures can be taken to prevent it from happening again. Traceability is made possible by documentation, and therefore documentation is a recurring theme throughout the GACP guidelines.

Social and Legal Concerns

The large majority of medicinal plants are still collected from the wild. This means that the plants are usually collected from land that is either owned by the local community or by the government (or a combination of the two) and is subject to a variety of local, national and international rules and regulations. With increasing competition for limited resources the medicinal plants in these collection areas are coming under growing pressure. The GACP guidelines stress the importance of adhering to both the traditional collection rules as well as the relevant government laws so common resources can be managed in a sustainable manner and the medicinal plants continue to be available for the local communities to collect for their own household use.

1.3 What is Included in the GACP Trainer's Toolkit?

The GACP Trainer's Toolkit contains a set of 'training tools' designed to help individuals, organisations and companies give training to farmers and collectors involved in cultivation, wild collection and primary processing of medicinal plants on how to implement GACP.

In summary, the GACP Trainer's Toolkit includes the following:

Trainer's Manual

The trainer's manual (which you are reading now) provides an overview of all the training tools and gives instructions to trainers on how to conduct training workshops with medicinal plant farmers and collectors.

DVD containing the GACP Training Video

The DVD contains a 35-minute Training Video that presents all the key principles of GACP.

CD containing the Illustrated Cause-Effect Training Tool

The CD contains the Illustrated Cause-Effect Training Tool, which is an interactive presentation with over 150 illustrations of correct and incorrect medicinal plant production practices.

Illustrated Booklet

The illustrated GACP Booklet is a 44 page booklet with a list of GACP 'dos' and 'do-nots' for medicinal plant farmers and collectors.

Each of these components is examined in more detail in Part 2 of this manual.

1.4 Who are the GACP Training Tools For?

The GACP Trainer's Toolkit has been developed for giving training to anyone involved in cultivation, wild collection and/or primary processing of medicinal plants in the Indian Subcontinent. The training may be given by representatives of Government institutions, NGOs, private companies or by lead farmers or collectors or anyone else involved in medicinal plant production and capable of learning how to use the training tools.

The GACP Trainer's Toolkit has been developed within the context of medicinal production in the Indian Subcontinent. This is evident in the examples used in the GACP Training Video, all of which are filmed in rural India and may not always be appropriate in other parts of the world. However, the underlying principles of the training material are applicable to all medicinal plant producers and can therefore be of use in training farmers and collectors in other countries and regions as well.

The original GACP guidelines developed by WHO contain instructions on relatively sophisticated processing facilities. Some of these guidelines have been omitted from this training material, as they were deemed not required for the target audience. Instead the training material focuses on activities carried out directly by farmers

and collectors, including cultivation, wild collection and on-farm primary processing up until the point of selling the raw material.

Although the GACP training material only covers production up until the point of selling the raw material, the buyers of medicinal plant material and manufacturers of herbal medicines also need to learn about the principles of GACP. There are many elements of GACP that can be implemented by farmers and collectors without any additional cost, yet to significantly improve the quality of medicinal plant material some investment may be required, especially to improve post-harvest processing facilities such as for drying and storage. The farmers and collectors may therefore be unwilling or unable to bear these costs unless these additional costs are reflected in the price offered by the buyer. The buyers and manufacturers of herbal medicines therefore share the responsibility of implementing GACP and should also be involved in GACP training sessions.

1.5 Scope for Further Development of the GACP Training Material

GACP in the context of low-income communities in the developing world is a subject still in its infancy. The theory and principles of GACP are well established; however the means of implementing them in a wide variety of environments, especially those with very limited resources, is still being explored. This GACP Trainer's Toolkit is perhaps a first of its kind and may not contain all the answers to the grassroot level challenges. It is hoped that, with the feedback and suggestions from different stakeholders, further improvements to the GACP training material will be continue to be made.

PART 2: USING THE TRAINING MATERIAL

2.1 An Overview of the GACP Trainer's Toolkit

The GACP training tools have been designed to allow the trainer as much flexibility as possible to meet the diverse training requirements of different medicinal plant producers. The guidelines in this chapter provide suggestions on how the training tools may be used, but ultimately it is up to the trainer to assess the situation and use the tools as he/she feels most appropriate at the time.

The main training tools developed as part of this trainer's toolkit are as follows:

The GACP Training Video

The GACP Training Video presents the key principles of GACP, providing examples of how these principles can be implemented with different medicinal plant species in a variety of different locations.

Participatory Exercise 1: Product Flow Charts

The product flow chart exercise shifts the focus from the underlying principles of GACP to the actual cultivation, collection and processing methods of the training participants. This exercise helps them visualise the 'product flow' of the medicinal plants they are working with and prepares them for subsequent exercises.

The Illustrated Cause-Effect Training Tool

The Cause-Effect Training Tool uses illustrations to present a wide range of possible 'correct' and 'incorrect' practices at each stage of the product flow and their cause-effect relations. Having explored *what* the GACP guidelines are in the video, this exercise examines *why* they are important. The Illustrated Cause-Effect Training Tool is designed to be opened in any web-browser (without needing to connect to the Internet).

