Components of a Sustainable Cotton Production System: Perspectives From the Organic Cotton Experience

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Introduction

Organic cotton is attracting a lot of attention at present following some impressive growth in recent years. This situation raises questions and challenges, which the industry must attempt to answer (Organic Exchange 2008). One of the central ones is how to guarantee the sustainability of the system in a time of growth (Ferrigno 2008), which in turn means identifying and analyzing what the components of a sustainable organic cotton system are. This analysis will have implications for the organic cotton sector itself, but also for the wider cotton sector and sustainable development debate.

The Farm Development Program of Organic Exchange (OE) has been working for the past three years both to promote the production of organic cotton, and to understand and shape how it is produced and what are the key components of an organic cotton system.

This paper talks about the current status of organic cotton production worldwide, and the necessary components to ensure production is sustainable, drawing on our work in India, Africa, Latin America, Turkey and United States. The paper concludes with some recommendations for the sector, for policy makers and for the cotton industry more generally.

Current Status of Organic Cotton

Organic cotton contributes 0.55% of global cotton production as of the latest estimates. Textiles made from organically grown cotton fiber have also achieved significant penetration in some markets, such as the UK, Germany, Switzerland, Japan, and the United States.

1) With contributions from other Farm Development Programme team members Prabha Nagarajan, Silvere Tovignan, Phil Monday, Doraliz Aranda. Simon Ferrigno is Director of the Organic Exchange Farm Development Program and Alfonso Lizarraga its Director for Latin America.

Organic cotton production in the 2007/08 season was estimated at 145,872 metric tons of fiber. The data has been confirmed for most regions although some uncertainties remain, where data has been estimated based on past reports and trends (Turkey) or where it is difficult to verify and cross-reference reports (e.g., China). Total production was 152% higher than in 2006/07, partly due to better data gathering and more reliable information, although 60% of the additional production is from increased production by existing known projects. Production currently takes place in 22 countries, covering the same regions as conventional cotton. However, the vast majority (87%) of production takes place in just three countries: India, Turkey and Syria.

The total area globally confirmed by research is 161,000 hectares. We extrapolate that total area in organic cotton production is close to 200,000 hectares. At least 177,678 confirmed farmers (with 70% of projects reporting data) are involved, of whom nearly 18% are women. Total organic cotton farmer numbers are estimated at 217,000 (Organic Exchange, 2008).

Growth in production has been ad-hoc until recently, meaning that, while organic certification is generally to one of the EU (2092/91) or US (NOP) legal standards, the organization of production and farmers is not to any recommended or accepted set of practices. Recent growth has led to questions and discussion over the meaning and definition of what an organic cotton system needs to be sustainable and over the integrity of organic cotton.

Africa is a region with much potential in organic cotton, some success stories and some challenges. Experiences in Africa have many valuable lessons in the definition of a sustainable production system (see Box 1 and Ferrigno *et al*., 2005).

Organic cotton production in Africa 2007/08: trends and analysis[2]

Organic cotton production continues to increase in Africa. During the 2007/08 season, Africa produced a total of 6,531 MT of organic cotton fiber, 43% more than the 3,716 MT harvested in 2006/07.

Eight countries (Benin, Burkina Faso, Mali, Senegal, South Africa, Tanzania, Uganda and Zambia) continue to lead the production of organic cotton on the continent. Pilot production began in South Africa in conjunction with a collaborative research project with Cotton South Africa, South Africa Agricultural Research Center in Rustenburg, and Woolworths South Africa.

Tanzania and Uganda are Africa's largest producers of organic cotton, contributing 83% of Africa's total production of the fiber. Tanzania alone produced 44% of the continent's total organic cotton fiber, taking over the lead from Uganda.

The greatest increase in organic cotton production in Africa over the past season was in Zambia, followed by Burkina Faso. Zambia's production increased as a result of trial acreage being scaled up, while Burkina Faso's strong growth is in large part due to having secured a 5-year contract with a major buyer.

Growth has continued across Africa despite late rains and subsequent flooding, especially in September 2007. Production growth may have been higher with more regular rainfall, but better market access and advance contracts, which many African countries now enjoy, is just as important a factor as weather in the growth figures. Reports from African farming projects are mostly optimistic, with new farmers joining existing projects, production scaling up in South Africa, and a new project beginning in 2008/09 in Benin.

OE would normally expect organic cotton production to increase approximately 40% throughout Africa in 2007/08. However, as a result of the poor organic cotton seed supply (seed may be delivered late, of poor quality, and/or in insufficient quantities) and organic farmers being abandoned by potential buyers due to DDT concerns, production may fall or stagnate in the years to come.

Africa CFA Region
(Benin, Burkina Faso, Mali, Senegal)

In the Africa CFA region, Burkina Faso has been surging ahead in terms of production, having secured high priced long-term contracts for the next five years. Next in order of production are Mali, Benin, and Senegal. All countries are seeing production increase, though the increases are occurring more slowly in countries such as Benin where sales remain uncertain and long-term commitments are unclear. In Benin, new certified organic cotton production will come on board in 2008/09, with a new project in Pendjari, developing organic cotton as a buffer around a national park to protect the national park from chemical contamination. Production on a significant scale will not occur for another 2-3 years.

