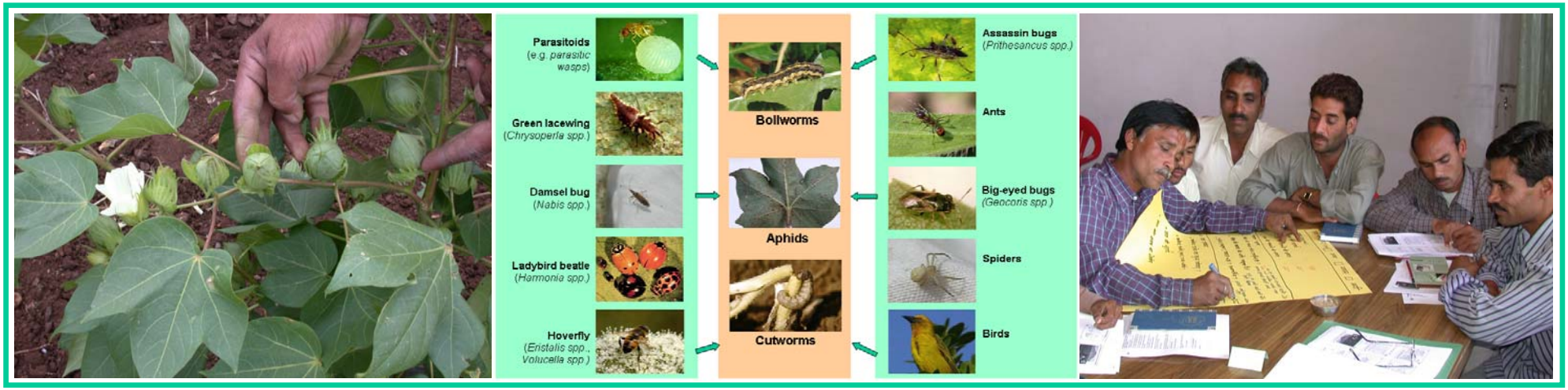
Organic Cotton Training Manual

Frank Eyhorn, Saro G. Ratter, Mahesh Ramakrishnan



Funded by:

- **Swiss Agency for Development and Cooperation (SDC)**
- **World Wide Fund for Nature (WWF), Switzerland**

2005 Edition

Publisher:
Research Institute of Organic Agriculture (FiBL), Ackerstrasse, P.O. Box, CH-5070 Frick, Switzerland, Tel. +41 62 865 72 72, Fax +41 62 865 72 73, info.suisse@fibl.org, www.fibl.org

In cooperation with:
- Swiss Agency for Development and Cooperation (SDC), www.deza.admin.ch
- World Wide Fund for Nature (WWF), Switzerland, www.wwf.ch
- Remei AG, Switzerland, www.remei.ch, Maikaal bioRe (India) Ltd.
- International Competence Centre for Organic Agriculture (ICCOA), India, www.iccoa.org

Distribution:
Copies and free downloads of this volume and its Hindi translation are available from the International Competence Centre for Organic Agriculture (ICCOA), 951 C, 15th Cross, 8th Main, Ideal Homes Township, Rajarajeshwari Nagar, Bangalore - 560 098, India, Tel. +91- 80-57682830, Fax +91-80-28601183, info@iccoa.org, www.iccoa.org.
Copies of this volume (excluding transparencies) also can be ordered from FiBL for the price of CHF 9.00/EUR 6.00 plus shipping costs (order number 1390), and are available as free downloads at www.shop.fibl.org.
A CD containing this training manual (including the transparencies as PowerPoint files) and other extension tools on organic cotton is available from ICCOA and FiBL (ISBN 3-906081-72-9, FiBL order number 1391).

English review: Christopher Hay (Germany, ecotranslator@t-online.de)

This publication was realized with support from:
- Swiss Agency for Development and Cooperation (SDC)
- World Wide Fund for Nature (WWF), Switzerland

Frank Eyhorn, Saro G. Ratter, Mahesh Ramakrishnan: Organic Cotton Training Manual. 1st Edition. Research Institute of Organic Agriculture (FiBL), Frick, Switzerland

ISBN 3-906081-71-0

Acknowledgment of contributions

The development of this training manual is a collaborative effort to which many people have contributed. Special thanks go to the following people and institutions:

- Maikaal bioRe (India) Ltd., especially Rajeev Baruah, Ritu Baruah and V. Tiwari, who opened their doors to the research project and provided all required support and information.
- The team members of Maikaal bioRe who worked on this manual from the concept up to the review. Special thanks go to Shriram Vishwakarma, Ishwar Patidar, Yogendra Shrivas, Dharmendra Singh Mandloi, Ashok Singh Chouhan, Rajeev Verma, Jitendra Vyas, Dinesh Tripati, and Sukhdev Gir. This manual is based largely on their experience and knowledge.
- The Research Team of Maikaal bioRe: Prashant V. Tekade, Lokendra Singh Chouhan, Gajendra Singh Chouhan, Raghuvir Singh Mandloi
- The Steering Group of the Maikaal Research Project: Patrick Hohmann (Remei AG), Dr. Walter Wagner (WWF), Dr. Urs Heierli (msd consulting), for providing guidance and feedback.

The training manual has been developed and produced as part of a research project funded by:

- Swiss Agency for Development and Cooperation (SDC)
- World Wide Fund for Nature (WWF), Switzerland

Contents

How to use this training manual

The aim of this training manual is to facilitate training activities on organic cotton cultivation for smallholder farmers in the tropics. We hope it will form the basis for training activities by providing the following:

- The essence of the involved subject matters in a compact and structured way;
- Material for illustration;
- Ideas for interactively addressing each topic in a training situation.

The target group of the training manual is extension staff of organic cotton projects and rural development agencies. The training manual complements the Organic Cotton Crop Guide (see www.organiccotton.fibl.org) which contains a detailed description of the theory, and references.

Each sheet of the training manual covers a topic described in detail in the Organic Cotton Crop Guide. The respective chapter in the guide is referred to after the heading (→ Chapter XY). The **key messages to be conveyed** give the most important points to be mentioned when covering the topic. The **didactics** section below provides ideas on how the topic can be dealt with in an interactive way in a training course. Each topic is illustrated with a **transparency**. The **description of the transparency** explains what is shown on each transparency. A printout of all transparencies can serve as a **handout** for the course participants. An example of a **schedule** for a one week training course on organic cotton is given in Annex 1.

The transparencies are available as a PowerPoint file on a CD containing all extension tools developed as part of this research project. Users are encouraged to alter them as deemed appropriate, complement them with their own illustrations, and translate them into local languages. For this reason, the files are laid out simply.

Obviously, the success of training activities also depends on the communication skills of the resource persons and on whether the course atmosphere is conducive to learning. Active participation of the trainees and consideration of the expertise they already bring with them is crucial for this. For general guidelines on how to organize interactive training sessions on organic agriculture please refer to the IFOAM Training Manual on Organic Agriculture in the Tropics[1].

As site and socio-economic conditions differ from place to place, so will the methods and technologies suitable for organic cotton farming. Trainers are thus invited to modify the provided material and develop their own adapted to local conditions. The more local experience of practitioners and trainees is included, the more meaningful will the training be.

[1] A free download is available at www.shop.fibl.org. For more on how to organize trainings see chapters 1.2 and 1.3.

Why organic cotton?

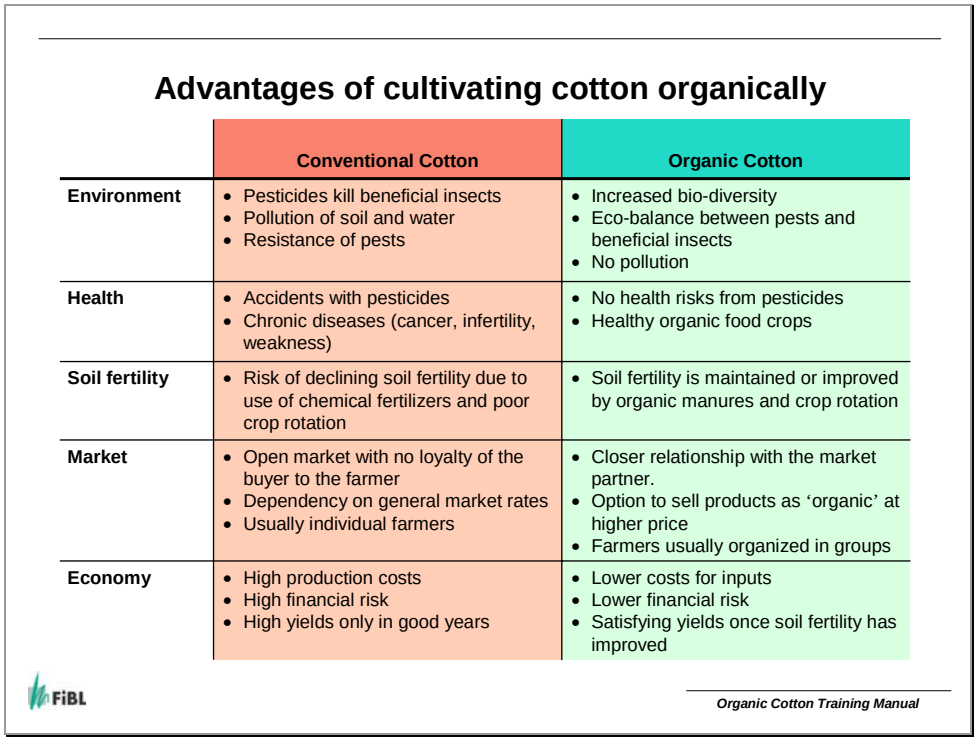
→ Chapter 1.2

Key messages to be conveyed

- Conventional cotton production uses large quantities of chemical pesticides and fertilizers.
- They are harmful to the environment as they kill beneficial insects and pollute soil and water. In organic farming, the absence of chemical sprays and increased biodiversity results in a better eco-balance between pests and beneficial insects.
- With frequent application of pesticides, pests can develop resistance and thus cause additional damage.
- Chemical pesticides can cause poisoning as well as long-term effects on human health. Organic farming is free of chemical pesticides and produces safe and healthy food crops.
- Frequent use of chemical fertilizers and narrow crop rotation can cause declining soil fertility, while organic farming improves soil fertility.
- In conventional cotton, farmers depend on open markets, whereas in organic cotton there is usually a closer relationship with the buyer, and an organic premium is paid.
- In organic cotton, yields might be lower, but so are the input costs and thus the financial risk. Diverse crop rotations further reduce the risk of crop failure and provide food for subsistence.

Motivation

Invite the participants to a brief brainstorming session: Why are they interested in growing cotton organically? Note down the points in key words on a flip chart or board. Present Transparency 1 and compare the listed aspects with those stated by the participants. Discuss which of these aspects are most important to them.



Advantages of cultivating cotton organically

	Conventional Cotton	Organic Cotton
Environment	• Pesticides kill beneficial insects • Pollution of soil and water • Resistance of pests	• Increased bio-diversity • Eco-balance between pests and beneficial insects • No pollution
Health	• Accidents with pesticides • Chronic diseases (cancer, infertility, weakness)	• No health risks from pesticides • Healthy organic food crops
Soil fertility	• Risk of declining soil fertility due to use of chemical fertilizers and poor crop rotation	• Soil fertility is maintained or improved by organic manures and crop rotation
Market	• Open market with no loyalty of the buyer to the farmer • Dependency on general market rates • Usually individual farmers	• Closer relationship with the market partner. • Option to sell products as 'organic' at higher price • Farmers usually organized in groups
Economy	• High production costs • High financial risk • High yields only in good years	• Lower costs for inputs • Lower financial risk • Satisfying yields once soil fertility has improved

FiBL

Organic Cotton Training Manual

Transparency 1: Advantages of growing cotton organically, as compared to conventional farming.

Description of the transparency

The table provides an overview of the disadvantages of conventional cotton (left side) and the advantages of organic cotton (right side) with respect to environment, human health, soil fertility, market situations and farm economy.

Growing organic cotton – A system approach

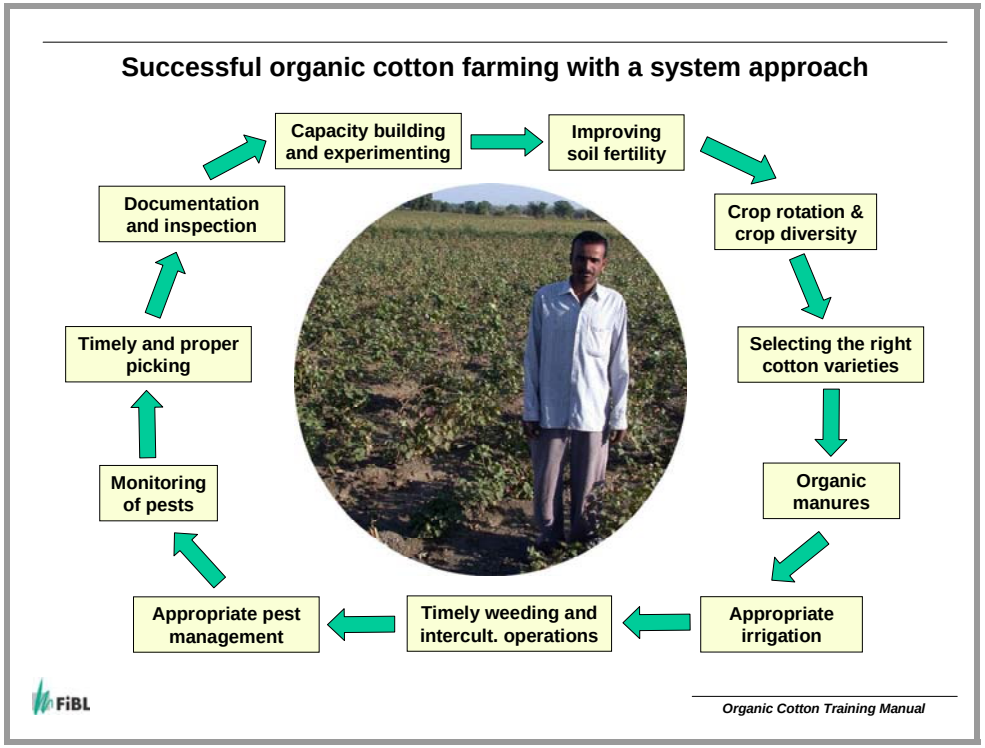
→ Chapter 1.3

Key messages to be conveyed

- Organic farming does not mean simply replacing chemical fertilizers and pesticides with organic manures and botanical sprays.
- Organic cotton farming means re-thinking the entire farming system. A system means that all elements (e.g. soil, crops, animals, the farmer, markets etc.) are connected with each other.
- Most important in organic farming is preventing problems from occurring at all. This always starts with a fertile and healthy soil.
- To get good results, organic farmers need to implement appropriate measures for the aspects mentioned in Transparency 2.

Group work: 'Ingredients' for organic cotton farming

Prepare a large paper chart with the drawing of a farmer in the centre. Divide the participants into 3-4 groups and ask them to discuss the 'ingredients' for successful organic cotton farming. 'Ingredients' are the measures that need to be adopted. The participants should write them on index cards. Each group is invited to briefly present their results by pinning or sticking their cards on the chart around the farmer. In the end, summarize the 'ingredients' with the help of Transparency 2, referring to the measures suggested by the participants.