Participatory Exercise 2: GACP Risks and Preventative Measures

The purpose of this exercise is to assess the potential 'GACP Risks' and plan corresponding 'preventative measures' at each stage of the product flow chart developed by the participants in the first participatory exercise. The results of this exercise provide an important 'GACP action plan' for the medicinal plant species they are working with.

The Illustrated Booklet

The illustrated booklet contains an overview of the GACP guidelines in a form that the participants can take home with them. It can also be used as an alternative training tool for individuals and small groups when there is no access to a computer or LCD projector for using the Illustrated Cause-Effect Training Tool.

It is recommended to use a combination of different training tools to cover each topic. For example, rather than watching the entire video, then moving on to the product flow exercise and so on, it is usually more effective to show the cultivation chapter of the video, followed by the cultivation product flow chart, the cultivation section of the cause-effect training tool and so on. This helps to retain the interest of the participants on the subject besides offering a greater variety of approaches to the trainer while dealing with each topic.

2.2 Planning the GACP Training Session

The structure and content of the training depends on a number of factors, all of which need to be planned in advance. A summary of the main factors to be considered is described below:

Pre-Training Preparation

The trainer must be well prepared before giving any training. Firstly he/she should have read the guidelines in this GACP Trainer's Manual and be familiar with each of the training tools. The trainer should then gather information on the participants and the medicinal plant species they are working with. If the species are unknown to the trainer then he/she should do some research before the training to improve his/her knowledge.

The Training Resources and Facilities

The GACP Training Video and the Illustrated Cause-Effect training tool both require a computer to operate (or a television and DVD player for the film). Efforts should therefore be made in advance to obtain these facilities. If the training session is for a large group then ideally a laptop should be used along with an LCD projector. If these facilities are not available, or if there is a power failure or any other such technical problem, then the trainer should be prepared with the other training exercises that do not require electricity, as described in sections 2.5 and 2.7.

The Duration of the Training

Depending on how much time the trainers and trainees have available, the training session may be given in a one-hour session or it may be organised over a full day or more. The training programme will need to be prepared accordingly. If there is only limited time available then the training video and the cause-effect training tool can be used, focusing on the chapters that are most relevant to the target audience. For example, if all the participants are involved in wild collection then there is no need to show them the cultivation chapter of the video and cause-effect training tool. If the participants are available for a longer period then the training material presented here can be backed up with practical demonstrations in the field such as different propagation methods, constructing a drying system etc.

Trainees and Size of the Group

The training format will depend on who is being trained and how many people are in the group. If there is a small group then it may be enough to take a laptop into the field, show the film and the cause-effect training tool and work on solutions to specific issues. If there is a larger group with mixed interests then a greater amount of planning will be required to address everybody's needs and ensure that everyone finds a way to actively participate. Where possible it is recommended to keep the group as homogenous as possible; it will be much easier and more productive to work with a group of farmers and collectors who are all involved in the same activities. This is particularly relevant for the flow chart exercises that examine the production methods of a particular species in more detail.

2.3 Introducing the Training

The first step in any GACP training programme should be for the trainer to introduce the subject and to learn more about the needs and interests of the participants. This should be an informal exercise and does not require any fixed structure. What is important is that the initial discussions provide the trainer with a clearer idea of the areas of the training session on which the participants wish, or need, to focus on.

The trainer should confirm which medicinal plant species the participants are working with and how many of them are involved with cultivation, wild collection and/or post-harvest processing. It is not necessary to find out every detail at this stage; there will be plenty of opportunities for to further analyse the needs of the trainees while conducting the training exercises.

2.4 GACP Training Video

Overview / Summary

The Training Video introduces the participants to the principles of GACP and provides examples of how they can be put into practice. The film is comprised of the following eight chapters:

Table 1: The GACP Training Video – a summary of each chapter

1.	Introduction <i>2 minutes 12 seconds</i>	An overview and brief background of the GACP guidelines.
2.	Hygiene and Cleanliness <i>1 minute 32 seconds</i>	An overview of the risks of microbial contamination and how maintaining a high standard of hygiene and cleanliness can prevent or minimise these risks.
3.	Correct identification <i>1 minute 16 seconds</i>	Simple guidelines on what to do if there is any confusion regarding the identification of a medicinal plant species
4.	Cultivation <i>9 minutes</i>	An exploration of the main principles of Good Agricultural Practices, from propagation through to harvest, with emphasis on how to maximise yield and medicinal properties and avoid any potential source of contamination.
5.	Wild collection <i>7 minutes 42 seconds</i>	An exploration of the main principles of Good Collection Practices, focusing on how to harvest medicinal plants in a sustainable manner, maximise medicinal properties and minimise risks of contamination.
6.	Primary Processing <i>8 minutes 10 seconds</i>	An exploration of the underlying principles and some of the different methods of sorting, washing, drying and packing medicinal plant material.
7.	Storage and Transportation <i>1 minute 40 seconds</i>	The main principles of storage and transportation, exploring how to prevent damage to the medicinal plant material through damp, contamination or insects.
8.	Conclusion <i>2 minutes 48 seconds</i>	An overview of the journey of the medicinal plant material after it leaves the farm gate, followed by a review of the main points illustrated during the film.