2) Extract from Organic Exchange Farm and Fibre Report 2008

Organic Cotton and the General Cotton Sector

Organic cotton has not evolved in a vacuum. It was introduced in response to social and environmental challenges, many of which have changed over time. As such, the organic cotton sector needs to evolve and respond to new challenges. It must also be seen, and see itself, as part of a global system in which lessons must be shared.

In West Africa, some of the challenges that have motivated trials with organic cotton include the macroeconomic environment, such as impacts from subsidies. Various factors in recent years have left many cotton farmers on the margins of economic viability (PAN 2003, Ton 2002a).

However, in many ways organic cotton's main focus is to lift the entire cotton sector, not replace it. Natural fibers may need to stick together.

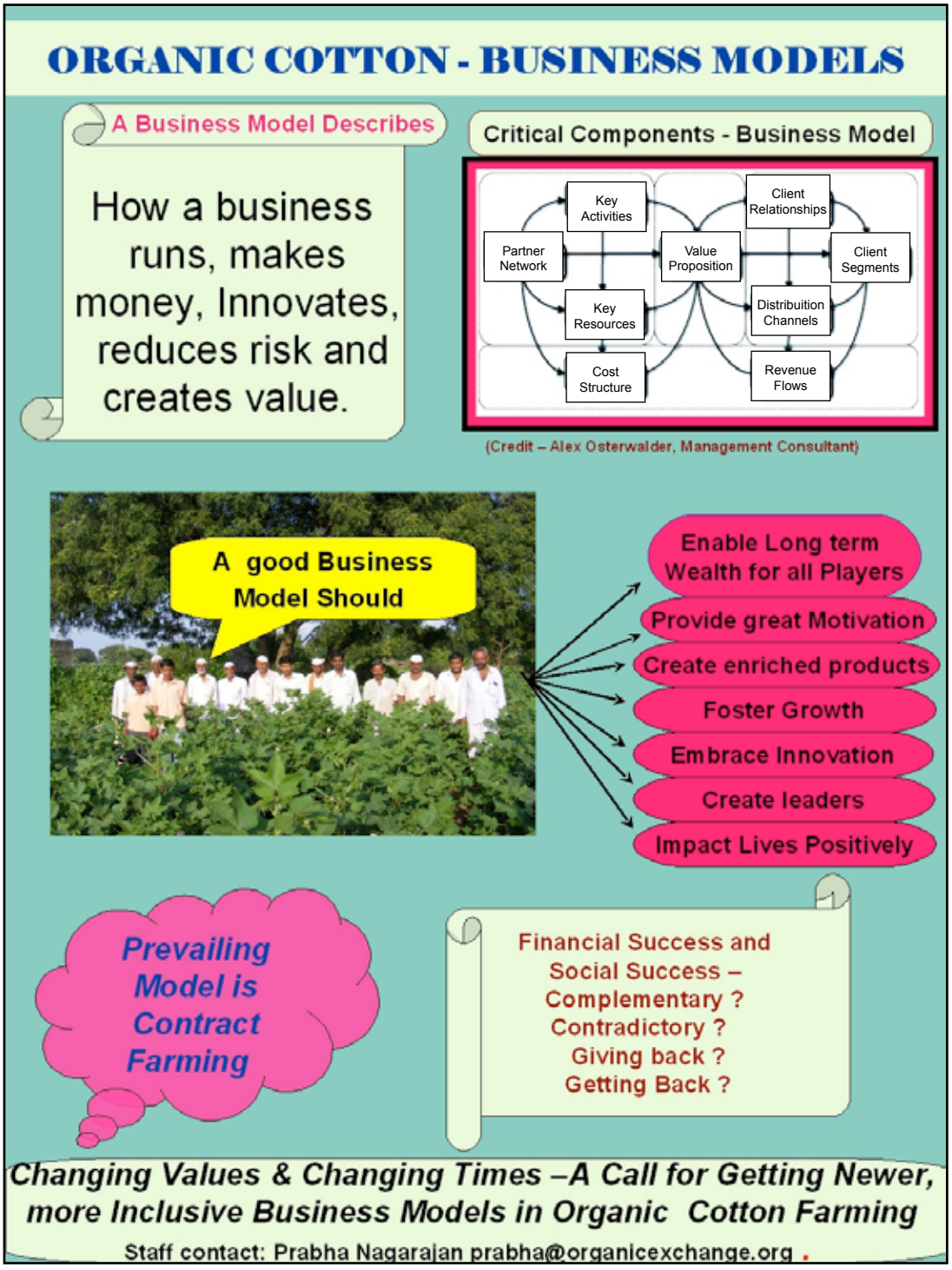


Table 1: Organic cotton production in Africa (in metric tons of fiber), Organic Exchange 2008

Countries	Production 2006/07 (Tons of fiber)	Production 2007/08 (Tons of fiber)	Contribution per country (%)	Growth as compared to 2007 (%)
Benin	200	223	3%	10.31%
Burkina	140	436	7%	67.89%
Kenya	3	-	-	-
Malawi	0	-	-	-
Mali	250	335	5%	25.37%
Senegal	65	83	1%	21.69%
South Africa	0	7	0,1%	100%
Tanzania	1,662	2,852	44%	41.73%
Uganda	1,378	2,545	39%	45.86%
Zambia	18	50	1%	64%
Total	3,716	6,531	100%	43.10%

Sustainable Organic Cotton?