Transparency 2: 'Ingredients' for successful organic cotton farming.

Description of the transparency

The illustration indicates the measures necessary for obtaining good results in organic cotton farming, from measures for improving soil fertility to keeping records for inspection. The farmer is in the centre of the farming system and needs to manage the system in an optimal way. For this, he/she requires training, advice and continuous experimentation. The photo shows an organic cotton farmer in the Maikaal bioRe project, central India.

Organic standards

→ Chapter 1.4

Key messages to be conveyed

- If a product is to be sold as organic, it needs to be certified by an authorised and accepted agency.
- The rules for a product to be certified organic are laid down by the standards of the respective country or private labels.
- Compliance with organic standards is ensured through inspection and certification.
- Organic standards only define the minimum criteria to be certified, not the best farming practices.
- Important requirements of most organic standards are summarized in Transparency 3. The requirements of the EU regulation are summarized in the Annex of the Organic Cotton Crop Guide.

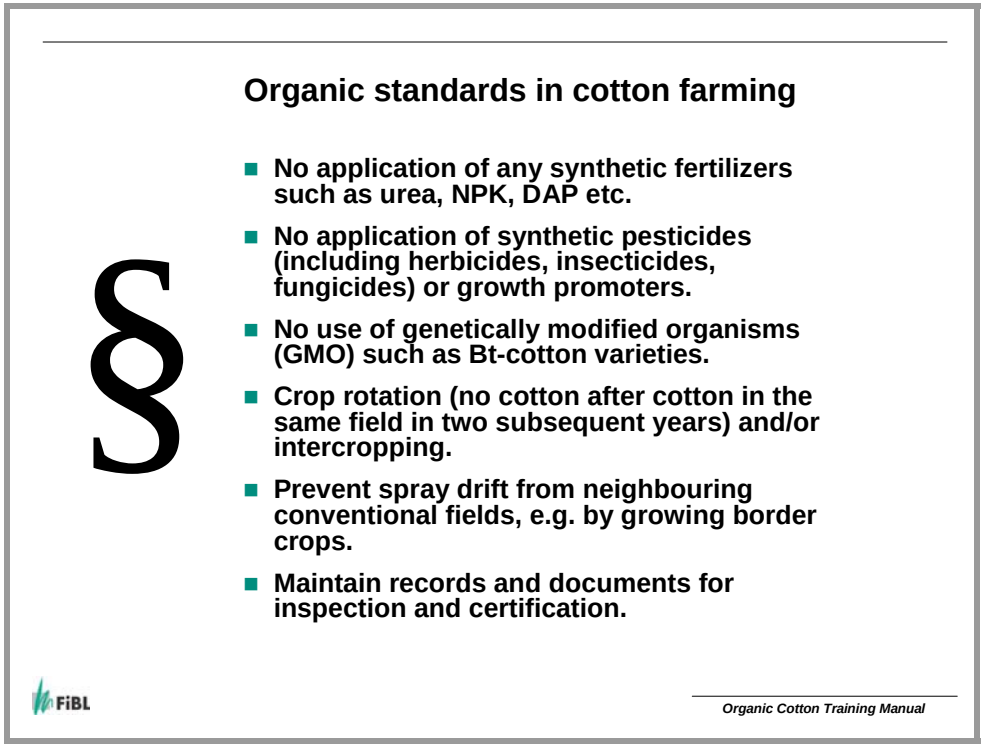
Group work on organic standards

Distribute copies of the organic standards that apply to the project(s) in question (e.g. internal regulations). Ask each group to summarize one section of the standards in their own words and present them in the plenum.

Alternatively, distribute copies of the summary in Annex 10.3 of the Organic Cotton Crop Guide and ask the participants to discuss whether their farms/farms they are familiar with meet all the requirements; and if not, what needs to be adapted to achieve compliance.

Summarize the session with the help of Transparency 3.

If time permits, present a video on organic farming (e.g. from IFOAM).



Transparency 3: Important requirements of organic standards relevant to cotton farming.

Description of the transparency

The transparency lists the most important requirements of organic standards relevant to cotton production. Standards on animal husbandry are not listed. The actual standards are far more complex.

Inspection and certification

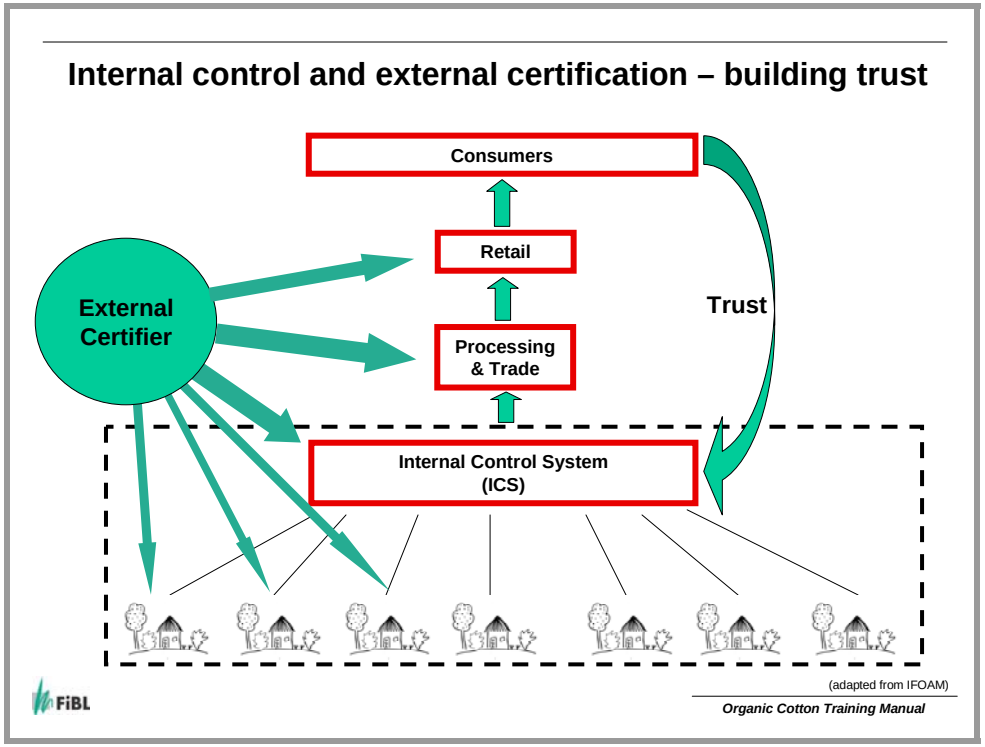
→ Chapter 1.7

Key messages to be conveyed

- Inspection and certification aim to establish trust between the consumers of organic products on the one side, and the vendors and producers on the other side.
- The requirement for certification also protects the (sincere) organic farmers from unfair competition and maintains a premium price.
- Certification needs to be implemented by an independent external agency not involved in the production, processing or trade of the product.
- Smallholder groups can streamline certification by implementing an internal control system (ICS) which inspects each farmer at least once a year.
- Non-compliance by individual farmers can put the entire project at risk.

Controversial discussion: Why is certification necessary?

For the farmers, inspection and certification usually mean a lot of extra work (record keeping) and additional hassle. Still, there are a number of reasons why certification can help them. Encourage the participants to discuss this issue by asking the question: Why is certification necessary? Some arguments for certification are: protecting the consumers from being cheated, ensuring price premiums, protecting the farmers from unfair competition, better quality management; the idea of self-control. Summarize the session with the help of Transparency 4, explaining how an Internal Control System functions.



Transparency 4: Internal and external control in an organic cotton project (adapted from IFOAM).

Description of the transparency

The organic cotton project (within the dashed box) maintains an internal control system (ICS) where each individual farm is inspected at least once a year by internal inspectors. The internal control system needs to ensure that all farmers in the project follow the standards, and that defaulting farmers are sanctioned. An independent external certification body inspects whether the ICS is functioning properly (by checking documents and re-inspecting randomly selected farms), and also inspects the processing and trade chain up to the retailer.

Requirements of the cotton crop

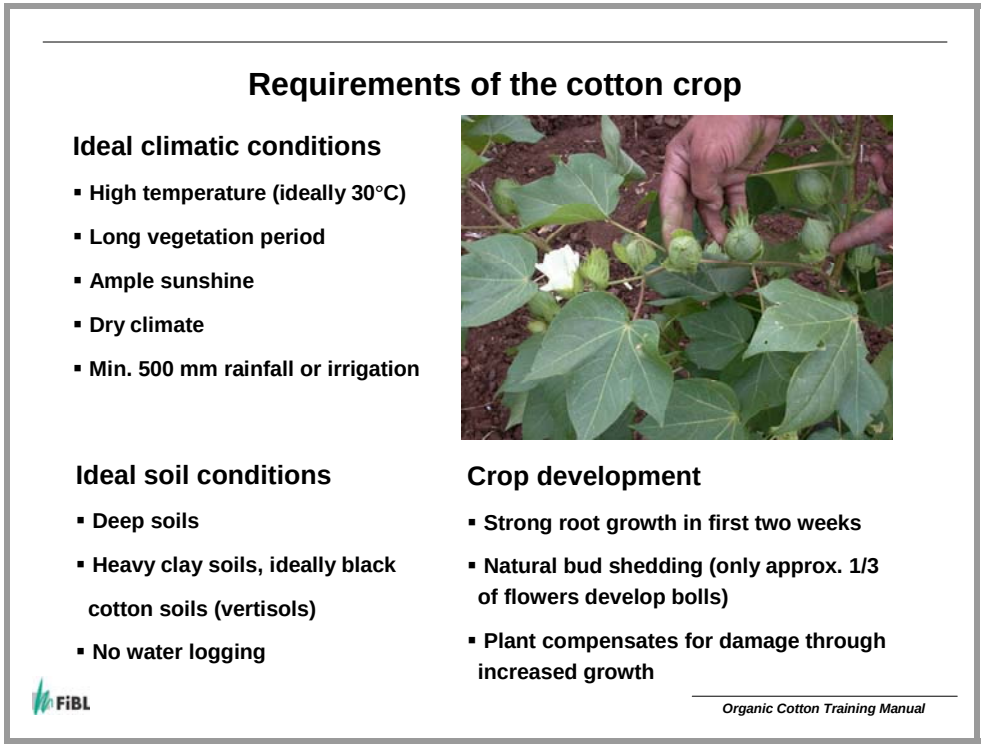
→ Chapter 2.2

Key messages to be conveyed

- The wild ancestors of cotton are hardy perennial shrubs with hairy leaves protecting them from pest attack.
- Cotton prefers a warm and dry climate with a long growing season without frost, and ample sunshine.
- Shedding of buds and bolls occurs naturally – only about 1/3 of the flowers develop mature bolls. This rate can drop further if conditions are adverse (drought, nutrient deficiency, cool weather, high nitrogen supply, heavy insect attack etc.).
- Cotton is very sensitive to water logging, which causes reduced growth and increased bud and boll shedding.
- The cotton plant can compensate for loss of buds and bolls by enhancing vegetative growth and prolonging its flower production.
- With its long tap roots, cotton can access soil moisture in deeper layers and thus survive short periods of drought.

Discussion: What do we know about cotton?

What do the participants know about the cotton crop, its development and its requirements? Collect the points on a chart or board. Present Transparency 5 to supplement the collected points.



Transparency 5: Requirements of the cotton crop concerning climatic and soil conditions, and aspects of crop development.

Description of the transparency

The photo shows a branch of a cotton plant with flowers, square buds and bolls. Flowering starts at the first node of the first fruit-bearing branch and goes from one node to another along the branch. The text to the left indicates the conditions preferred by the cotton crop (though it can also be grown in sub-optimal conditions). The text below the photo lists some important features of crop development.

Selecting the right cotton varieties

→ Chapter 2.3

Key messages to be conveyed

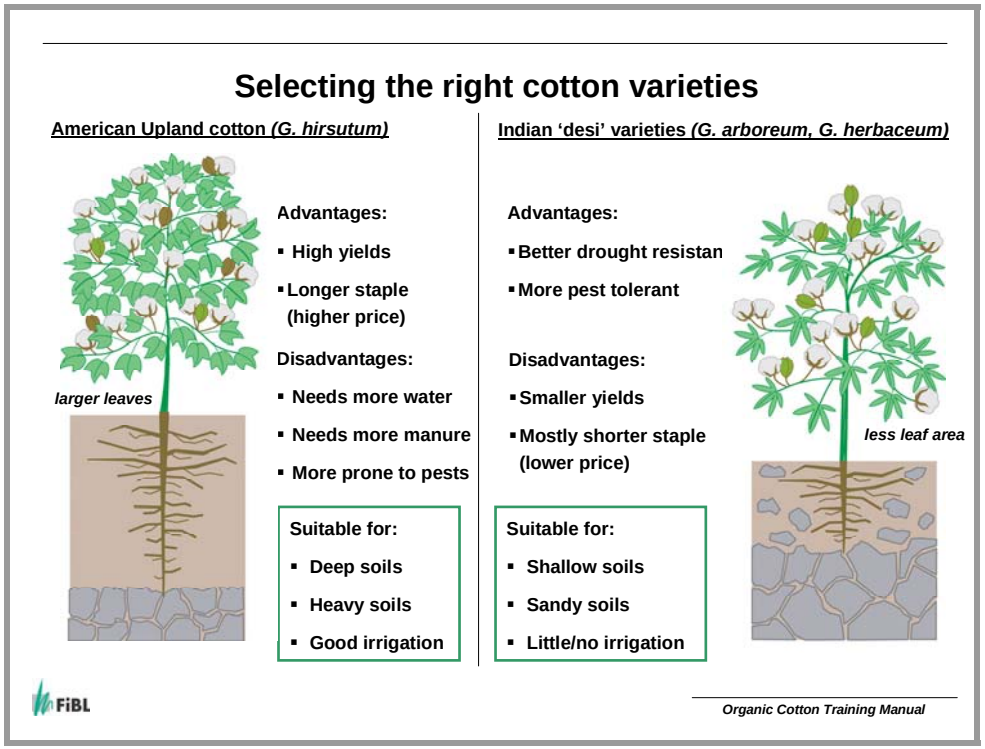
- There are four main species of cotton grown for fibre: American upland cotton (*G. hirsitum*, most widely grown); Sea Island cotton (*G. barbadense*, with extra long fibres); and the species of the Indian sub-continent: *G. herbaceum* and *G. arboreum*.
- A large number of varieties have been bred from these species; some are more and some are less suitable for organic farming.
- Varieties suitable for organic farming are those which have good resistance to pests and diseases and produce satisfying yields with moderate manure application.
- When selecting the most suitable varieties the specific conditions of the farm (climate, soil, irrigation, manure) need to be taken into account.

Discussion: Evaluating cotton varieties

Present Transparency 6 to introduce the topic. Ask the participants how to identify the most suitable cotton varieties for organic farmers in a region. Prepare a table on a paper chart, with columns as given below. Ask the participants which varieties are grown in the region and what the farmers' experiences are with them. Enter the characteristics into the table. An example:

Variety	Yields	Water requirements	Resistance to pests	Fibre quality
Variety X	*Good, if sufficient irrigation*	*High, drought sensitive*	*Medium, sensitive to sucking pests*	*25 – 27 mm staple, fetches good price*

Discuss with the participants which varieties are the most suitable ones for fertile sites and which for marginal sites. Is there any need/interest in comparing the performance of certain varieties under organic conditions in plot trials on the farmers' fields?