Learning Objectives

Having watched the film the participants should:

- a) have a clear understanding of the GACP guidelines
- b) have an understanding of how GACP principles are put into practice in different situations

Time Required

The duration of the whole film is 35 minutes, however in most cases it is recommended to watch it chapter by chapter and to combine each topic with the other relevant training tools. The duration of each chapter is written in the table above. The total time required to cover each topic varies depending on how the training tools are used. Generally speaking though, at least 1½ - 2 hours should be planned for each topic if all the training tools are to be used.

Materials Required

- Laptop / Desktop computer with DVD drive *or* a television with a DVD player
- LCD Projector if available (strongly recommended for large groups)

Methodology

There is no set way to use the film; it can be watched all at once or it can be split into different chapters (the starting DVD menu gives the option to watch select specific chapters). The film contains a lot of information condensed into a relatively short timeframe. At times it may be useful to pause the film for the participants to absorb certain points and discuss them in more detail. In some cases, especially if the film is being translated

into another language, it can be started and stopped at regular intervals to discuss each point. Some trainers may prefer to play each chapter without interruption and to discuss the topic in more detail after it has finished.

While discussing each topic the trainer should try to relate the principles that are presented in the film to the experience and situation of the participants. For example, in the cultivation chapter it states that the land should be away from any potential sources of contamination; the trainer can then facilitate a discussion on what may be the potential sources of contamination around the participants' farms. In this way each key point shown in the film can be the basis of an interesting discussion amongst the participants.

2.5 Participatory Training Exercise 1: Product Flow Chart

Overview / Summary

To implement GACP the farmers and collectors must learn to *prevent* problems from happening before they occur. For example, if medicinal plants are packed in a contaminated sack it becomes extremely difficult to 'decontaminate'. If, on the other hand, the risk of contamination is anticipated in advance then measures can easily be taken to clean the sack or replace it with a new one. To be able to foresee potential GACP risks the farmer or collector needs to be able to visualise the 'product flow' of the medicinal plant species they are growing, collecting or processing and recognise which factors may negatively affect the appearance, efficacy, safety and sustainability of the final product. This exercise introduces the participants to the concept of a product flow chart – a visual map of each stage of the medicinal plant's journey from beginning to end. This prepares the participants for subsequent exercises that explore potential risks and preventative measures in more detail.

Learning Objectives

Having completed the Product Flow Chart exercises the participants should have:

- a) Learned how to develop a product flow chart
- b) Developed (either on their own or in a group) a flow chart for at least one of the medicinal plant species they are working with

Time Required

The time taken to complete each product flow chart exercise depends on whether the topic is cultivation, wild collection or post-harvest processing. The flow charts for cultivation and post-harvest processing usually take longer than wild collection. A cultivation flow chart, for example, is likely to include details of propagation methods, spacing, irrigation, weeding and so on, all of which take much more time to cover than the relatively simple steps for wild collection. To complete a detailed flow chart for cultivation with the full participation of the group can take as long as 45 minutes to one hour.

Materials Required

- Flip Chart or White Boards
- Notepads and pencils for each participant (optional)

Methodology

The exercise should begin with a short presentation by the trainer to give an example of a simple product flow so that the participants understand how to prepare a flow chart of their own.

Depending on whether the whole group is involved in the same activities or whether there is a mixture of farmers and collectors they can either work together on single flow chart or they can be split up into different groups. If they are split up then each group requires a facilitator who should be well prepared prior to starting the exercise.

The first step of this exercise is to prepare the table for a product flow chart (see Table 2). The table should have four columns; the first two columns ('stage of product flow' and 'current methods') are to be used in this

exercise, the third and fourth columns will be used in the second exercise and should be kept blank for now (see section 2.7 for more details). Provide plenty of space for writing in each column and ensure that there is enough space for the required number of rows.

Table 2: The Layout of a Product Flow Chart Table

NAME OF MEDICINAL PLANT SPECIES:

Stage of Product Flow	Current Methods	KEEP BLANK FOR NOW	KEEP BLANK FOR NOW

The trainer may either wish to leave the table blank and request the participants to fill it in themselves, or he/she may prefer to start by adding the key stages of the product flow to give them a helping hand. The latter is a good option if there is limited time. In some cases the trainer may wish to focus on selected stages of the product flow that are of most concern. For example, in post-harvest processing *washing, drying and storage* are stages of production that often involve the highest risks. If time is limited then it may be more productive to focus on key issues such as these rather than trying to cover all the topics in less detail.

The participants should be given an opportunity to decide which medicinal plant species they wish to explore in the product flow chart. The plant species proposed by them could be one that they are all working with, or it may be a species that some of the group are working with and others are planning to take up. Ideally it should be a medicinal plant species that the trainer or facilitator is also familiar with.