Organic cotton, to be a sustainable method of producing fiber, needs to be more than just 'environmentally friendly'. It needs to be productive, offer decent returns to farmers, and in a growing world with limited returns, needs to be efficient in terms of land use and offer opportunities to be more than just a fiber production system, i.e., it needs to be an efficient system for producing other crops and offering other benefits to its farmers and to the wider world, such as 'clean' air and water and reduced carbon footprints, for example.

To be productive, organic cotton production needs to take place on fertile soils and in 'perfect' conditions where yields can easily match those from other production methods.

In cases where organic cotton plays the role of a social safety net, 'capturing' farmers who can no longer afford to produce using other methods, this may be modified slightly. There are several 'sustainability' sides to the organic cotton story, which are visible behind some of the yield reports (See Organic Exchange Farm and Fiber Report 2008[3]).

What is Organic?

The IFOAM basic standards state that 'Organic agriculture [also known as "Biological" or "Ecological" agriculture or protected equivalent forms of these words (in other languages) is a whole system approach based upon a set of processes resulting in a sustainable ecosystem, safe food, good nutrition, animal welfare and social justice. Organic production therefore is more than a system of production that includes or excludes certain inputs.' (IFOAM 2008)

3) www.organicexchange.org

Organic cotton has been criticized for offering lower yields and being water intensive, although both these points are far from borne out by the reality. Even where some evidence exists, the story is far from simple. For example, lower yields may be more related to the socio-economic status of the farmers or to areas where all yields are low because of water shortages, climatic conditions and change or general environmental degradation. With regards to water, most organic cotton is produced in rain-fed systems, while projects in areas with irrigation have often invested heavily in efficient technologies such as drip irrigation.

In general, we must note that organic cotton is most frequently produced by smallholder farmers in many developing countries, especially in Africa and India and parts of Latin America. Even in more developed economies such as the US and Turkey, organic farmers generally plant smaller area than their neighbors.

However, on a global level, we can point towards some ingredients of a sustainable system, despite the diversity of production environments globally. These can be divided between the system within the farm (soil, land availability, inputs, water availability, labor, and so on) and the wider farm environment (market conditions, prices, regulatory issues, support services, organization and logistics and infrastructure, policy). Both are covered here.

A Farm Systems Approach

Cotton is grown in a farm system. In organic cotton, this is an essential basis for successful, productive organic cotton growing – other crops provide green manure, tools for pest

Illustration 1: Example of an organic cotton farming system

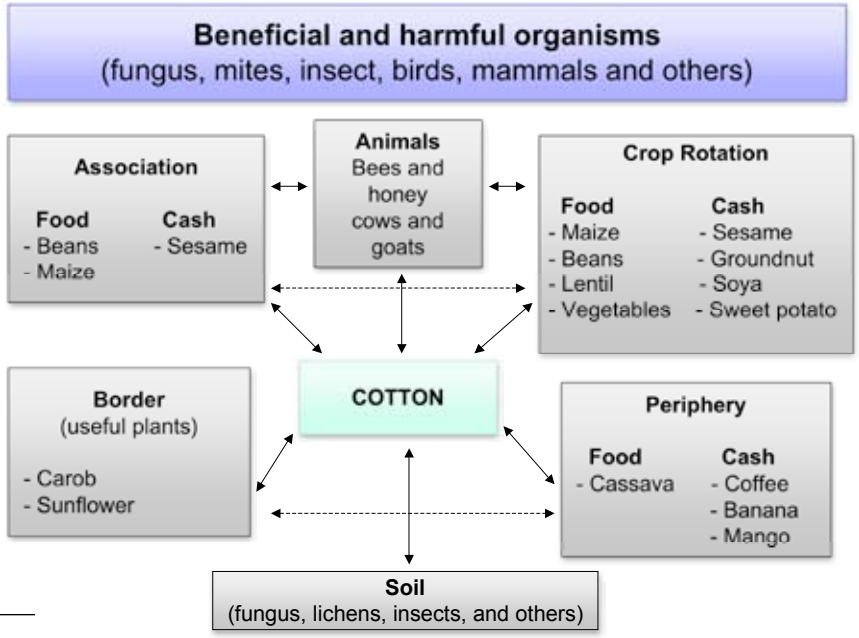
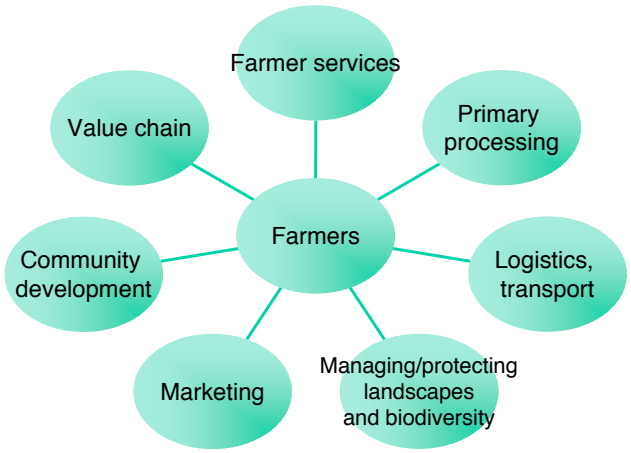


Illustration 2: The external environmental of organic cotton farming



management (by creating traps, providing ingredients, etc.). The farm system includes crops grown in rotation, livestock, and other products both farmed and wild. It is a systems approach that does not lend itself well to a monoculture (Van Elzakker 1999).