Transparency 6: Comparison of American upland cotton (Gossypium hirsitum) and Indian 'desi' varieties (G. arboreum and G. herbaceum).

Description of the transparency

The illustration compares the most widely cultivated American upland cotton (left) with the typical Indian 'desi' varieties ('desi' means local, indigenous). Note the larger leaf area and larger number of bolls of the *hirsitum* plant. The desi varieties are usually more adapted to marginal soils, indicated by the more shallow and stony soil in the right drawing. The graph may be adapted to the species/varieties used for the project.

Soil properties

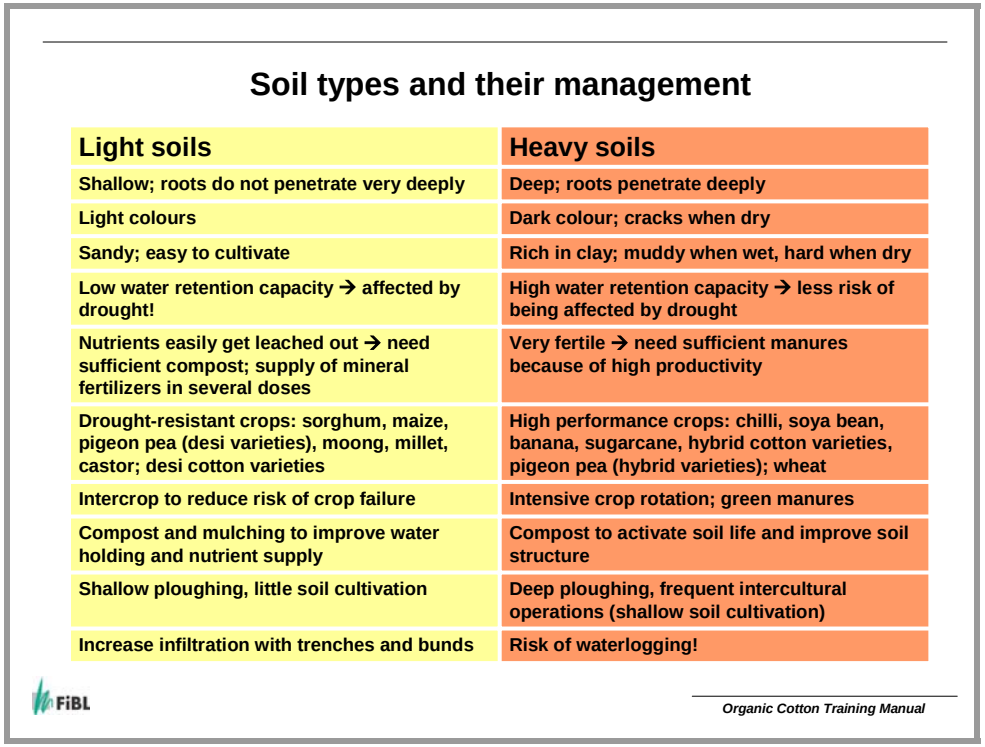
→ Chapter 3.1

Key messages to be conveyed

- The right soil fertility management strategy primarily depends on the types of soil present on a farm.
- It is thus important to develop an understanding of the different soil types and their characteristics.
- Light (sandy) soils usually have lower capacity to store moisture and nutrients.
- Therefore, apply sufficient compost and select crops and varieties which are less prone to drought. Reduced soil cultivation and application of mulch can help to reduce soil erosion.
- Heavy (clay-rich) soils keep nutrients and moisture much better and thus sustain more intensive farming.
- Frequent shallow soil cultivation helps improve soil aeration, nutrient supply (accelerated decomposition of organic matter), and reduces evaporation and weed pressure.

Group work: Soil quality and crop management

Ask the plenum the following questions and note down the results on a board: What are the dominant soil types in the region? What are their properties? Divide the participants into 2–3 groups (one for each soil type). Figure out in groups: What is the relevance of the properties of the selected soil for farm management? The results of each group are presented and discussed in the plenum. Compare the collected points with those listed in Transparency 7.



Soil types and their management

Light soils	Heavy soils
Shallow; roots do not penetrate very deeply	Deep; roots penetrate deeply
Light colours	Dark colour; cracks when dry
Sandy; easy to cultivate	Rich in clay; muddy when wet, hard when dry
Low water retention capacity → affected by drought!	High water retention capacity → less risk of being affected by drought
Nutrients easily get leached out → need sufficient compost; supply of mineral fertilizers in several doses	Very fertile → need sufficient manures because of high productivity
Drought-resistant crops: sorghum, maize, pigeon pea (desi varieties), moong, millet, castor; desi cotton varieties	High performance crops: chilli, soya bean, banana, sugarcane, hybrid cotton varieties, pigeon pea (hybrid varieties); wheat
Intercrop to reduce risk of crop failure	Intensive crop rotation; green manures
Compost and mulching to improve water holding and nutrient supply	Compost to activate soil life and improve soil structure
Shallow ploughing, little soil cultivation	Deep ploughing, frequent intercultural operations (shallow soil cultivation)
Increase infiltration with trenches and bunds	Risk of waterlogging!

FiBL

Organic Cotton Training Manual

Transparency 7: Properties and management recommendations for light and heavy soils.

Description of the transparency

The table compares typical light (sandy) and heavy (clay-rich) soils and provides recommendations for respective management practices. If necessary, adapt the table to the soils prevalent in the respective region.

The importance of soil organic matter

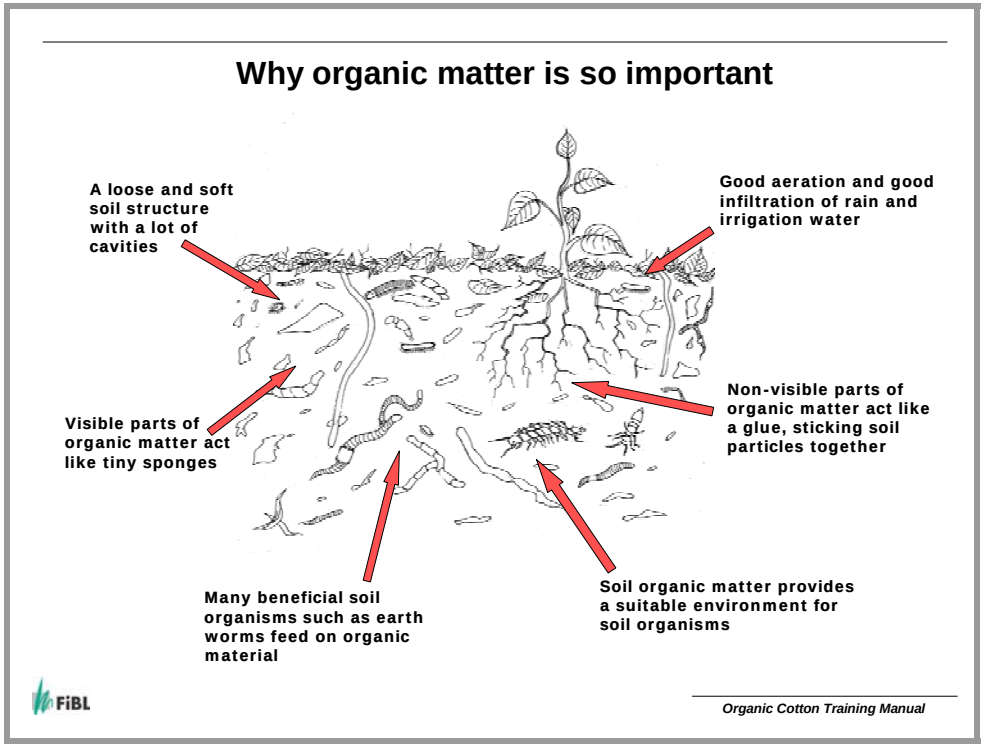
→ Chapter 3.2

Key messages to be conveyed

- On many conventionally managed farms continuous application of chemical fertilizers, along with low inputs of organic manures, have led to loss of soil fertility.
- Organic matter is crucial for soil fertility, as it improves soil structure, increases water holding and infiltration, takes up and releases nutrients and hosts a large number of beneficial soil organisms.
- Thus, a continuous supply of organic material is crucial for maintaining and increasing soil fertility.
- Sources of organic matter are crop residues (including crop roots), farmyard manure, compost and organic manures such as oil cakes or press mud.

Experience sharing: Soil organic matter

What have the participants observed or experienced in relation to soil organic matter? What happens to soil if no organic material is applied? What happens if organic manure application is increased? Show Transparency 8 to explain the different ways organic matter affects soil fertility.



Transparency 8: The importance of organic matter for soil fertility.

Description of the transparency

The drawing shows a soil profile with leaves (mulch), soil organisms (earthworms, centipedes, spring tails, millipedes etc.), canals and soil pores. The arrows indicate the various functions of organic matter.

Crop rotation – rotation crops

→ Chapter 3.3

Key messages to be conveyed

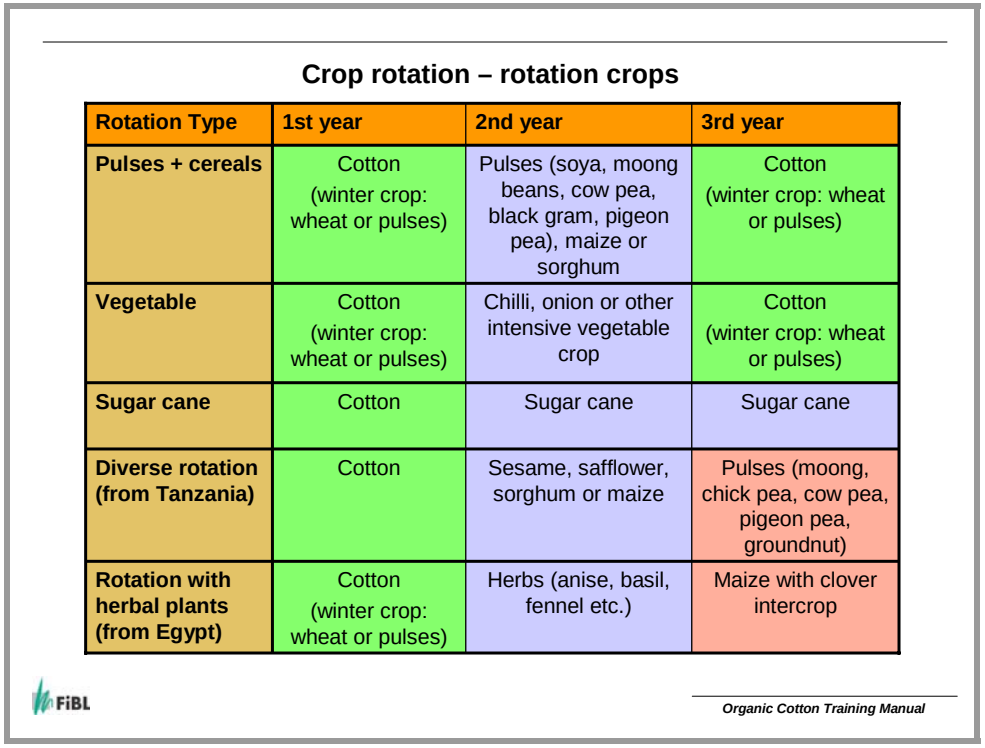
- On organic farms it is a must to grow cotton in rotation with other crops. It is required by the standards, and is crucial for soil fertility and pest management.
- If cotton is grown continuously over years on the same field, nutrients get depleted and pest and disease populations may increase.
- Because cotton prefers fertile soils rich in nutrients, it grows particularly well after pulses (nitrogen-fixing crops) or intensive horticulture crops (e.g. chillies, vegetables, bananas).
- Where sufficient irrigation water is available, a winter crop of wheat or pulses can be grown after cotton, leading to a more diverse crop rotation.
- Crop rotation helps farmers reduce their economic risk because they are less vulnerable to price fluctuations and crop losses.

Group activity: Designing suitable crop rotations

Prepare a crop rotation table on a paper chart or board (example given below). Ask the participants which are the typical cotton rotation patterns in the area and list them in the table.

Rotation	**1st year**	**2nd year**	**3rd year**	**Advantages (+) & Disadvantages (-)**
Type 1:	*Cotton*	*Chilli*	*Cotton*	*+ high value* *- lot of inputs needed - risk of diseases*

Discuss the advantages (+) and disadvantages (-) of each rotation pattern. Summarize: Which rotation patterns are most suitable under regional conditions? Are the participants interested in developing and trying out new patterns? Compare with the rotations given in Transparency 9.



Transparency 9: Some crop rotation patterns from organic cotton projects in India and Africa.

Description of the transparency

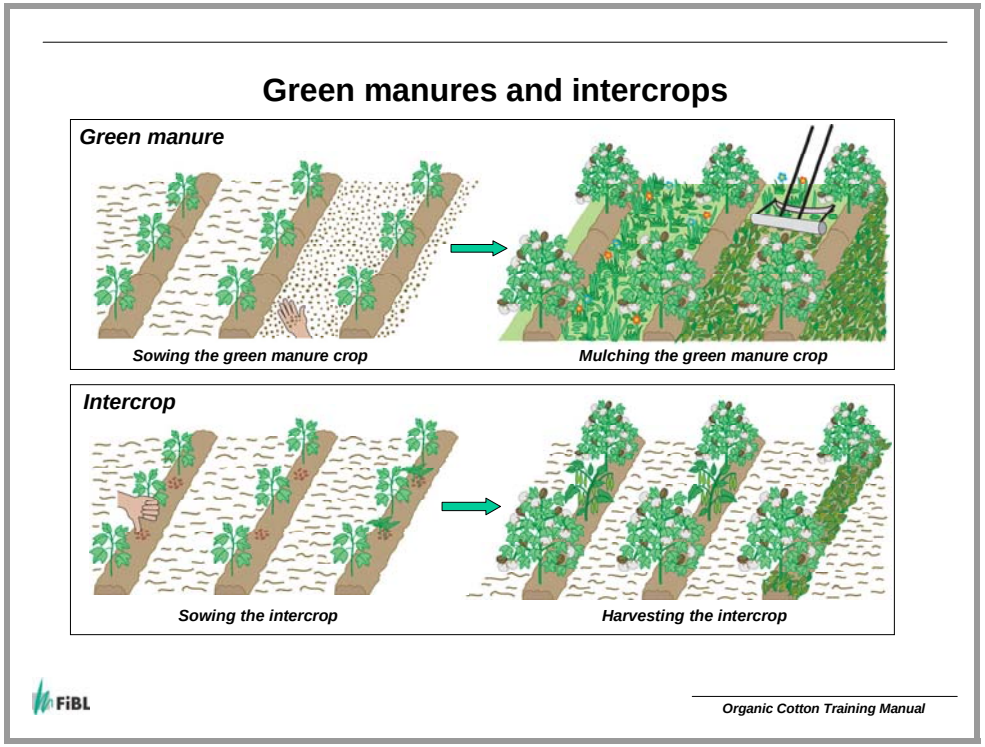
The table provides 5 examples of cotton-based crop rotations. The left column names the crops grown in rotation with cotton, and the subsequent columns indicate the crop grown in the first to third year of the rotation. In the first two rotations cotton is grown on the same field every alternate year, while in the remaining three rotation patterns cotton returns to the same field only every third year.