The table 3 below contains a simple example of a product flow chart for post-harvest processing of a medicinal plant species harvested for its roots.

Table 3: The Contents of a Product Flow Chart

NAME OF MEDICINAL PLANT SPECIES: Example Species

Stage of Product Flow	Methods used	KEEP BLANK FOR NOW	KEEP BLANK FOR NOW
Transportation	Sack carried for 3km to road, then transported on the roof of the bus		
Sorting	Substandard or damaged roots removed		
Drying	Cleaned roots laid out on tarpaulin to dry in the sun		
Packing	Dried roots packed in clean jute sacks		
Storage	Sacks stored in tool shed of collector’s house		

During this exercise the trainer should take note of any obvious areas of concern (i.e. incorrect practices). At this point however there is no need to discuss with the group whether the practices are correct or incorrect – these can be explored in more detail in the next exercises.

2.6 Illustrated Cause-Effect Training Tool

Summary

The GACP guidelines generally provide guidance on **‘what’** to do. The Illustrated Cause-Effect Training Tool answers the question of **‘why’**. For example, the guidelines say ‘wash your hands before handling herbs’, the Illustrated Cause-Effect Training Tool explores *why* it is necessary to wash hands by exploring the effects of *not* washing hands before handling herbs.

The Illustrated Cause-Effect Training Tool is designed in HTML and can be opened in any web browser and operated just like a website. It is designed to be used offline however and does not require an Internet connection. The site is divided into two main sections: *Cause* and *Effect*. The *Cause* section explores the causes of common GACP violations through illustrations of incorrect practices and their effects, as well as the corresponding correct practices. The *Effect* section presents possible end-results of incorrect practices and explores the different possible causes.

For example, the illustration below (Figure 1) shows a collector harvesting bark from a tree in an unsustainable manner; this is one of the incorrect practices in the *Cause* section. The navigation arrows can be used to explore the effect of this practice and the corresponding correct practice.

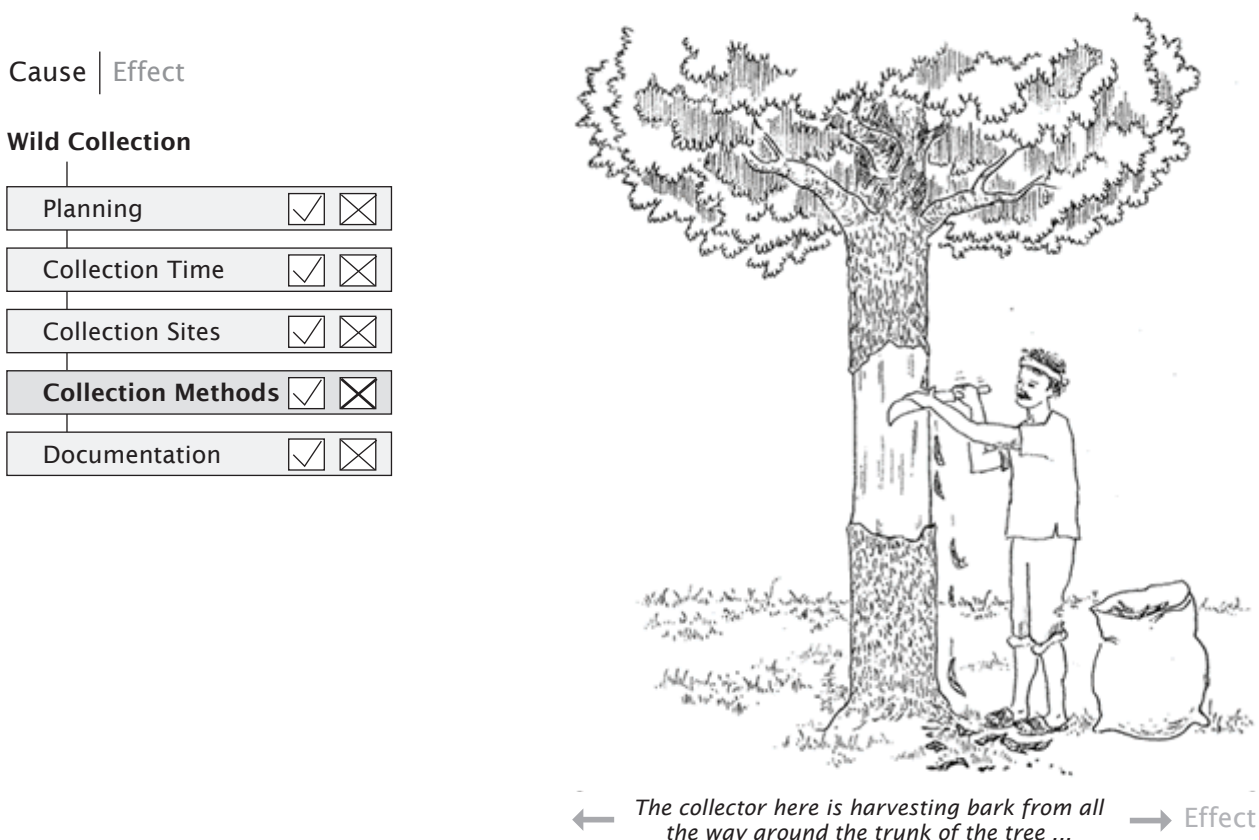


Figure 1: An Incorrect Wild Collection Method in the *Cause* Section of the *Cause-Effect* Training Tool