Van Elzakker (1999) suggests the following quick formula for the organic farming system: '*The use of locally adapted varieties + the reduction of nutrient losses + the use of locally available organic material and green manuring + a wide rotation + fostering natural balances + mechanical and manual weed control = no need for synthetic inputs*'.

In the years since this formula was suggested, growers have learned and refined this systems approach. Seed selection is clearly critical, but experiments have shown that hybrid seeds can be bred and adapted (e.g., Paraguay, Roa 2008) and native, resistant varieties improved (e.g., India). Different soil fertility management approaches can be used depending on resources and finance, and water has become a critical issue, if only as a potential tool used to criticize organic cotton production. Pest control is also an important factor in some agro-ecosystems. Input substitutions and externally purchased organic inputs have also been used, although to what extent these are sustainable in a narrow sense is questionable.

The Farm in the Wider Environment

In a more recent research review of experiences with organic cotton, Eyhorn (2007) identifies the following factors as some of those necessary to support a sustainable organic cotton system:

- Trade relations between farmers and the value chain
- The need for purchase guarantees to give security of production over time
- The need for a good Internal Control System, involving farmers in certification and training and extension
- The need to work with the right farmers – organic is ideal for small and marginal farmers, and farmers must be motivated to work in an organic cotton system
- The need for pre-financing of the crop and the organizational set-up.

The work of the OE during the past three years in looking at how to create a sustainable foundation for growth of organic cotton and drawing from other experiences is given below.

Definitions of Sustainable Production Systems and Organic Basic Standards

In looking at sustainability within the organic cotton system, The Organic Exchange has used two main definitions of sustainable agriculture:

Sustainable agriculture is:

... 'the ability of an agroecosystem to maintain production through time, in the face of long-term ecological constraints and socio-economic pressures'
(Altieri, 1987)

and

.. 'involves a system for food and fibre production that can maintain high levels of production with minimal environmental impact and can support viable rural communities'
(Mellon et al., 1995)[4]

Organic cotton production requires the involvement of many different actors, and often, partnerships between public and private actors, NGOs and business stakeholders as well as farmers (See Illustration 3 for an example). This makes it a very complex sector, more so because of the diversity of ecological, environmental, cultural, social, economic and political contexts in which farming takes place. Making sense of this complexity to understand what makes production sustainable requires some understanding of the production systems and farmers' profiles (e.g., marginal systems, population pressure, fragmentation, smallholders, resource poor, etc.) and some analysis of successful business models and their objectives, reports, indicators, and factors influencing these from outside, such as markets and policy. Illustration 4 shows an example of a business model in Latin America.

The components OE is looking at include the following components (illustration 3), grouped under four headings to distinguish them. The paper will discuss these using examples from different organic cotton production systems within our experience.

4) Both quoted in vanLoon et al, Agricultural Sustainability, Strategies for Assessment, 2005

Social components of sustainable organic cotton production systems

"Training the farmers to develop leadership qualities, marketing skills for collective bargaining and educating them to strengthen their farmer organizations to execute their plans and internal control systems so that over a period of time they become independent. Alongside the training of farmers and strengthening their associations, creating the producer company with tangible assets which can process and trade multiple agro-commodities."

Zameen, India
(Quoted in Truscott, 2008)