Green manures and intercrops

→ Chapter 3.4

Key messages to be conveyed

- Green manure crops are grown for cutting and mulching before they mature, while intercrops are grown for harvesting.
- Green manures and intercrops help to:
  - distract pests from the cotton crop, and host and feed beneficial insects;
  - catch nutrients and fix nitrogen from the air (legumes);
  - make nutrients available to the crop while decomposing, and build up organic matter;
  - suppress weeds and reduce soil erosion;
  - provide mulch which keeps the moisture in the soil and feeds soil organisms;
  - provide additional harvests (intercrop) and fodder.
- However, green manures and intercrops do compete with the cotton crop, so appropriate spacing and timing are crucial for overall benefit.
- Encourage farmers to conduct simple trials with green manures and intercrops to find out about their suitability (trial design: see Organic Cotton Crop Guide).



Transparency 10: Green manures (cutting at the time of flowering) and intercrops (cutting after harvesting the seeds) for cotton.

Discussion: Pros and Cons of Green Manures and Intercrops

Explain the concept of green manures and intercrops with the help of Transparency 10. If possible, present some plants that can be used as intercrops. Ask the participants which green manure crops and which intercrops they would suggest for cotton and list them on a board. Discuss the advantages and disadvantages of the suggested options, if possible based on the experience of farmers. Conclude which are the most suitable options under regional conditions. Are the participants interested in trying them out?

Description of the transparency

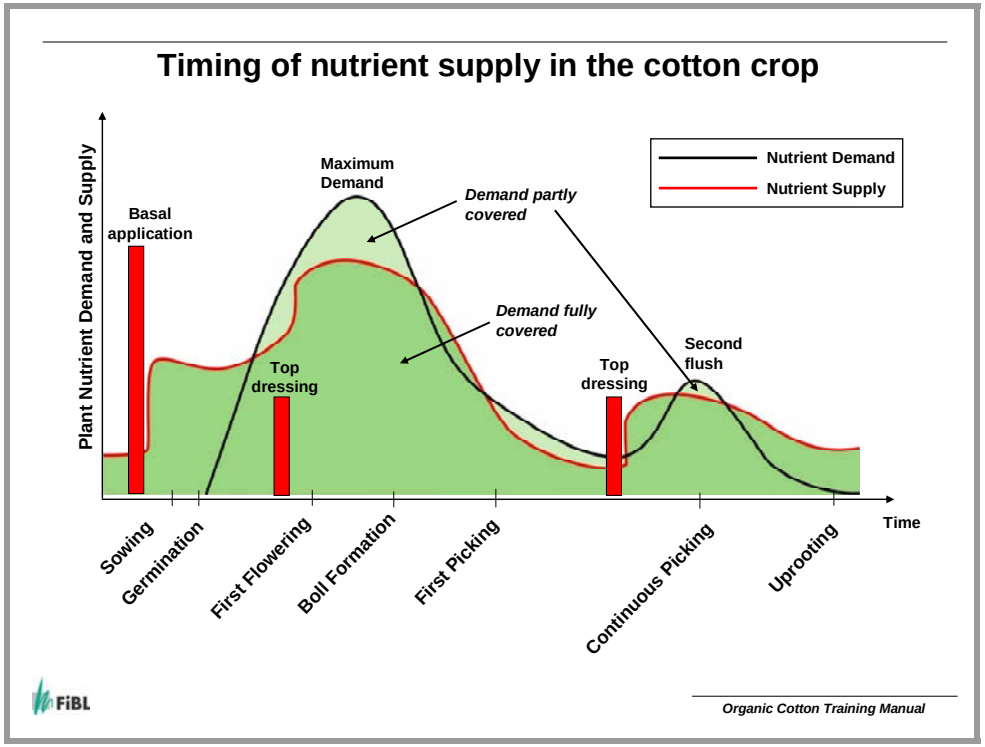
The upper graph shows how green manures are sown by distributing the seeds between the cotton rows (left) and cut for mulching between the cotton rows at the time of flowering (right). The lower graph shows the sowing of intercrop seeds (e.g. beans) between the cotton plants (few seeds per spot) and its cutting after harvest of the fruits and use as mulch within the cotton row. Of course, variations in the design are possible.

Nutrient requirements

→ Chapter 4.1

Key messages to be conveyed

- Crop rotation and intercropping with legumes, recycling of crop residues and the application of farm-produced organic manure (FYM and compost) must form the basis of nutrient management in organic cotton farming.
- Cotton requires not only N, P and K, but the full range of nutrients applied in a well-balanced manner.
- Two-thirds of these nutrients are required during the first two months of growth, because nutrient demand drops at the end of boll formation.
- Unlike chemical fertilizers, organic manures release nutrients only when they decompose, which in moist soils usually starts 1-2 weeks after application. Thus, the timing of application needs to be different from conventional farming.
- Nutrient supply can be ensured through initial application of compost or farmyard manure (basal application) and subsequent top dressing of nitrogen-rich organic manures (e.g. oil cakes mixed with compost).
- The timing of manure applications needs to be adapted to local conditions (growing pattern, soil humidity, manures etc.).



Transparency 11: Nutrient demands of cotton and timing of manure applications (qualitative development over time).

Discussion: Timing of manure application

Draw the axis of the graph of Transparency 11 on a board or OHP slide. Ask a participant to draw the nutrient demand of the cotton crop over its life cycle. Discuss and correct if necessary. Ask another participant to mark the timing of manure application in order to ensure optimum nutrient supply. Discuss and correct if necessary. Compare with the graph on Transparency 11 and explain the relevance of proper timing of manure application.

Description of the transparency

The curve indicates the nutrient demand of the cotton crop throughout the vegetation period (from sowing to up-rooting, qualitative approximation). The second peak is only relevant where the crop is kept for a 'second flush'. The bars indicate recommended timing of nutrient applications: the first bar for the basal application (compost) and the second and third bars for top dressing of manures like oil cake. The arrows symbolize the release of nutrients through decomposition.

Uptake of nutrients

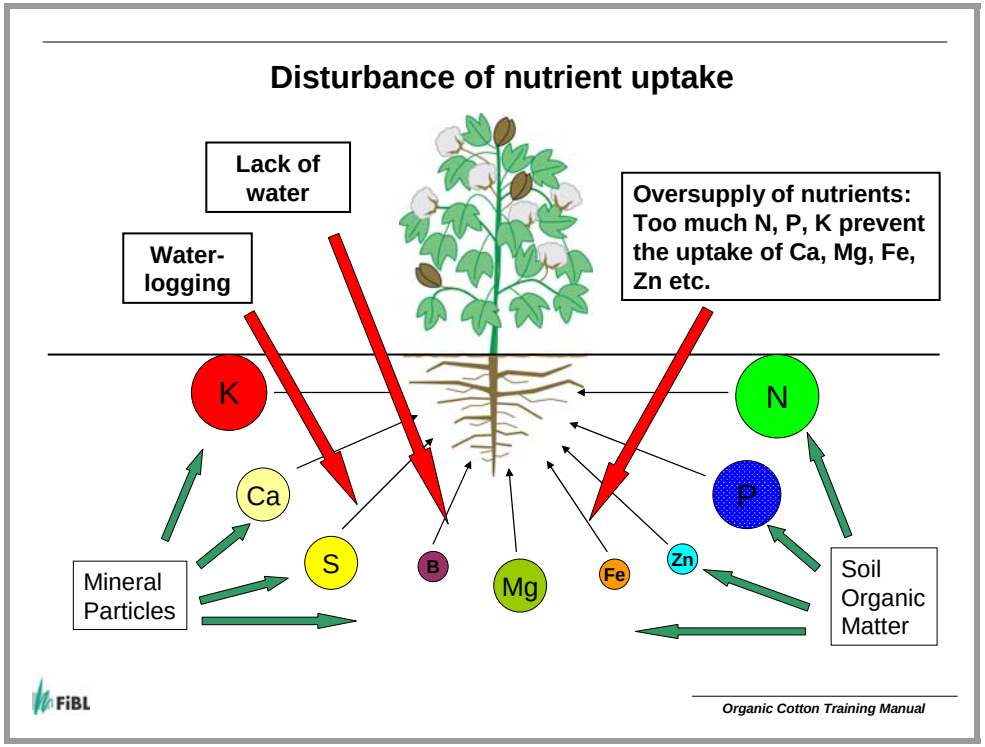
→ Chapter 4.2

Key messages to be conveyed

- In organically managed soils the crop mainly depends on nutrients released by mineral particles and soil organic matter
- These take up, store and release nutrients (through exchange, weathering, and decomposition).
- Measures to improve overall soil fertility (microbial activity, structure, moisture retention) are more likely to result in increased yields than the mere application of fertilizers.
- More important than the total nutrient content in the soil is the availability to the plant. This depends on, among other things, the activity of soil organisms and the water content in the soil.
- Nutrient uptake can be hindered by waterlogging, dryness, and an excess of some nutrients (especially N, P and K).
- Measures to overcome the inhibiting factors and to stimulate microbial activity can thus be more effective than application of fertilizers.

Consolidation: Nutrient management in cotton

Present Transparency 12. Ask a participant to explain the transparency in his/her own words. Summarize the relevance of nutrient uptake and its disturbance for crop management in organic cotton cultivation.



Transparency 12: The uptake of nutrients (represented by coloured circles) and its disturbance (red arrows). K = potassium, Ca = calcium, S = sulphur, B = boron, Mg = magnesium, Fe = iron, Zn = zinc, P = phosphorus, N = nitrogen.

Description of the transparency

The different nutrients (coloured circles) are released by mineral particles and by soil organic matter. They are taken up by the plant roots (thin arrows). This uptake can be hindered by the factors given in the text boxes (red arrows).

Nitrogen immobilization

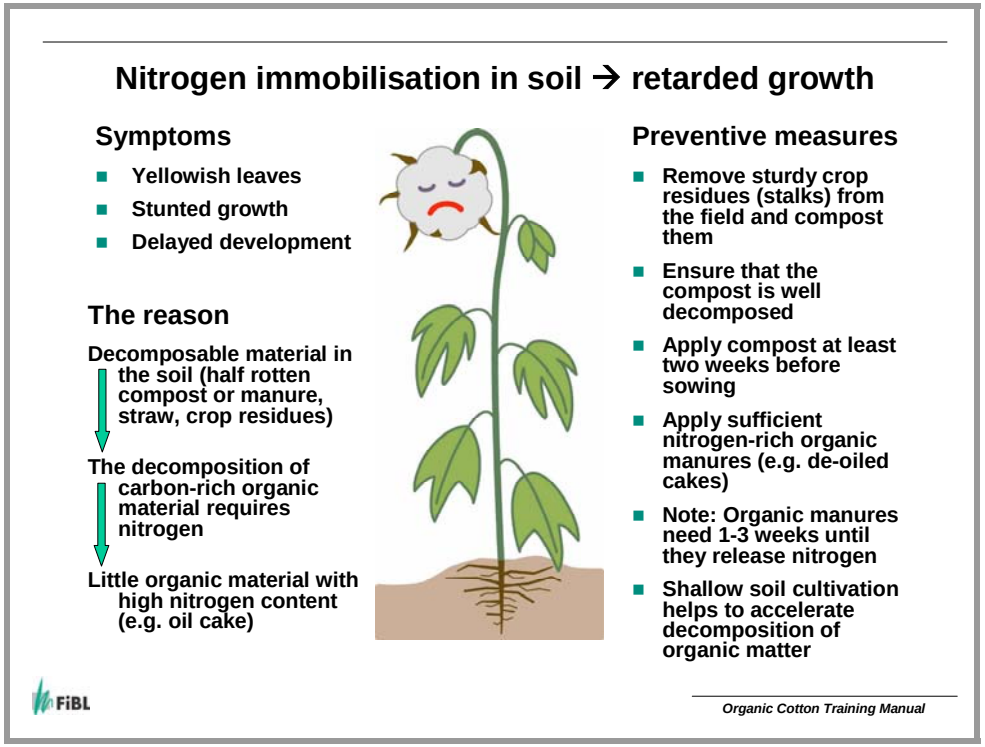
→ Chapter 4.2

Key messages to be conveyed

- If cotton plants have yellowish leaves, stunted growth or delayed development of pods and bolls, this may be due to a process called temporary nitrogen immobilisation.
- To decompose sturdy plant material like half-rotten compost, straw or crop residues, micro-organisms use the nitrogen present in the soil.
- Thus, the nitrogen is temporarily unavailable to the cotton plant.
- To prevent this situation, collect sturdy crop residues from the field and prepare compost out of them.
- Ensure that the compost decomposes well. Keep it moist and turn it at least twice.
- Apply the compost at least two weeks before sowing, and add nitrogen-rich manures once the crop has established itself.
- Soil cultivations speed up the decomposition of organic matter and thus increase the nutrient supply to the crop.

Illustration: A non-scientific comparison

Present and explain Transparency 13. To illustrate this slightly complex situation in simple words, one can use a non-scientific comparison: “Instead of eating plain rice, most people prefer to have it with some vegetable or meat dish. If plain rice is served, people will do everything to get some gravy. Similarly, soil microbes are very keen on carbon-rich materials such as straw, stalks or husks, but they need a certain amount of nitrogen to ‘eat’ it. Thus, they will do everything to find some nitrogen to eat it. They are much better at doing this than plant roots, so that the plants will go hungry. Only once the microbes are saturated and die can the incorporated nitrogen become available to the plants again."



Transparency 13: Temporary nitrogen immobilisation leads to retarded growth in cotton.

Description of the transparency

The cotton plant is ‘unhappy’, which it indicates by a number of symptoms (top left). The reason for these symptoms is that the decomposition of carbon-rich material requires nitrogen, and there is not enough nitrogen-rich material in the soil. Measures to avoid it are listed at the right hand side.

Application of manures and fertilizers

→ Chapter 4.3

Key messages to be conveyed

- Organic manures contain the full range of nutrients including micronutrients in a balanced composition.
- Nutrient management in organic cotton cultivation should be based on the following components:
  - Crop rotation, intercrops and green manure
  - Use of crop residues, weeds, leaves etc. for preparing compost
  - Proper storage and use of farmyard manure
- Only then farmers should complement nutrient supply with purchased organic manures and natural mineral fertilizers.
- Foliar application of liquid organic manures like vermin-wash, diluted biogas slurry or diluted cow urine can help to fine-tune nutrient supply.

Discussion: Suitable on-farm and off-farm manures

Ask the participants which manures and fertilizers are available on the farms, and which are available in the market. List the suggested manures and fertilizers on a board or paper chart together with a comment on their nutrient value. Present and explain Transparency 14 to give some examples of organic manures and natural mineral fertilizers. Discuss with the participants how nutrient supply can be further improved, and which alternative sources of nutrients could be tried out.