Learning Objectives

Having explored the Cause-Effect Illustrated Training Tool the participants should:

- Understand the context of *why* GACP guidelines were developed
- Be more aware of common GACP violations, and therefore able to anticipate them more easily
- Have a clearer understanding of the effects of GACP violations, and therefore *why* they need to be avoided

Time Required

The time required to complete this exercises depends on the trainer. It may only be used to illustrate a few specific points or it may be used as the basis of a long discussion that could last for many hours. The flexibility of the training tool allows the trainer to adjust the duration spent on it according to the available time remaining in the training session.

Materials Required

- Laptop
- LCD projector (strongly recommended for large groups)

How to open and view the site

The Training Tool files are located in the CD in a folder named 'GACP Cause-Effect Training Tool'. To open the starting page double-click on 'enter.html' and it will automatically open in the computers default browser. For the best effect open the 'view' menu and hide the toolbar, bookmarks bar, status bar and anything else that is not required on the screen.

Methodology

Cause Section

The *Cause* section is based on three product flow charts; cultivation, wild collection and post-harvest processing as shown in the image below (Figure 2).

Cause | Effect

Cultivation

Site Selection	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Land Preparation	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sowing/Planting	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Irrigation	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Crop Management	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Harvest	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Documentation	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Wild Collection

Planning	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Collection Time	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Collection Sites	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Collection Methods	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Documentation	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Post Harvest Processing

Transportation	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Processing site	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Primary Sorting	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Washing	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Drying	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sorting/Grading	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Packing	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Storage	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Documentation	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Figure 2: The Main Menu of the *Cause* Section of the *Cause-Effect* Training Tool

Clicking on any of the ticks (correct practices) or crosses (incorrect practices) opens its associated menu as in the example of 'incorrect washing practices' shown below (Figure 3).

Cause | Effect

Post Harvesting Processing

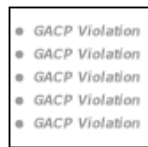
- Transportation
- Processing site
- Primary Sorting
- Washing**
- Drying
- Sorting/Grading
- Packing
- Storage
- Documentation



Washing herbs alongside clothes washing



Herbs placed on ground after washing



Other common 'washing' GACP violations (without illustrations)

Figure 3: The Menu Page for 'Incorrect Washing Practices' in the Cause Section

From this page any of the thumbnail images can be clicked to open that particular scenario. If, for example, the image next to 'herbs placed on ground after washing' is clicked on, then the full-size illustration will appear, as shown in the following image (Figure 4).

Cause | Effect

Post Harvesting Processing

- Transportation
- Processing site
- Primary Sorting
- Washing**
- Drying
- Sorting/Grading
- Packing
- Storage
- Documentation



← The farmer places the washed herbs directly on the ground ... → Effect

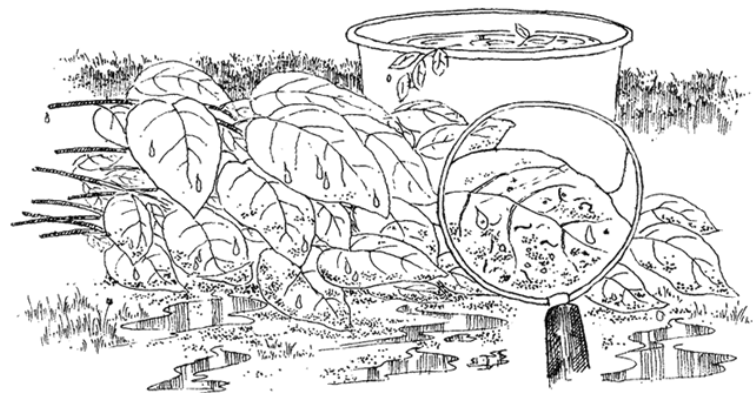
Figure 4: An Incorrect Washing Practice in the Cause Section

At this point the trainer should ask the participants to suggest why this is an incorrect practice... what is the violation in question? And what are the effects of this violation? Once someone has given a correct answer, or the trainer chooses to give a clue, the 'effect' navigation arrow can be clicked to go to the next page, as illustrated below (Figure 5).