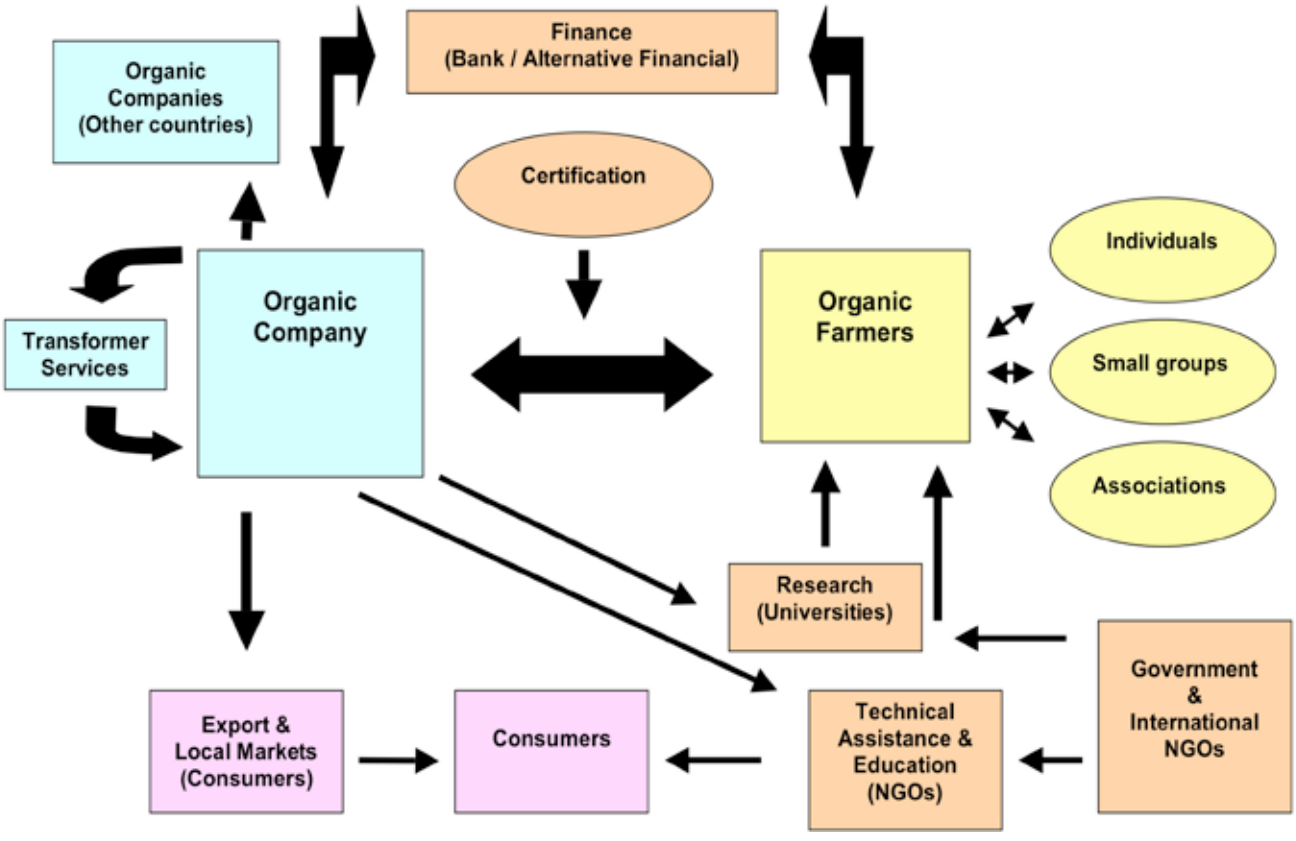
The social aspects of organic cotton production were very important in most early organic cotton projects and continue to be promoted in many new ones. Investments were made in how farmers are organized among themselves for production as well as marketing of their crops, and how they relate to those aspects of the value chain and wider cotton sector nearest to them.

Strong farmer organizations and participation can benefit production by helping motivate farmers and drawing on their experience and knowledge. Most successful projects, OE has studied, involve some form of formal or semi-formal farmer structure and/or a strong element of social/community/family cohesion among farmers. In Peru and Uganda, the APAEM and LOFP groups are farmer owned/managed structures who are closely involved in the extension, certification, research and sometimes trading activities (OE find other examples of this model in India, Zambia and Senegal), while in countries such as Turkey, production is often based around farmers bonded by strong social and family ties. Strong groups can have a better influence on the supply chain when it comes to negotiating prices and contracts. While this may sometimes be uncomfortable for buyers, it gives a solid foundation to maintaining production over time.

An example of social cohesion and farmer organization is also offered by the Texas Organic Cotton Marketing Cooperative, where a group of farmers founded their own marketing cooperative, and set prices based on real costs of production, trading directly with mills, bypassing traders and commanding a higher direct return as a result. Successful producer groups have often incorporated social goals in their programs, for example, around integration of women or building farmers' organizations and capacity (Ferrigno *et al.*, 2005).

Farmers who are fully involved and cohesive will generate ideas and help sustain production. In cases where the social foundation is weak, organic cotton production many require more external support, in terms of finance, technical assistance and managing conflicts or weaknesses in self-management.

Illustration 3: Business Model in Latin America



In any case, in the early days of organic cotton production with a new group of farmers, a strong training program is required. This can be costly and is a major reason why sponsors of new production need to pay attention to ensuring farmers understand and adopt the concepts of organic cotton production and support some of the training, integrated cropping system management and research of the farming system as soon as possible, as this will help manage costs, especially after any initial grants or support for conversion has finished. A full-cost system to capture these expenses must be put in place so that the project, over time will be able to be self-sustaining.

Tensions may occur within a group of farmers, between farmers' groups, or between farmers and external agents. Externally driven initiatives where farmers are contracted are the most vulnerable, as farmers will constantly wonder whether they are getting fair returns and will be comparing themselves to other groups and organic returns against other production methods. Thus, transparency, negotiation and trust are key components of social sustainability, which can be built up through institutions, investments by producer partners and project organizers, and fair and transparent pricing mechanisms and a balance of benefits given to producers as part of the system.

Ecosystem-Environment

Understanding and working with the ecosystem and natural environment is critical for organic farming that is sustainable over time.