Organic manures and natural mineral fertilizers for cotton

Manure/Fertilizer	Comment	Nitrogen (total N)	Phosphate (P_2O_5)	Potash (K_2O)
Compost	Soil improvement	0.6 - 1.5 %	0.5 - 1.0 %	0.5 - 2.0 %
Farmyard manure	Less stable humus	0.7 - 1.5 %	0.5 - 0.9 %	0.4 - 1.5 %
Vermi-compost	Very stable humus	0.6 - 1.5 %	0.4 - 0.9 %	0.5 - 1.0 %
De-oiled Castor	N- and P-supply	4.5 - 6.0 %	0.8 - 1.8 %	1.3 - 1.5 %
Cane press mud	Soil improvement	1.4 - 1.8 %	0.1 – 1.0 %	0.4 - 0.6 %
Rock phosphate	P-supply, in compost heap	0	15 - 30 %	0
Muriate of potash	Natural potassium fertilizer	0	0	ca. 60 %
Wood ash	K, Mg, Ca, Mg etc.	0	1 - 3 %	1 – 8 %

Note: Figures are given in percent of dry matter. The nutrient contents vary from source to source.

FiBL

Organic Cotton Training Manual

Transparency 14: Approximate nutrient contents of important organic manures and natural mineral fertilizers.

Description of the transparency

The table lists some important organic manures (based on biomass) and natural mineral fertilizers, along with a comment on their main function in nutrient management. The contents of nitrogen (N), phosphorus (P) and potassium (K) are approximate values. They can vary considerably from source to source.

Compost quality

→ Chapter 4.4

Key messages to be conveyed

- Composting is a process during which biomass is transformed into high-quality organic manure.
- If the material is set up in a heap at once, the compost develops heat. This kills weed seeds, diseases and pests.
- The decomposition of the material in a well maintained compost heap is fast and avoids loss of nutrients.
- To achieve a product of good quality, keep the compost heap moist (not too dry, not too wet) and turn the heap at least twice.
- Proper handling of the compost process pays off, as it influences the quality and the nutrient value of the manure (see Transparency 15).
- Vermi-composting with the help of earthworms requires additional labour, but the result is a manure of excellent quality.

Experience sharing: Measures to improve compost quality

Collect samples of different dung and compost heaps and display them on a table, with labels indicating the origin of the sample. Invite the participants to examine the samples and to assess their quality. Ask the participants about their experience with preparing compost, and what they have observed on different farms. Discuss which measures can help improve compost quality. Present and explain Transparency 15 to illustrate the importance of proper management of farmyard manure (FYM) and compost.

Compost and farmyard manure – proper handling pays off!

Nutrient contents of different compost and dung heaps collected in the Nimar region, India

Manure / Compost type	Nitrogen (total N)	Phosphate (P_2O_5)	Potash (K_2O)
Cow dung heap, well maintained	**1.5%**	**0.7%**	**0.8%**
Cow dung heap, poorly maintained (too wet)	**0.9%**	**0.5%**	**1.2%**
Compost in good condition (with heat process and turning)	**1.3%**	**0.9%**	**0.8%**
Compost, poorly maintained (too dry)	**0.8%**	**0.5%**	**0.5%**
Vermi-compost in good condition	**1.5%**	**0.9%**	**0.7%**
Vermi-compost, poorly maintained	**0.6%**	**0.4%**	**0.7%**

FiBL

Organic Cotton Training Manual

Transparency 15: Nutrient content (% dry matter) of samples of different compost and dung heaps collected on organic farms in the Nimar Region, India.

Description of the transparency

The table shows nutrient analysis results (lab-testing) of different dung and compost heaps on organic farms from the Maikaal bioRe project in India. The contents of nitrogen (N), phosphorus (P) and potassium (K) are considerably different in well-maintained and poorly maintained heaps. This shows that proper handling, like keeping the heaps moist and mixing them, pays off.

Setting up a compost heap or pit

→ Chapter 4.4

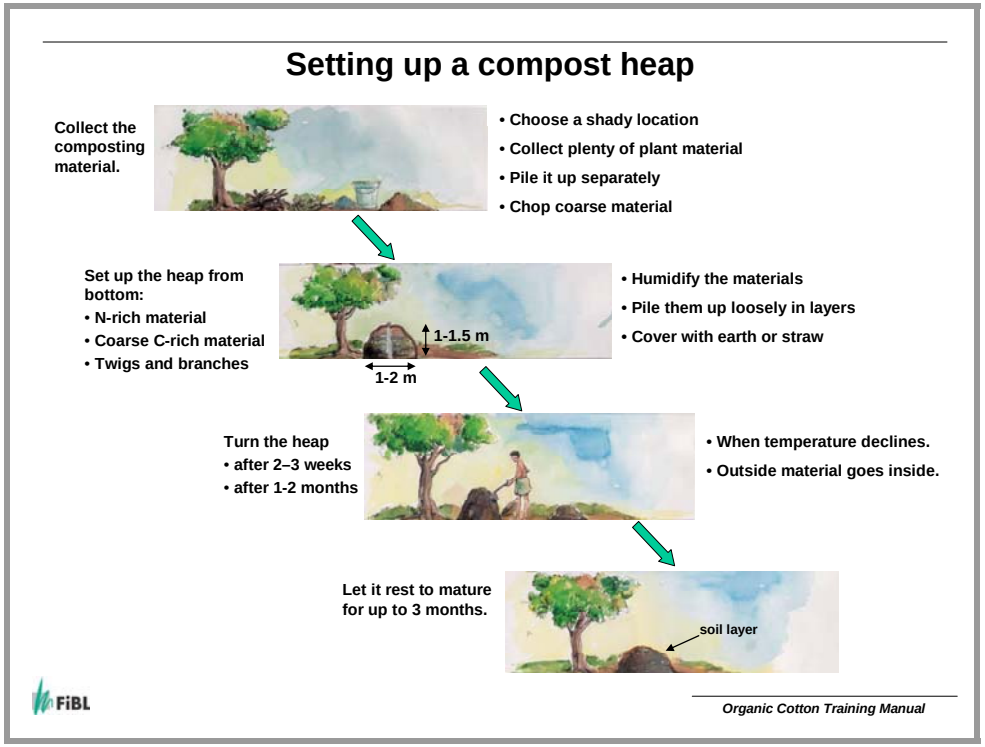
Key messages to be conveyed

- To set up a compost heap, select a shady location where transportation of materials, water and the final product is easy.
- Compost can be prepared in any season, but ideally heaps are set up during periods when sufficient biomass is available.
- To ensure sufficient aeration inside the heap, they should not be more than 2.5 m wide and 1.5 m high.
- Materials suitable for composting are crop residues, weeds, twigs, leaves, fodder residues, dung, biogas slurry, kitchen waste and agricultural processing by-products.
- Materials that can be added to improve the compost quality are cow-dung slurry, rock phosphate, wood ash and soil.
- For best results, mix sturdy material, medium-to-fine material and material with high nitrogen content.
- Turning the compost heap at least twice is essential for obtaining a manure of good quality.

Practical exercise: Setting up a compost heap

Preparation: Identify a suitable location close to the training venue. Collect the different materials required for preparing compost. Keep them ready along with the necessary equipments (buckets, knifes, sticks, shovels).

Present and explain Transparency 16 to introduce the practical exercise. Guide the participants (possibly in two groups) in chopping the compost material, piling up the heap layer by layer, sprinkling slurry of cow dung and water over the layers, adding rock phosphate and wood ash, and finally covering the heap with straw or a mud plaster. A detailed description of the ingredients and the process is given in the Organic Cotton Crop Guide.



Transparency 16: How to make good compost.

Description of the transparency

The transparency illustrates the steps for setting up a compost heap. Steps are described on the left side. Brief descriptions of how the steps should be implemented are given on the right side.

Bio-fertilizers

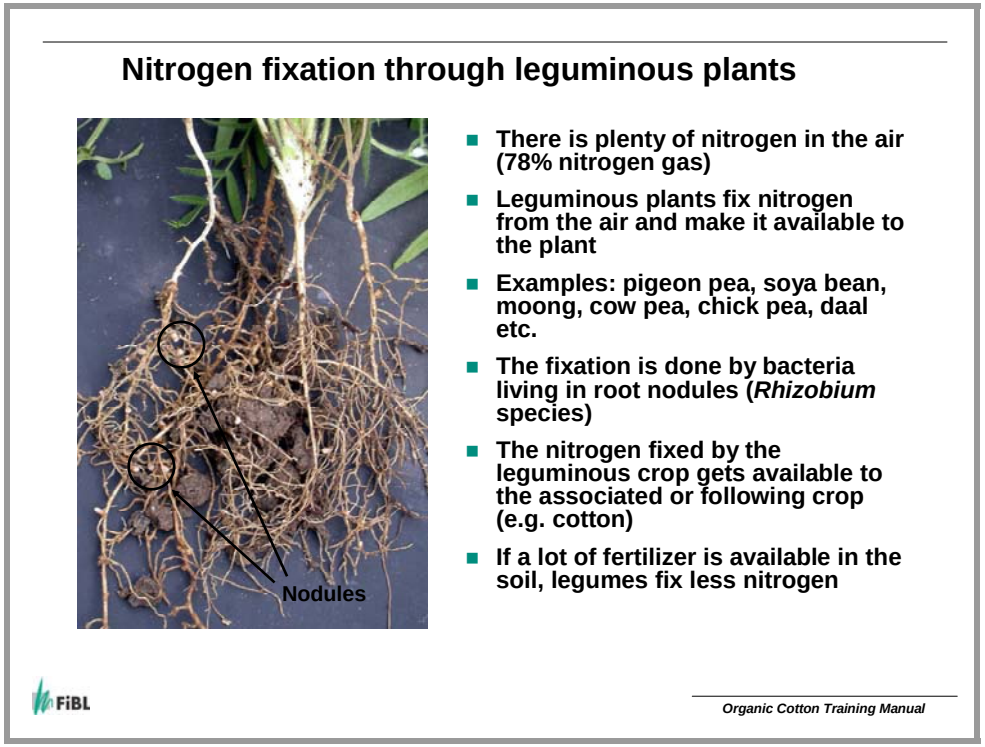
→ Chapter 4.8

Key messages to be conveyed

- Bio-fertilizers contain beneficial micro-organisms that increase the availability of nutrients.
- The application of bio-fertilizers can further increase the number and activity of beneficial micro-organisms.
- Some micro-organisms that are commercially sold as bio-fertilizers are:
  - *Rhizobium* (nitrogen fixation, see Transparency 17);
  - *Azotobacter* and *Azospirillum* (nitrogen fixation outside root nodules);
  - Phosphorus Solubilizing Bacteria (PSB);
  - *Mycorrhiza* (VAM, helps in taking up water and nutrients).
- To find out whether a specific bio-fertilizer has a real beneficial effect in the field, farmers can conduct simple plot trials comparing treated and untreated areas.

Guest lecture: Bio-fertilizers

Invite a guest speaker to give a short presentation on the use of bio-fertilizers in cotton cultivation. This can be a vendor of bio-fertilizers, a scientist or an extension worker or farmer experienced with the use of bio-fertilizers. If possible, display a range of available products and explain their effect. Discuss the usefulness of bio-fertilizers, and invite the participants to share their experiences.



Transparency 17: Nitrogen fixation by leguminous plants.

Description of the transparency

Rhizobium is an example of a beneficial micro-organism that is used as a bio-fertilizer. The bacteria cause the legume crop to form root nodules in which nitrogen from the air is fixed into a form that is available to the plant. The photo shows root nodules on a vetch plant.

It is possible to inoculate legume seeds with *Rhizobium* cultures. However, most soils already host the *Rhizobium* bacteria in sufficient numbers, so that an inoculation has little or no effect.

Keeping your cotton crop healthy

→ Chapter 5.1

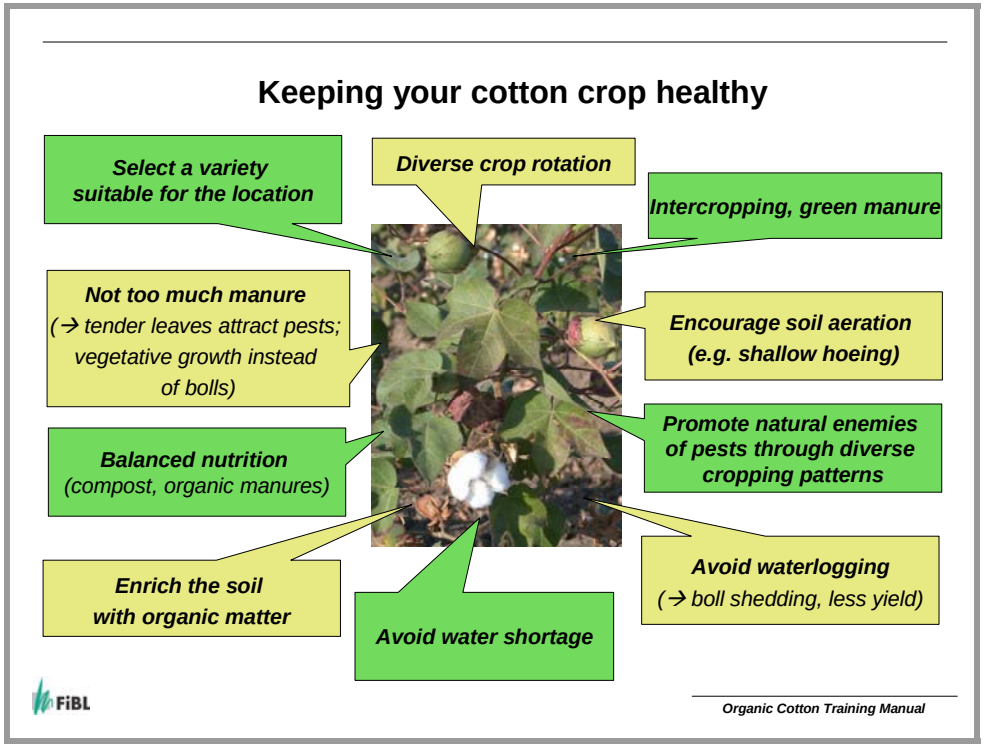
Key messages to be conveyed

- A large number of pests feed on cotton. The healthy cotton plant, however, has some means of defence.
- First and foremost, organic cotton farming tries to prevent pests from even becoming a problem.
- Good soil fertility and balanced nutrition support plant health.
- Diverse cropping systems and natural habitats enhance control of pest populations. Intercrops like pulses and trap crops like sunflower or maize distract pests from the cotton plants.
- Just like humans or animals, plants also have a kind of immune system that enables them to fight an attack, especially of sucking pests.
- To prevent stressful situations for the crop, apply appropriate amounts of manure and water through irrigation at the right time, and cultivate the soil (intercultural operations) in order to encourage soil aeration and decomposition of organic matter.

Group work: Measures to keep the cotton crop healthy

Prepare a pin board with "Healthy cotton" written in the centre. Divide the participants into two groups and ask them to discuss which measures can help to keep the cotton crop healthy (preventive pest management). A comparison with human health might help to illustrate the task: To stay healthy it is important to eat nutritious and balanced food, drink enough water, exercise, keep warm, have a sound social environment, avoid stress etc. Similarly a number of measures can help to keep the cotton crop healthy.

The groups are invited to briefly present their results by pinning their cards on the pin board. In the end, summarize the discussed measures with the help of Transparency 18.



Transparency 18: Measures used to keep a cotton crop healthy.

Description of the transparency

The figure illustrates the different aspects involved in keeping the cotton crop healthy and preventing damage through pest or disease attack. For each aspect, a number of specific measures can be formulated (see group work).