Cause | Effect

Post Harvesting Processing

Transportation	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Processing site	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Primary Sorting	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Washing	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Drying	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sorting/Grading	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Packing	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Storage	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Documentation	<input checked="" type="checkbox"/>	<input type="checkbox"/>



Cause ← *The wet plants pick up pieces of dirt from the floor ...* → Effect

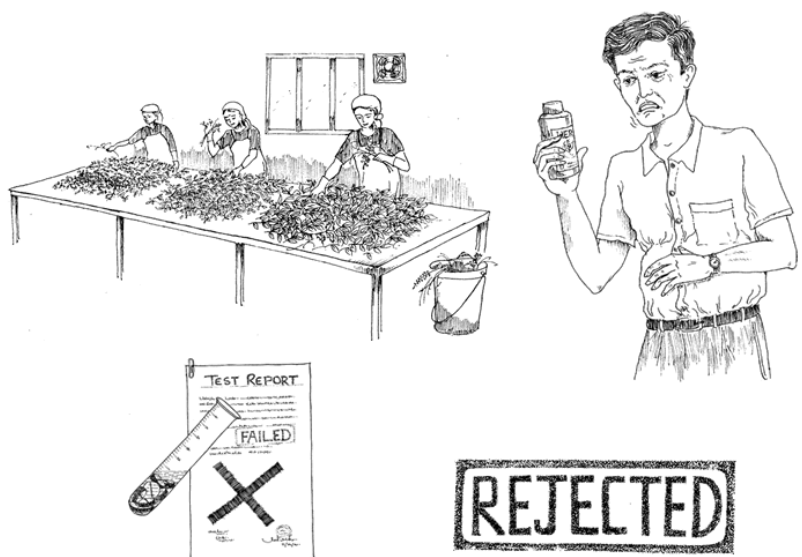
Figure 5: The *Effect* of Placing Washed Herbs Directly on the Ground

In this way the trainer can encourage everyone in the group to actively participate in explaining each of the illustrations and their potential effects. Clicking on the effect navigation arrow again reveals a number of possible 'end results', which in this case include extra labour (to remove or clean dirty plant material), possible adverse health effects to the consumer, failed test reports and rejected material (Figure 6).

Cause | Effect

Post Harvesting Processing

Transportation	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Processing site	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Primary Sorting	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Washing	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Drying	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sorting/Grading	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Packing	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Storage	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Documentation	<input checked="" type="checkbox"/>	<input type="checkbox"/>



Cause ← *Extra work and investment is required to clean the plant material before processing. If all the contaminants are not removed it may cause harm to the consumer. There are chances it will fail quality tests and may be rejected by the buyer*

Click for Correct Practice

Figure 6: The 'End Results' of Placing Washed Herbs Directly on the Ground

On each of the 'end results' page is a link to see the corresponding 'correct practice' (see the grey box on the bottom right of the images). In this example clicking on this link leads to an illustration of a farmer placing the washed herbs on some netting for the excess water to drain off before being placed in a dryer (Figure 7).

Cause | Effect

Post Harvesting Processing

Transportation	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Processing site	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Primary Sorting	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Washing	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Drying	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sorting/Grading	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Packing	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Storage	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Documentation	<input checked="" type="checkbox"/>	<input type="checkbox"/>



← After washing the herbs they should be placed on a clean container and excess water should be removed before the plants are put in a dryer →

Figure 7: A Correct Washing Practice in the Cause Section of the Cause-Effect Training Tool

Effect Section

The Effect section explores the same causal relationships but from the perspective of the end result of different GACP violations. The main Effect menu, as shown below, consists of different end-results, which can be traced back to assess their different potential causes (Figure 8).

Cause | Effect

Yield/Profit

Low yield/Little Profit
Low Market Value
Extra Work/Investment
Crop Failure

Community

Resistance from community

Law/Regulations

Fines/conviction

Safety

Chemical Contamination
Microbial Contamination
Heavy Metal Contamination
Risk of Consumer Sickness

Quality

Low Active Ingredients
Rejected by Buyer
Low Essential Oil

Sustainability

Environmental Degradation
Species Extinction

Traceability

No Traceability

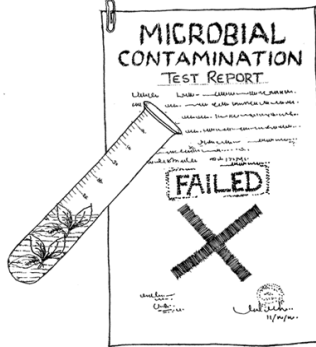
Figure 8: The Main Menu of the Effect Section of the Cause-Effect Training Tool

If, for example, the 'Microbial Contamination' link in the 'Safety' category is clicked on, the generic image used for microbial contamination appears (see Figure 9). The possible causes of this can then be explored by clicking on any of the three links at the bottom (cultivation causes, wild collection causes or post-harvest processing causes).

Cause | Effect

Safety

- Chemical Contamination
- Microbial Contamination**
- Heavy metal Contamination
- Risk of Consumer Sickness



Microbial contamination, What could be the causes of this?