> Soil and soil fertility management are essential foundations for this. To be productive, organic farming requires fertile soils, and management of that fertility over time. In many cases where organic farming is introduced in areas where soil fertility is depleted, big efforts are required to repair this. It is noticeable as OE studies organic cotton yields that the lowest averages are recorded in areas where either soil fertility in general is poor or degraded (i.e., West Africa) or in areas where farmers are resource poor and unable to use the best available organic technologies and approaches to manage their soil (for example, Uganda).
>
> Soil fertility is the foundation of sustainable and productive organic farming. When soil is well managed, pest pressure is reduced, water use is optimized and yields will improve for all crops grown in the rotation.
>
> To be sustainable and to enable organic cotton production to grow to meet demand, soil fertility has to be a priority for farmers and farming projects.
>
> Soil fertility and its management require specific approaches in organic production, including:
>
> 1) 1using natural fertilization methods
>
> 2) practices such as crop rotation and association
>
> 3) elimination of chemical fertilizers
>
> Organic soil fertility management thus emphasizes the use of practices that systematically introduce nutrients into the system in natural ways.
>
> Extract from Monday and Lizarraga (2008)

Seed selection is also important, and farmers need to have access to varieties that are resistant or less susceptible to common pests and diseases. Being able to choose an adapted variety for organic cotton can substantially improve productivity. Many examples from Latin America highlight the value of this approach, for example, organic cotton farmers in Paraguay obtain very good yields despite the common presence of the boll weevil, as do farmers in Nicaragua and Brazil. A similar situation with regards to damage caused by *Heliothis/Helicoverpa* exists in some parts of Africa. However, having to use the same varieties as in conventional cotton is a major problem for many producers, especially in Africa. Good compromises need to be found between the agronomic needs of farmers and the quality requirements of spinners for certain fiber characteristics. Specific organic cotton breeding programs are needed on a wider scale than the existing small experiments such as those in Paraguay (Roa 2007).

Other important environmental factors to consider in a sustainable program are:

- Biodiversity – a balanced agro-ecosystem helps reduce pest pressures and provides tools and ingredients for managing soil (green manures) and pests and diseases (botanical pesticide ingredients, trap and refuge crops).
- Managing the rotation crops and other crops (farmed and wild) to maximize the total returns from the farm as far as possible, both in cash terms and in terms of food security.
- Managing risks, for example, planning for climatic variation in the short term and the possible long term effects of climate change on the farm.
- Managing and improving water consumption and retention. Improving water management is critical for improving productivity and sustainability over time. This is particularly true in dryland farming areas such as Senegal, Gujarat in India and Northern Peru, but in rainfed areas, being able to manage the impacts of variations in rainfall is also important.

Economic components

Several interrelated factors need to be discussed in looking at the economic sustainability of organic cotton production. These factors are both internal to the farms (socio-economic status of the farmers, their access to resources and finance, for example) and external. The latter components include the access to finance of the project donors or investors, availability of any local, national or international financial and technical support, and the willingness of fiber buyers to support the transition process and the necessary fiber costs over time, such as paying premiums.

Illustration 4: Making the most of other crops in the production system can work for food security, local markets as well as export markets

Variables such as changes in interest rates, oil prices and currency exchange rates can be important factors and sustainable organic cotton production requires an ability to absorb short term impacts and manage risk over time. Similarly, organic cotton systems need to be resilient in the face of global economic slowdowns. Partly, ensuring long term purchase agreements as discussed previously can help manage some of the risks.

Price is a critical point in this discussion – in the context of the return from the production system and not cotton alone (unless cotton is the only crop available).

In a system where service costs are internalized and the current final retail value of processed organic textiles is higher, there can be a strong temptation to try and squeeze the final returns to farmers to reduce the overall cost and make products more competitive against conventional garments. This is an error in several ways. First, the farm-level costs of organic cotton are a very small proportion of total costs of garments, and more attention should be on managing value chain costs. Second, the system depends on the farmers and requires that a range of services and costs not covered by the market price in conventional cotton be internalized in organic, such as training, extension, research and capacity building. Also, organic cotton depends in the market on its perceived solutions on a range of environmental and development problems, and squeezing prices threatens this. There are two aspects to this discussion: the internal farm level costs and the costs of the system, i.e., training, extension, certification, research and capacity building.

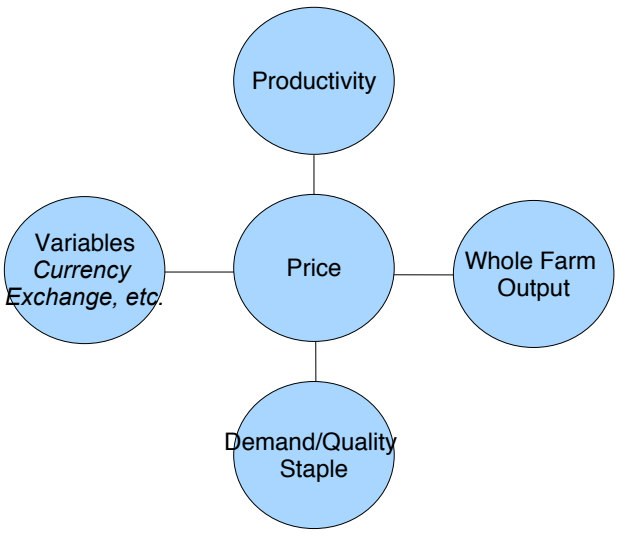
The organic cotton value chain needs to support the following triangle at the farm level (i.e., for seedcotton):

1. Cost of production (inputs, soil fertility, seed research, water management),
2. Cost of basic needs (food, education, health, and shelter),
3. Cost of development/maintaining a healthy rural economy and landscape (infrastructure development and maintenance, human development, landscape and biodiversity management and preservation, a healthy rural economy…)' (Ferrigno *et al.*, 2007).

The system itself requires that extension, training, capacity building, certification and other normal costs of cotton trade be covered by the fiber price. Generally speaking this might lead to fiber prices for organic cotton being 20-50% higher than conventional cotton.