Important cotton pests

→ Chapter 5.2

Key messages to be conveyed

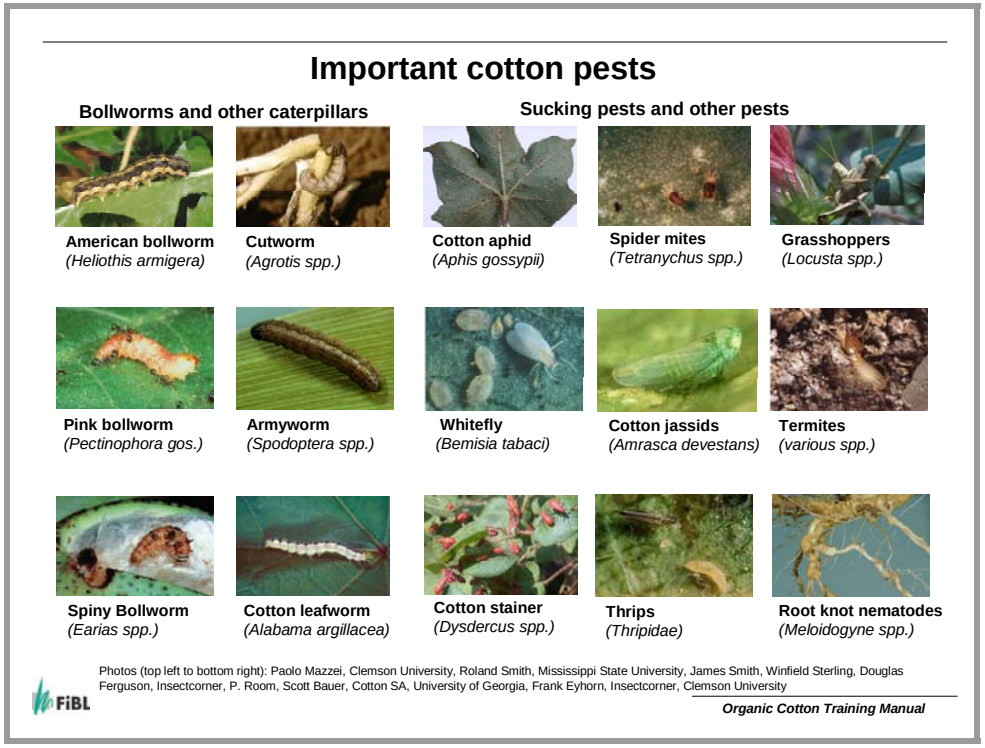
- To effectively manage pests in cotton, farmers should know the main pests and the damage they cause to the crop.
- Knowledge of the complex life cycles of the pests (different stages in the development) helps farmers adapt pest management strategies accordingly.

Demonstration: Knowing more about cotton pests

Collect different cotton pests and keep them in glass jars or preserve them in alcohol. For pests that you cannot find in the fields, use drawings or photos (e.g. from the transparency). If possible, also collect plant parts affected by the respective pest.

Divide the participants into groups and distribute the displayed pests to them. For each pest the group is to fill in a card indicating the name of the pest, the damage it causes, characteristic features of its life cycle and its natural enemies. Each group presents their results to the other participants.

To consolidate the information, show Transparency 19 with names of the pests hidden (in the PowerPoint file, delete the names, or use animated presentation mode). Ask the participants for the names of the pests. Supplement with the information provided in the Organic Cotton Crop Guide.



Transparency 19: Important cotton pests (common English and scientific names).

Description of the transparency

The transparency shows photos of some important cotton pests along with their common English and scientific names.

Management of major cotton pests

→ Chapter 5.2 – 5.3

Key messages to be conveyed

- The first step in organic pest management is to support healthy growth of the cotton crop (refer to previous chapter).
- The second step is to prevent pest populations from building up and becoming a problem.
- Preventive measures include promotion of natural enemies, cultivation of trap crops, use of pheromone traps or dispensers, and removal of crop residues.
- Only when the first two steps of organic pest management are not sufficient to keep pest populations below the economic threshold, should direct control methods be used.
- Direct control methods in organic cotton farming include biological control (use of living organisms or germs affecting the pest), natural pesticides and mass trapping.

Group work: Management of major cotton pests

Identify together with the participants the 3-4 most important cotton pests in their region. Write the names of these pests on cards. Ask the participants to form groups dealing with one pest each. The participants shall join the group of the pest they are most familiar with. Each group shall discuss measures to prevent and control damage by the respective pest. The suggested measures are to be noted down on cards of different colours for preventive and direct control measures. Each group is to present their points by pinning the cards on a pin board. Summarize the topic by using Transparency 20, possibly adapted to regional conditions.

If available and if time permits show a video on organic or integrated pest management.

Pest management in cotton

	Pest	Preventive measures	Direct control measures
	**Bollworms** *(Helicoverpa and others)*	▪ Trap crops: sunflower, okra, castor ▪ Hand-pick damaged capsules ▪ Encourage natural enemies ▪ Remove cotton stalks ▪ Cattle grazing after picking is over	▪ Bt-spray, NPV spray ▪ Neem, botanical preparations ▪ Buttermilk spray ▪ Pheromone traps, light traps ▪ Trichogramma cards
	**Aphids, jassids, thrips, whitefly** *(Bemisia)*	▪ Intercrop of moong, cow pea etc. ▪ Avoid high manure application ▪ Avoid waterlogging and water shortage ▪ Promote natural enemies by growing flowering plants	▪ Neem, botanical preparations (chilli, sweet flag, turmeric etc.) ▪ Soft soap spray ▪ Cow urine spray ▪ Potato starch spray ▪ Yellow sticky traps
	**Cotton stainers** *(Dysdercus)*	▪ Frequent soil cultivation to destroy the eggs (also along field borders) ▪ Encourage birds (turmeric-coloured rice, bird perches, trees) ▪ Avoid stand-over of cotton	▪ Pyrethrum spray ▪ Botanical sprays (neem, custard apple, garlic bulb, sweet flag, sweet basil, Derris species) ▪ Grazing of chickens
	**Cutworms** *(Agrotis and other species)*	▪ Early soil cultivation ▪ Remove weeds in and around fields ▪ Encourage birds, spiders etc. (bird perches, trees, hedges)	▪ Apply neem cake into the soil ▪ Pyrethrum, Derris or thyme spray ▪ Cutworm baits ▪ Hand picking or Bt-spray at night

FiBL

Organic Cotton Training Manual

Transparency 20: Management recommendations for major organic cotton pests.

Description of the transparency

The table lists important cotton pests and preventive as well as direct control measures recommended in organic pest management.

Promotion of natural enemies

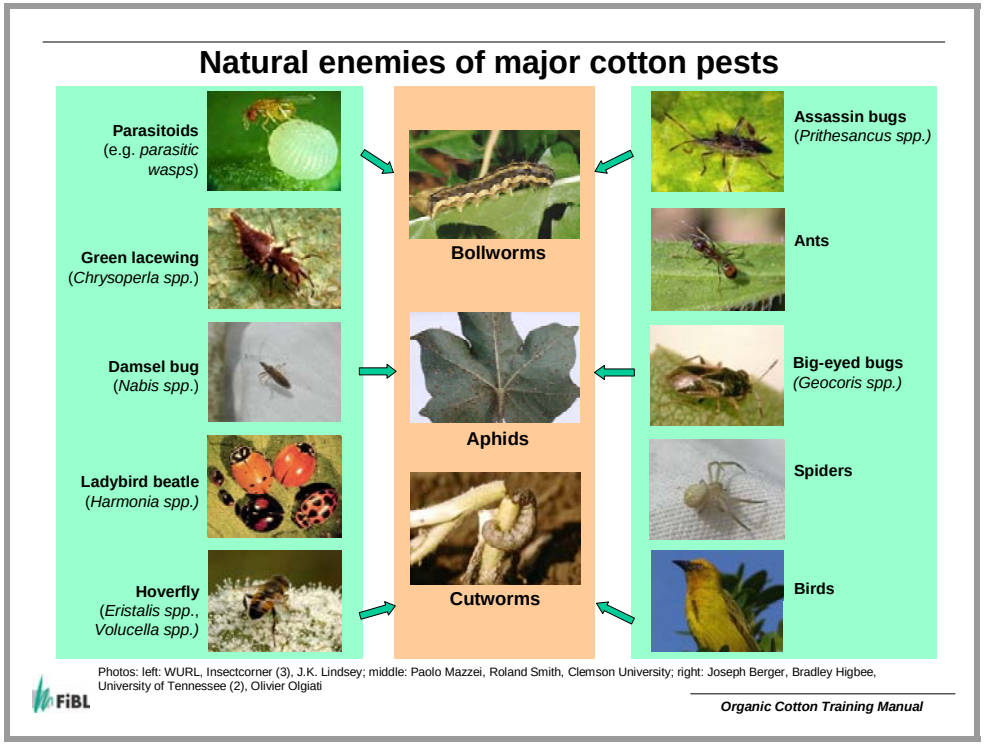
→ Chapter 5.3.1

Key messages to be conveyed

- In a diverse field not treated with pesticides, natural enemies help the farmer keep pest attacks within tolerable levels.
- Natural enemy populations can be increased in the field by providing suitable habitats: intercropping of flowering plants, applying mulch, setting up bird perches etc.
- Important natural enemies are ladybird beetles, spiders, lacewings, parasitic wasps, ants and bugs (see transparency).
- The greater diversity of plants growing in a field, the higher the number of different natural enemies. Intercropping of pulses or other crops in cotton is therefore an effective preventive pest-management strategy.
- To attract beneficial insects to the field, gaps in the rows of cotton seedlings can be re-sown with flowering plants like sesame, sunflower and marigold.

Demonstration: Insect zoo

Present and explain Transparency 21. To see how natural enemies work, collect different varieties of pests (bollworms, aphids, jassids, cutworms etc.) and their natural enemies (ladybird beetles, lace wings, assassin bugs, spiders etc.) from a cotton field and put them in a glass jar, together with some twigs of cotton (stuck in wet cotton wads to keep them fresh). Observe over 2–3 days which insects are eaten by others, and which survive.



Transparency 21: Important natural enemies of some major cotton pests.

Description of the transparency

The central column shows three important cotton pests. To their left and to their right important natural enemies feeding on these pests are shown. Note: Not all natural enemies feed on all pests.

Direct pest management methods

→ Chapter 5.4

Key messages to be conveyed

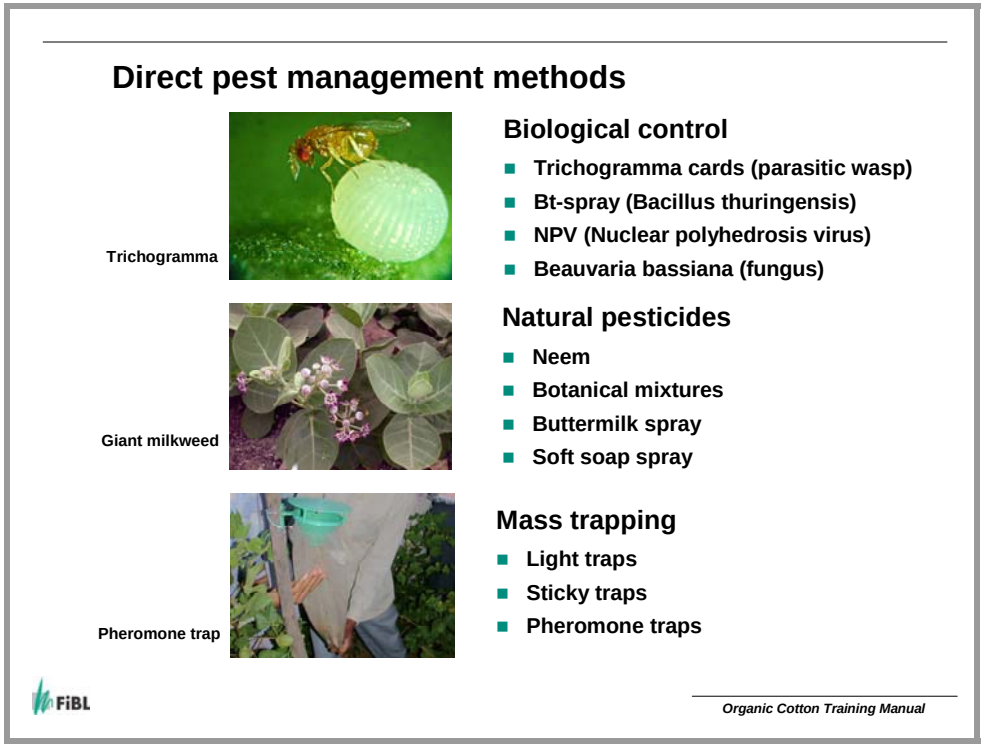
- Only when the first two steps of organic pest management – strengthening the crop and preventive measures – are not sufficient to keep pest populations below the economic threshold, should direct control methods be used.
- Biological control uses living organisms or germs to affect the pests.
- There are a number of natural pesticides that can be used in organic cotton cultivation. Most of them are based on locally available plants.
- Caution: Many natural pesticides also affect beneficial insect populations and thus should be used only when really necessary.
- Traps can help reduce the populations of certain pests, especially of moths. If used at an early stage, they can prevent mass multiplication.

Practical exercise: Preparing natural pesticides

Preparations: Arrange materials and equipments for preparing 3-4 natural pesticides in group work.

Provide an overview on the direct pest management methods with the help of Transparency 22. Invite the participants to share their experiences with using natural pesticides. If available, distribute sheets describing the preparation of different natural pesticides used in the region.

Divide the participants into groups, each group preparing one natural pesticide. The groups can be instructed by an extension worker or farmer experienced in the preparation and use of the natural pesticide. In the end, each group presents their method and product to the other participants.



Transparency 22: Direct pest management methods.

Description of the transparency

The transparency shows three categories for direct pest management and lists some examples of each category. The pictures show one example, with the name indicated to the left.

Monitoring pests

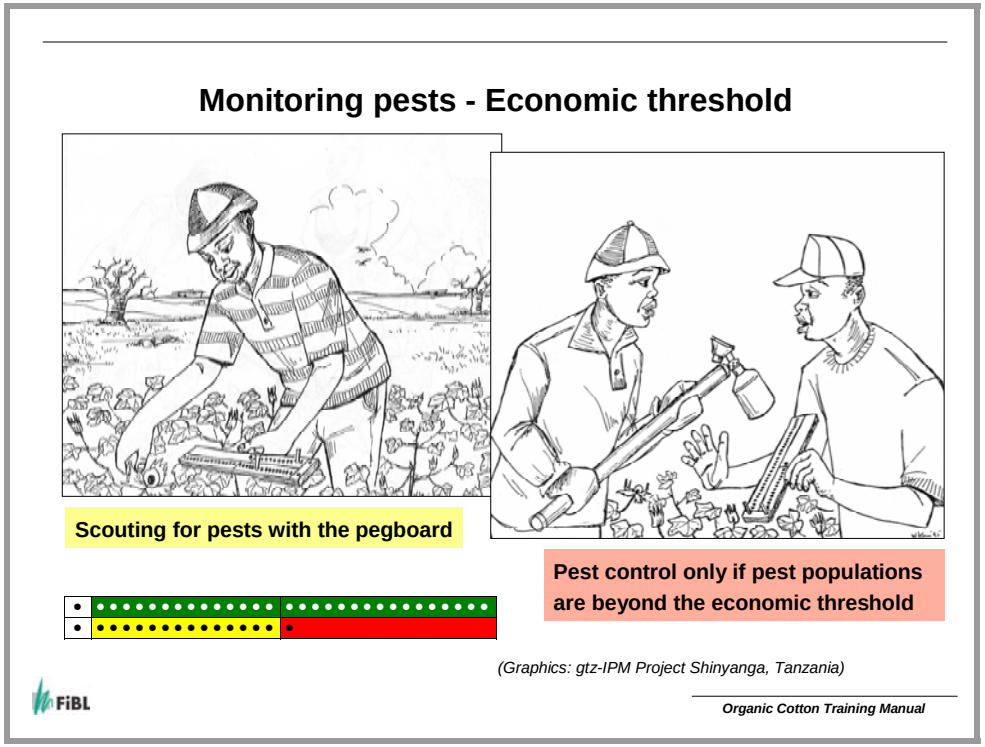
→ Chapter 5.5

Key messages to be conveyed

- A key to successful pest management in cotton is a careful and continuous monitoring of pest levels in the cotton fields during the critical growth period (approx. 4 weeks after sowing up to the second harvest).
- Monitoring helps to determine when a pest population reaches the economic threshold and, therefore, when direct control measures need to be implemented.
- For different pests there are different economic threshold levels. Pest populations below the economic threshold are acceptable and do not cause crop loss to an extent that justifies spraying.
- For monitoring pest populations, randomly inspect a number of cotton plants while crossing the field in diagonals.
- It is important that pest management measures are implemented at the right time – not too early, not too late.