Cultivation Causes *Wild Collection Causes* *Post Harvest Processing Causes*

Figure 9: The Generic Image for Microbial Contamination in the *Effect* Section

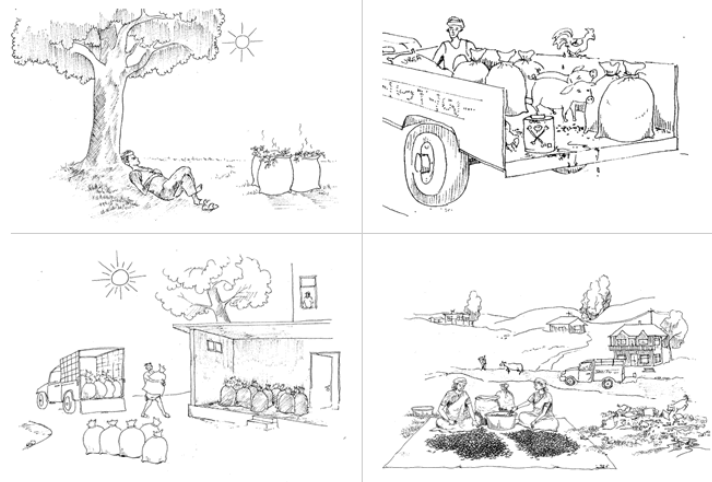
Before clicking on any of these links the topic can be discussed amongst the participants... What are the likely causes of microbial contamination? What were some of the examples discussed by the group in the *cause* section? This is a good way to assess how much of the training is being absorbed by the participants and helps them to start seeing the causal relationships more clearly.

Clicking on the 'Post-Harvest Processing Causes' link opens up a montage of the relevant illustrations from the *cause* section of the site (as in Figure 10 below). Any of the four illustrations can be clicked on to explore the possible causes of microbial contamination in more detail. For example, clicking on the contaminated tractor will open up the corresponding page of the *Cause* section, from where the effects of the incorrect practice can be explored. In this way the *Cause-Effect* relationship of each GACP violation can be clearly illustrated to the participants of the training.

Cause | Effect

Safety

- Chemical Contamination
- Microbial Contamination**
- Heavy metal Contamination
- Risk of Consumer Sickness



Some of the possible incorrect processing practices that may cause microbial contamination ... → Next
(Click on image for more details)

Figure 10: Some of the Possible Causes of Microbial Contamination During Post-Harvest Processing

With a wide range of different incorrect and correct practices to explore, the Illustrated Cause-Effect Training Tool is designed to be as flexible as possible. In this way the trainer can concentrate on the areas of GACP that he/she thinks will be of most use to the participants.

The illustrations in this training tool provide many generic examples to help illustrate common GACP issues. Where possible the trainer should add to this by relating the GACP issues to local examples that the participants are familiar with. For example, in the cultivation section one of the GACP violations is ‘incorrect spacing between plant to plant and row to row’; this may affect the root size of the plant, cause it to flower early or affect the medicinal properties. If the trainer can relate these principles to plant species that are well-known to the participants then it will help them grasp the concept more quickly and thoroughly.

2.7 Participatory Training Exercise 2: Risk Assessment and Prevention

Overview / Summary

This exercise is a continuation of the ‘product flow chart’ exercise described in section 2.5. The purpose of this exercise is to fill in the final two columns of the flow charts; ‘potential risks’ and ‘preventative measures’. In this context a ‘potential risk’ refers to any potential ‘violation of the GACP guidelines’, a concept that the participants should now understand having seen examples of incorrect practices in the Illustrated Cause-Effect Training Tool.

Filling in these final two columns will help the participants to relate the GACP principles presented in the film and cause-effect training site to their own situation, thereby providing them with an action plan to take home with them.

Learning Objectives

Having filled in the final two columns of the product flow charts that were prepared in the first participatory exercise (as described in section 2.5) the participants should have:

- a) A clearer understanding of the potential risks involved at each stage of growing, collecting or processing the medicinal plants they are working with
- b) Developed a list of preventative measures which can be used as a GACP action plan.

Time Required

The time required to complete this exercise depends on how many different stages of the product flow are being explored and how many issues there are in the participants’ current production methods. This is a vital exercise though and it is extremely important that sufficient time is left to complete the final column.

Methodology

Returning to the flow charts developed in the previous group exercise, the headings of the final two columns can now be filled in, as shown in the example below (Table 4).

Table 4: Potential Risks and Preventative Measures at each Stage of the Product Flow

NAME OF MEDICINAL PLANT SPECIES: Example Species

Stage of Product Flow	Methods used	Potential Risks / GACP Violations	Preventative Measures
Transportation	Sack carried for 3km to road, then transported on the roof of the bus	Risk of damage to herbs caused by sunlight, dust or rainfall during journey	Tie the herbs down with a tarpaulin to protect against sun, dust or rain
Sorting	Substandard or damaged roots removed	Risk of contamination from unhygienic processing site?	Ensure the processing site is in a clean location
Drying	Cleaned roots laid out on tarpaulin to dry in the sun	Risk of animals and birds walking on the herbs?	Raise the herbs off the ground on racks
Packing	Dried roots packed in clean jute sacks	Risk of contamination if the sacks have been used before	Clean the sacks before use
Storage	Sacks stored in tool shed of collector’s house	Risk of damage caused by damp or insects in storage	Raise the herbs off the ground and set humane rat rodent traps