A further necessity in organic cotton is the availability of services such as finance (crop and other business finance), and insurance. Innovative examples of financing in organic cotton exist already with the activities of the U.S. based ethical group Root Capital, who support crop financing for many organic cotton projects and in a new pilot program between the Dutch Cooperative Bank Rabobank, and the NGOs Solidaridad and Organic Exchange.

Illustration 5: Relationship between price and other factors in organic cotton production system



Technology and Policy

Ensuring sustainability over time with sufficient returns means that organic farming needs to invest in improving productivity of the cotton crop and of the whole farm. An ideal scenario would see organic farming totally independent of the need for premiums or even a specific organic market. To attain this ideal requires that organic yields and returns factored against production and management costs are sufficient to make a compelling economic case for farmers to adopt this system.

Illustration 6: Different pricing mechanisms in organic cotton, workshop report from Organic Exchange Annual Farm Development Meeting 2008

Overview of the current pricing mechanism

Different from a context to another:

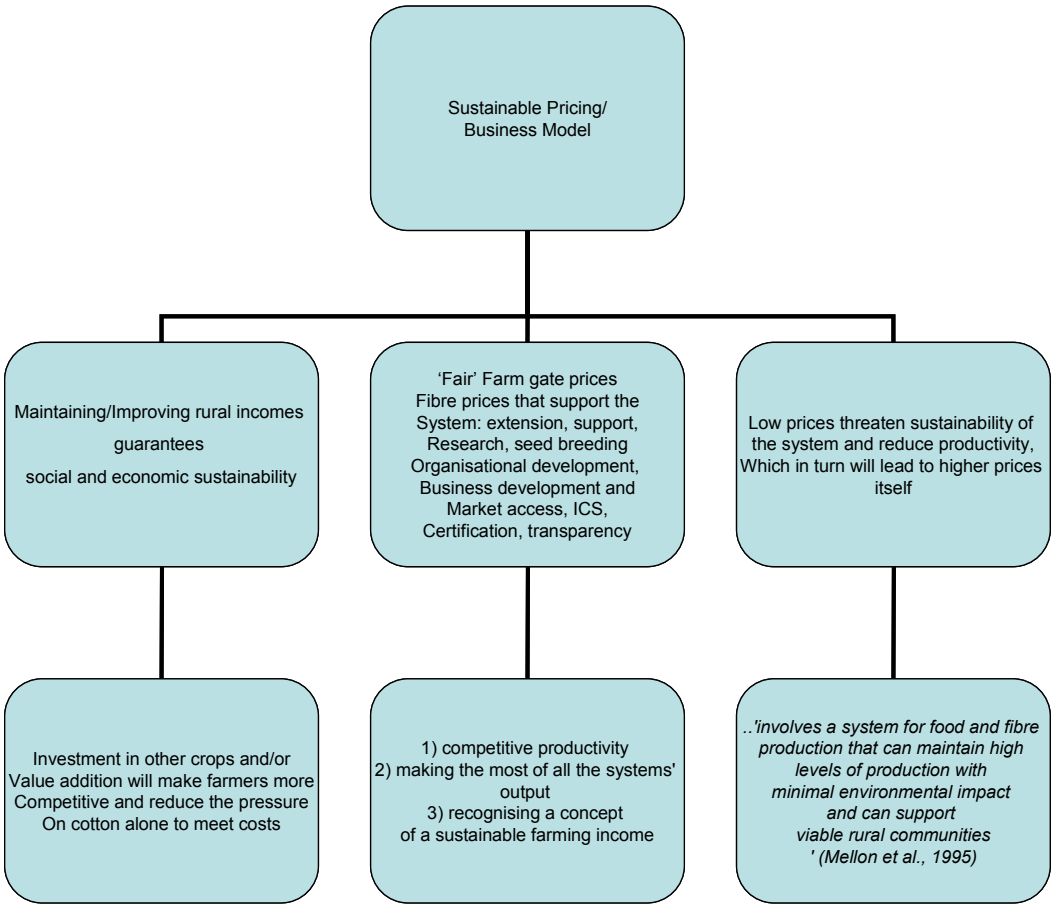
- Direct negotiation between organic farmer's leaders and company (Brazil). The organic premium is quite satisfying and sustainable for all involved actors since five years;
- Linking organic price to conventional price with fixed or varying organic premium (Benin, USA, Zambia, India);
- Agreement on a floor price taking into account the production cost (Paraguay).

Improving the technological package available in organic cotton by, for example, managing costs and improving knowledge on agronomic approaches while offering adapted seeds will make the system more attractive. Making sure farmers are recruited who are motivated and have access to good land or resources for the organic system is important.

Development of technologies requires a system that supports research and extensions services to develop new approaches to managing organic cotton production, to develop seed varieties and seed banks, and to improve the overall sectoral sustainability.

This means that organic production needs to gain (and earn) broad acceptance among the general cotton sector and with policy makers as another, valid method of cotton production to generate more research support – and to share the valuable lessons from organic systems with others. Policy support is also required to manage the interactions between different cotton production systems.

Illustration 7: The role of pricing in the sustainability of the organic cotton system



Good progress is being made in India with regards to policy and cotton sector acceptance of organic cotton production, and the sector has recently started to incorporate perspectives from the organic sector in policy initiatives and boards.