Field demonstration: Monitoring with the help of the pegboard

Explain the concept of monitoring and the use of the pegboard (see description in the Organic Cotton Crop Guide) with the help of Transparency 23. If possible, visit a nearby cotton field and demonstrate the use of the pegboard for monitoring American bollworms or other insects. This exercise can be combined with field demonstrations on pests, pest damage and natural enemies covered in Chapters 5.2 and 5.3.



Transparency 23: Monitoring bollworm infestation based on the concept of economic thresholds with the help of a peg board.

Description of the transparency

The picture on the left side shows a farmer using the pegboard for monitoring bollworm populations in a cotton field. An example of a pegboard is given below the drawing. The picture to the right emphasizes that spraying (of natural pesticides!) should only be done if the economic threshold is reached.

Soil cultivation and weed management

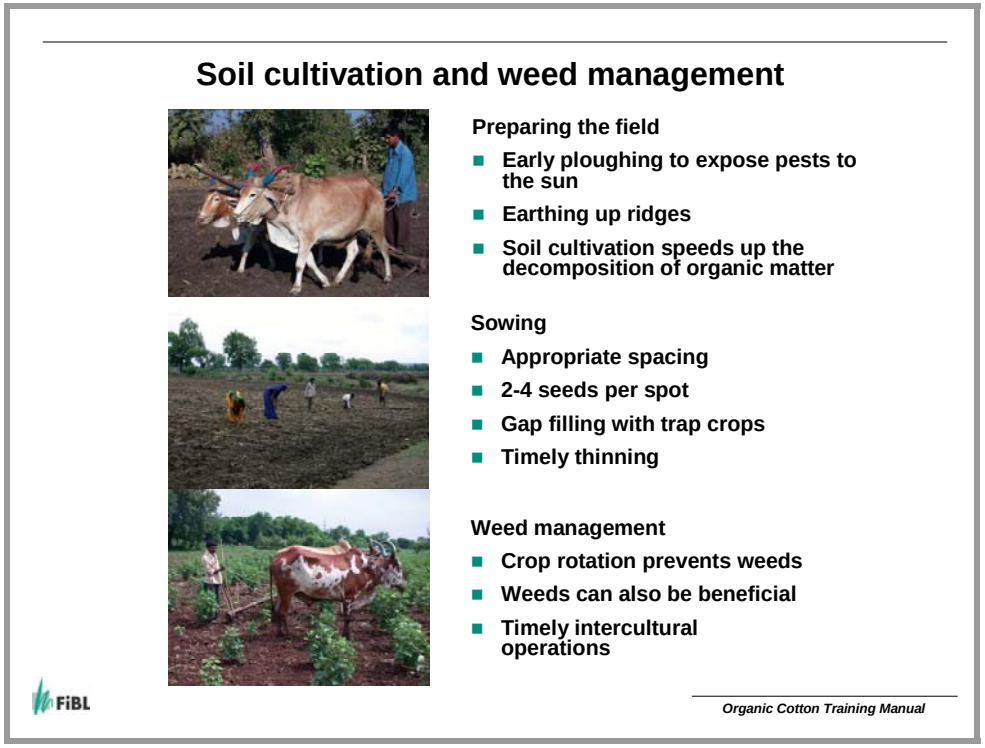
→ Chapters 6.1 – 6.3

Key messages to be conveyed

- For soil and seedbed preparation the same 'good farming practices' should be followed as recommended in conventional farming.
- Once the cotton crop has developed a good stand and the first top dressing of organic manure has been applied (e.g. de-oiled castor cake (DOC) and compost), earthing up ridges helps suppress weeds and reduces evaporation of soil moisture.
- The ideal spacing depends on the soil type and the irrigation facilities. The spacing should be such that the mature crop covers the soil completely.
- Re-sow cotton in gaps where the seeds did not germinate, or fill the gaps with trap crops such as sunflower, maize and pigeon pea.
- Most important for successful weed management in cotton are proper crop rotation and timely soil cultivation.
- Fields need **not** be kept completely free of weeds: weeds take up nutrients which otherwise would be lost through leaching, and are important hosts for beneficial insects.
- They also serve as trap crops, distracting pests from the cotton plant.

Brain storming: Soil cultivation and weed management

Prepare three charts with the topics 'Preparing the field', 'Sowing' and 'Weed management'. Ask the participants what practices they find useful in the three areas, and note them down on the respective charts. Complement the collected points with the help of Transparency 24.



Transparency 24: Soil cultivation and weed management in organic cotton.

Description of the transparency

The transparency lists some measures recommended for organic cotton cultivation related to field preparation, sowing and pest management. Photos are of the Maikaal bioRe project in central India.

Water management

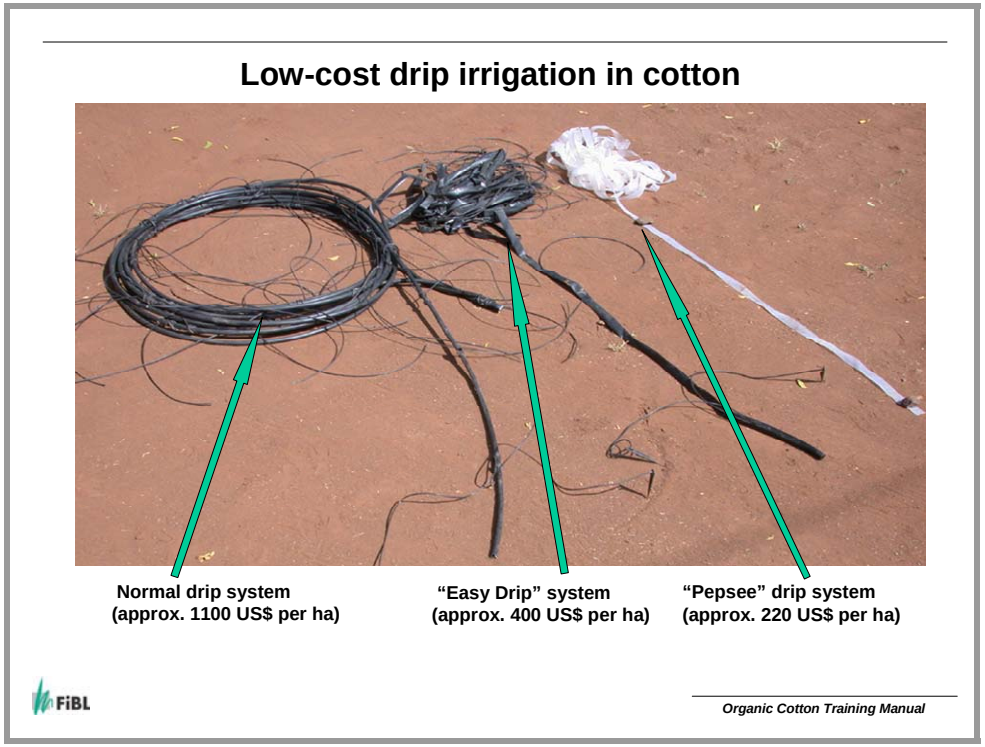
→ Chapters 7.1 – 7.3

Key messages to be conveyed

- Increasing soil organic matter improves water retention in the soil, and thus allows the crop to better sustain dry periods.
- During the first 6–7 weeks after sowing, irrigation should be moderate in order to avoid too heavy vegetative growth, and to encourage cotton roots to penetrate deeply into the soil.
- The cotton crop is very sensitive to waterlogging, which causes increased boll shedding, thus affecting yields.
- Shallow soil cultivation (hoeing) breaks the soil capillaries and thus reduces evaporation.
- Active rainwater harvesting through pits or trenches leading to wells can help to recharge groundwater levels and thus to improve the availability of irrigation water.
- Drip irrigation systems enable farmers to start cotton cultivation before the onset of the rainy season, to bridge dry periods and to protect at least part of their fields from drought.
- Low-cost drip systems allow farmers to install drip-irrigation with lower investment costs, but the cheaper systems are usually less durable.

Guest lecture: Irrigation and water saving in cotton

Invite a resource person (extension worker, scientist, experienced farmer) to share his/her knowledge and experience with irrigation and water saving in cotton cultivation. If possible, illustrate the suggested measures with photos, samples or field visits. Discuss the advantages and disadvantages of the suggested measures with the participants and note down the points.



Transparency 25: Drip, "Easy drip" and "Pepsee drip" systems for cotton.

Description of the transparency

The photo shows three low-cost drip irrigation systems used in cotton fields in central India. From left to right the durability as well as the price decreases. The 'Pepsee' system makes use of thin polyethylene pipes locally used for packing ice candies. Because it is installed without micro-tubes one pipe is needed per cotton row.

Picking, storage, processing and trade

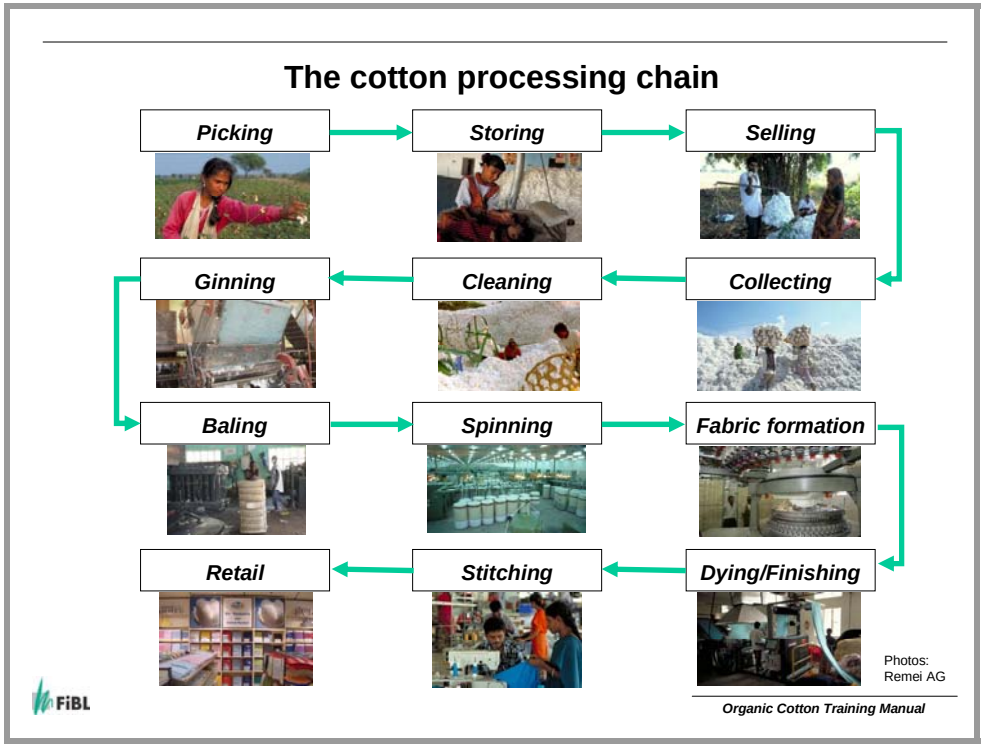
→ Chapters 8.1 – 8.3

Key messages to be conveyed

- The quality of the cotton harvest depends on the length of the fibre (staple length), on the degree of contamination with non-fibre material such as leaves or dust, and on the portion of fibre damaged by pest or disease infestation.
- Measures like picking cotton at the right time and keeping cotton of lower quality separately improve the quality of the harvest, and thus pay off directly for the farmers.
- To reduce the labour required for cotton picking use a long sack so that the weight rests on the ground, keep the sack permanently open with a ring of flexible wood and pick two rows at a time.
- Take care to prevent contamination from dust or chemicals, especially fertilizers, pesticides and petroleum while storing the cotton.
- Throughout the entire organic cotton processing chain, it is important to prevent contamination and to separate organic from conventional cotton.
- The market success and thus the businesses of all who are involved in the cotton chain depend on whether a product of high quality and ensured organic integrity can be achieved.

Discussion: Identifying critical points for quality management

Present Transparency 26 and explain the individual steps of the cotton processing chain from field to the consumer. Ask the participants what could affect the quality or the organic integrity of the product in each processing step. Discuss why the quality of the final product is important also for the organic farmer.



Transparency 26: The cotton processing chain – from field to consumer.

Description of the transparency

The arrows lead you through the individual steps of the cotton processing chain from the field to the consumer. The photos illustrate how organic cotton from the Maikaal bioRe project reaches the retail outlets in Switzerland as organic garments.

Strategies for organic cotton production

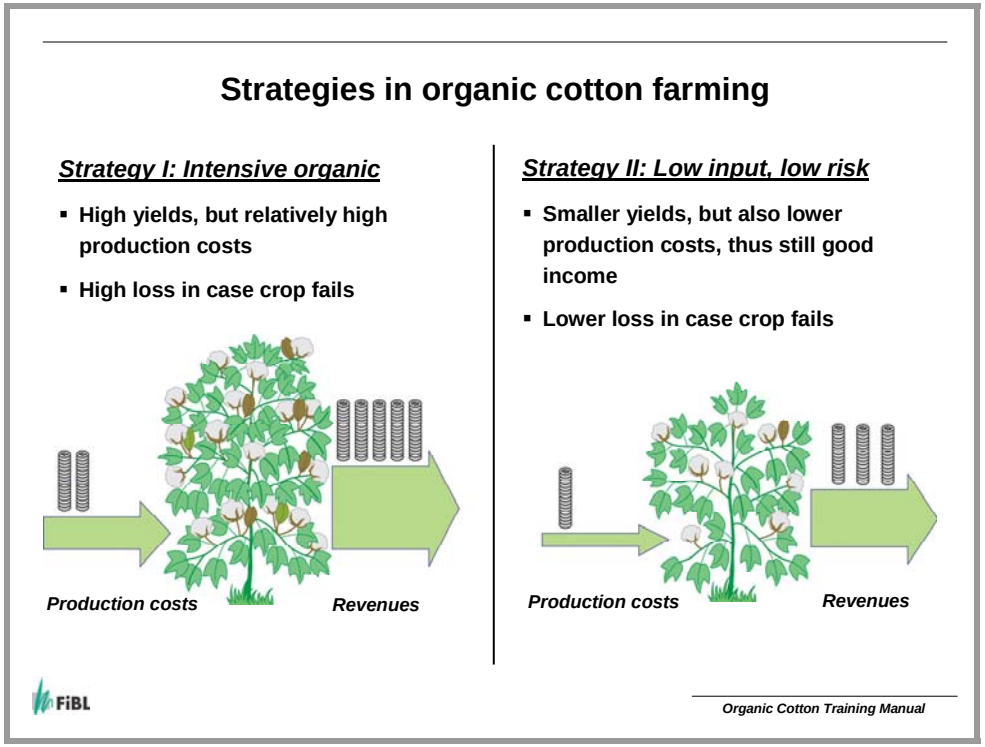
→ Chapter 9.2

Key messages to be conveyed

- Generally, farmers' income from a crop depends on the yields, the costs of production, the price gotten on the market and the production risk involved.
- In organic cotton, farmers can basically follow one of two different strategies to achieve good profits: 'intensive organic' or 'low input, low risk'.'
- The first strategy ('intensive organic') aims to achieve high yields through optimum nutrient supply and crop care.
- The second strategy ('low cost, low risk') tries to reduce production costs and the risk of production, targeting medium yields.
- Although it is not possible to draw a clear line between the two strategies, this basic understanding can help farmers to make their farms more profitable and/or less risky.