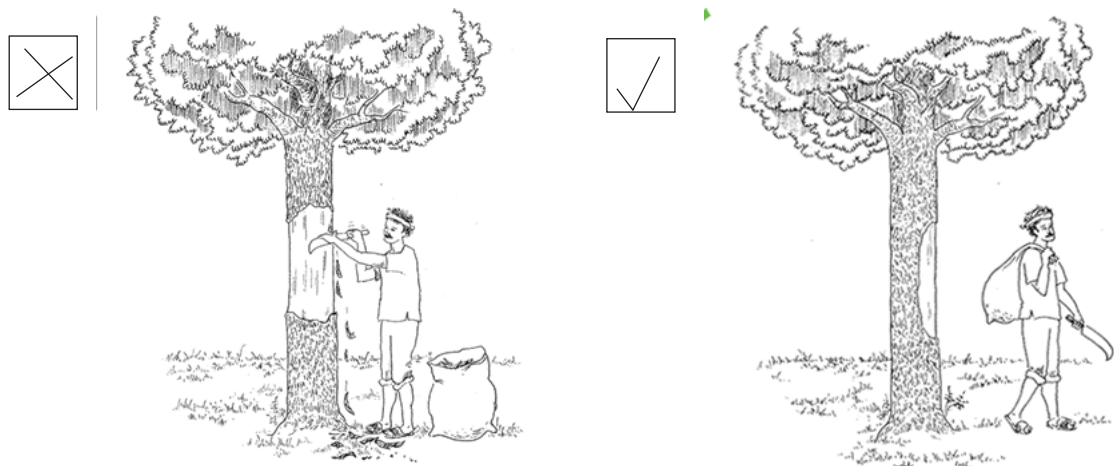
During this exercise the trainer's role as a facilitator is extremely important. If the participants have missed out any important stages in the product flow, this should be brought to their attention and the product flow chart modified accordingly. The trainer should question the participants on the methods they use and explore all the variables that may affect the quality of the medicinal plant material, the sustainability of the collection method, the traceability of the end product, and so on.

As the participants analyse the potential risks and preventative measures some practical issues are likely to arise. For example, there may be a risk of contamination in storage but the collector has no other option and no resources to invest in improved storage conditions. Issues such as this should be presented to the group for them to discuss the best solution. In many cases, especially in rural areas where individuals have limited resources, the solution must come from the group; in this case, for example, they may decide on working together to convert a community-owned building into a storage facility for all the collectors to use.

In some cases it may be that certain farmers are experiencing problems which other farmers have already found solutions for. When this is the case then this can be a very useful exercise for the participants to exchange their knowledge.

2.8 Illustrated GACP Booklet

The Illustrated GACP booklet provides an overview of both good and bad agricultural and collection practices as presented in the GACP training video and the cause-effect illustrated training site. This is done through a list of DOs and DONTs in simple bullet-point form along with selected illustrations.



These booklets can be distributed to the participants at the end of the training session, for them to take it home for future reference. It may also serve as a useful training tool for the trainers to use in situations where the possibility of using other training tools is remote; or for the farmers/collectors if they wish to train their fellow farmers/collectors, family members or labourers on the farm.

2.9 Concluding the Training Session

Where possible time should be allocated for questions and discussion at the end of the training session. It is always good to receive feedback from the participants... what have they learnt that they will immediately implement in their own medicinal plant production systems? What have they learnt that they feel is too difficult to implement in their own medicinal plant production systems? If there is something they feel is not possible, why is it not possible? What is needed to make it possible?

When invited to address their concerns it is common for the participants to bring up the issue of the additional cost of implementing GACP. For example, some of the examples shown in the GACP Training Video require investment that may not be possible for the poorer farmers or collectors to make. Yet there are also many examples of how simple GACP principles can be implemented at no extra cost at all. It is important that the final message that the participants take away with them is that they must apply their own knowledge and wisdom to find solutions using locally available resources. The training is intended to introduce them to the GACP principles; how they implement these principles will vary from person to person, group to group and place to place.

ANNEXURE

Useful Web Resources for GACP Trainers

General

- The Original World Health Organisation's GACP guidelines–The download page for the original GACP guidelines–<http://apps.who.int/medicinedocs/en/d/Js4928e/>
- National Medicinal Plants Board–The government body in India that oversees all medicinal plant activity. The NMPB GACP guidelines can be downloaded from the publications page–<http://nmpb.nic.in/index.php>
- The Foundation for the Revitalisation of Local Health Tradition (FRLHT)–Encyclopaedia on Indian Medicinal Plants–<http://envis.frlht.org.in/indian-medicinal-plants-database.php>

Cultivation

- The Central Institute of Medicinal and Aromatic Plants (CIMAP)–<http://www.cimap.res.in>
- The Directorate of Medicinal and Aromatic Plants Research (DMAPR)–<http://www.dmapr.org.in>

Wild Collection

- ISSC-MAP–The International Standard for Sustainable Collection of Medicinal and Aromatic Plants documentation and download site–<http://www.floraweb.de/MAP-pro/>
- FairWild–The FairWild Foundation promotes and facilitates implementation of sustainable, fair and value-added management and trading system for wild-collected natural ingredients and products thereof –<http://www.fairwild.org>



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