Discussion: Making organic cotton farming profitable

Using a board, explain the different general options for increasing farmers' income (see Organic Cotton Crop Guide Figure 22). Then present Transparency 27 and explain the idea of the two different strategies. If possible, provide examples of farmers following the strategies (e.g. the examples given in the Crop Guide Table 9). Ask the participants which strategy they would opt for on their farm. Discuss the advantages and disadvantages of both strategies. Which strategy could be suitable for which type of farms? The objective of this exercise is to make participants aware that there is no one-size-fits-all approach in organic cotton farming.



Transparency 27: Two strategies for achieving good revenues from organic cotton.

Description of the transparency

The transparency shows two different approaches to organic cotton farming. In reality, of course, farms are somewhere in-between. The major advantages and disadvantages are listed for both strategies. The illustration shows how higher or lower input costs (piles of coins) lead to bigger or smaller crops, resulting in higher or lower revenues. The difference between the revenues (e.g. 500 coins) minus the production costs (e.g. 200 coins) is the profit or gross margin (in this case 300 coins).

The economic performance of organic cotton

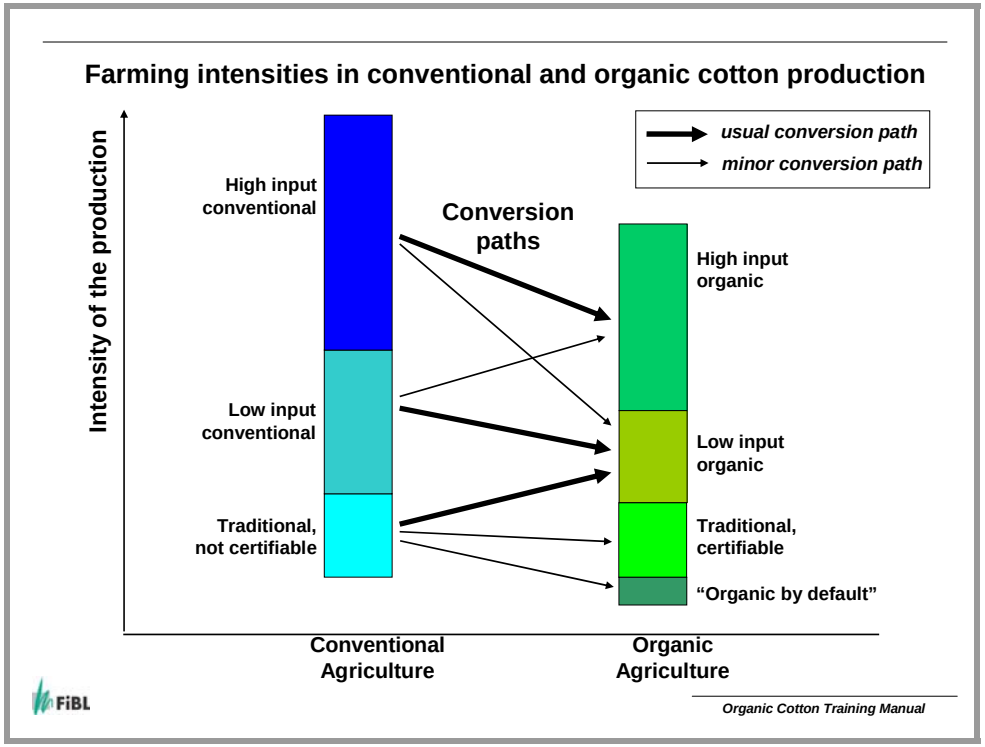
→ Chapters 9.3 and 9.4

Key messages to be conveyed

- The yields and profits of organic cotton production vary to a great degree among different farms and different regions.
- Organic cotton production can be more or less intensive regarding input use and productivity (see Transparency 28).
- Most organic cotton projects in the tropics report that after going through a conversion period of 2–3 years, the cotton yields on organic farms reach back to roughly the same level.
- Costs for inputs are usually 20-80% lower, depending on whether organic manures and pest management items are purchased from outside or are produced on the farm itself.
- With similar yields, lower production costs and a premium price, organic cotton farming usually is more remunerative compared to conventional cotton farming.
- During the initial years of organic management (conversion period), the farm economy looks different.
- Record keeping can help compare the economies of organic and conventional farms, and monitor the economic performance during the conversion period.

Exercise: Record keeping

Introduce the concept of record keeping with the help of the template given in Annex 10.6 of the Crop Guide. Invite the participants to fill in empty templates in small groups, using the examples of their own farms or of farmers they know. If time permits organize a visit to a village and ask the participants to fill in the templates together with cotton farmers in interviews. Each group shall calculate the production costs, revenues and profits, and present the result to the plenum.



Transparency 28: Farming intensities in conventional and organic cotton production. The arrows indicate typical paths of conversion from conventional to organic production.

Description of the transparency

The illustration compares the intensity of production (input use, yields) of different types of conventional (left) and organic cotton farming (right). While conversion to organic farming usually means a reduction in intensity (the right bar is lower), in some cases it can also lead to higher intensity – with intensive organic nutrient and pest management. The arrows indicate typical developments when conventional farms convert to organic management.

The conversion process

→ Chapter 9.5

Key messages to be conveyed

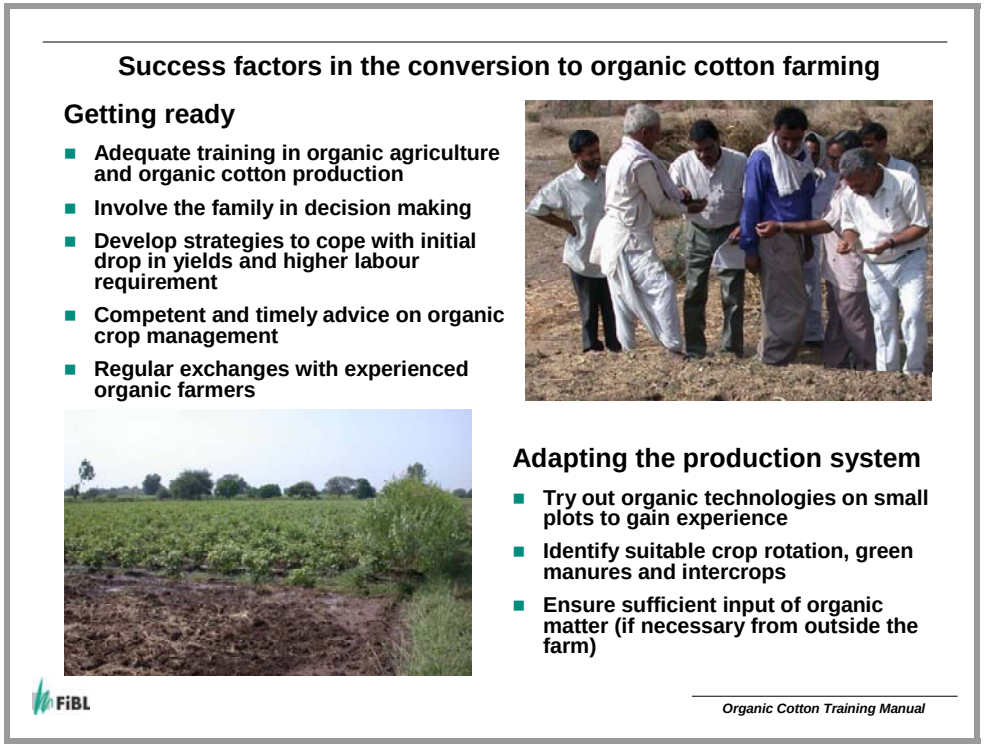
- The most important hurdle for organic cotton production is the challenge of getting through the conversion process.
- During conversion, most farmers experience a drop in yields, while at the same time measures to re-establish soil fertility require additional effort and labour.
- With proper organic management implemented, yields usually recover after 2–3 years, as the soil builds up organic matter and populations of soil organisms increase.
- Conversion to organic farming usually results in greater diversity: of crops grown, of types of activities and of solutions to problems.
- Organic farming is a knowledge-intensive type of production, and thus competent extension services play an important role.
- Appropriate measures can help to reduce problems encountered during the conversion process.

Group work: Developing a crop calendar

Introduce the topic with the help of Transparency 29. Divide the participants into 3-4 groups. If participants are from different regions, form groups by region. Provide each group with a chart with a grid as given below:

Period/Month	Crop management & general activities	Soil and water management	Pest management & crop care

Ask the groups to fill in the measures they find suitable for organic cotton farming for each month/period. Inspiration can be drawn from the crop calendar in Annex 10.5 of the Organic Cotton Crop Guide. Each group shall present their result in the plenum.



Transparency 29: Success factors in the conversion to organic cotton farming.

Description of the transparency

The transparency lists some crucial aspects to be considered before and during conversion to organic cotton farming. The photo to the right shows a farmer explaining his compost management to extension staff from different organic cotton projects in India. The photo to the left shows an organic cotton field with a border crop of pigeon pea (right) and residues of a previous soy bean crop (front).

The role of women in organic cotton farming

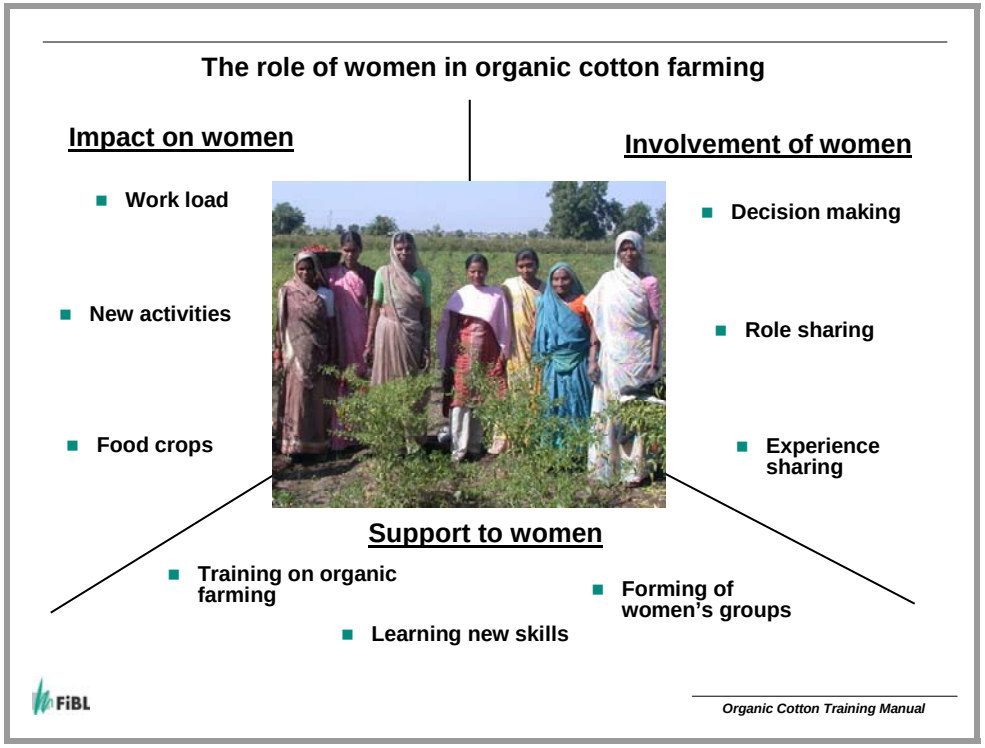
→ Chapter 9.6

Key messages to be conveyed

- Although on many farms most decisions are still taken by men, women play an important role in organic farming.
- Conversion to organic cotton farming is not only a question of production techniques; it has equally important implications for the social and economic level of the household.
- Thus the different perceptions and needs of the family members should be taken into consideration when thinking about conversion.
- Organic cotton projects need to ensure that women are included in decision-making processes, especially concerning the conversion process. For this, they should be encouraged to participate in training activities and meetings.

Group work

Introduce the topic with the help of Transparency 30. Divide the participants into groups and invite them to brainstorm about the different aspects mentioned on the transparency. Ask them to note down their main points on cards. Each group shall present the result of their discussion by posting their cards on a chart with the three divisions. Discuss possible activities and measures that organic cotton projects can do to improve the participation of women. The aim of this session is to stimulate awareness among participants for gender issues in organic cotton farming.



Transparency 30: The role of women in organic cotton farming.

Description of the transparency

The transparency indicates some relevant aspects when it comes to re-thinking the role of women in organic cotton farming. The points listed in the three fields are to stimulate reflection and discussion. The photo shows women harvesting red chillis on an organic cotton farm of the Maikaal bioRe project, central India.

Annex 1: Example of a 5-day training schedule

Time	Monday	Tuesday	Wednesday	Thursday	Friday
9:00	• Introduction to the training: objectives, programme • Introduction of the participants • Why organic cotton?	• Soil properties • The importance of soil organic matter	• Keeping your cotton crop healthy	Excursion to organic cotton farms: • The farmer presents the farm and explains his management practices.	• Soil cultivation and weed management • Water management • Picking, storage, processing and trade
10:30	**Tea Break**				
11:00	• Growing organic cotton • Organic standards	• Crop rotation – rotation crops • Green manures and intercrops	• Important cotton pests • Management of major cotton pests	• Demonstration: Pests and natural enemies • Exercise: Monitoring pests	• Strategies in organic cotton production • The economic performance of organic cotton
12:30	**Lunch Break**				
13:30	• Inspection and certification	• Nutrient requirements • Uptake of nutrients • Nitrogen immobilisation	• Promotion of natural enemies • Direct pest management methods	• Exercise: Setting up a compost heap	• The conversion process • The role of women in organic cotton farming
15:30	**Tea Break**				
16:00	• Requirements of the cotton crop • Selecting the right cotton varieties	• Application of manures and fertilizers • Compost quality • Bio-fertilizers	• Monitoring pests	• Exercise: Record keeping	• Course evaluation and feedback about the training
17:30	**Break, Dinner**				