Conclusions

The organic cotton farming system relies on strong support and training structures. To succeed, groups need "price structures and income distribution that cover the costs of internal control systems, training and education, capacity building and business growth" (Ferrigno 2008). A successful business model moves farmers away from reliance/dependence on the market price to sharing in the efficiency and success of the whole chain (Organic Exchange 2007).

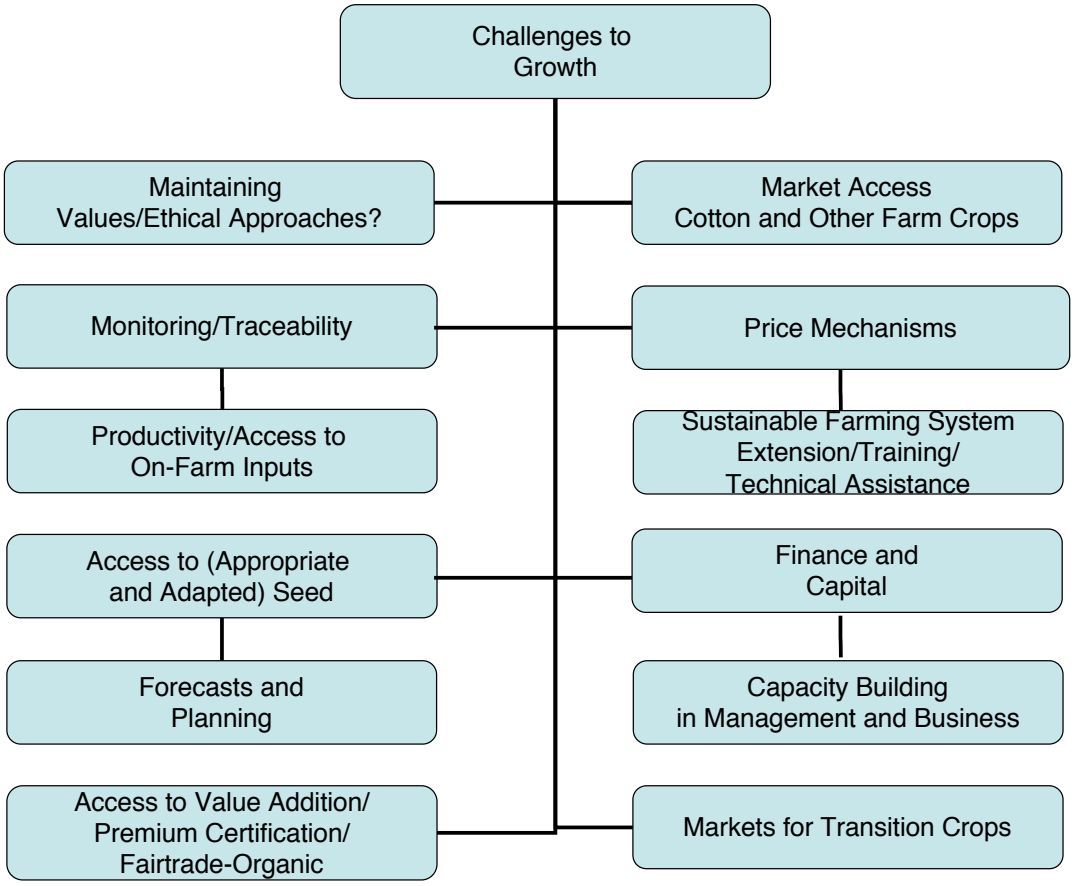
Organic cotton is a complex system that is still being analyzed, understood and codified following the past two decades of experimentation and development. This is likely to result eventually in a Code of Conduct for Good Relationships to maintain the balance between social and developmental goals, environmental responses and the market (see illustration 8 below).

The production of organic cotton must be viewed in a comprehensive or holistic way, as the management of a system that integrates various elements together, including social, environmental, economic, and technological aspects. There are risks and real challenges, but with the right tools and planning, organic cotton production can be sustainable and productive and deliver real benefits. In a growth situation, such aspects as participatory processes, transparency, fair returns, and good relations in the supply chain are necessary.

Lessons for the wider cotton sector

The positive impacts on farmers of many organic cotton initiatives show that there is value in supporting organizational development of farmers' groups and participation by farmers in marketing, extension and research. The capacity of organic cotton to internalize many costs of such a model might also point the way for more attempts to improve other forms of cotton production using market mechanisms and recognition. This might be a useful way forward for such programs as the Better Cotton Initiative. Surely improved practices deserve market rewards for producers who implement them.

Illustration 8: Areas to be considered in a potential organic cotton Code of "Relationships'



Similarly, organic cotton shows that much can be achieved with relatively low investments and without encouraging dependency on expensive inputs and technology, while supporting poor and resource poor farmers. For developing economies, a large and productive organic farming sector could have a positive impact on the balance of payments by reducing the imports of technology.

Policy recommendations

In organic cotton:

- Finalize analysis of best practice in organization, agronomic practices, and service provision and make adoption of these a requirement in the sector.
- Allow farmers to access adapted seed and develop research and breeding programs.
- Allow farmers to save and replant seed.
- Analyze cotton sectors and offer support to organic where appropriate, e.g., where certain socio-economic groups would benefit (resource poor, smallholders, women, minorities).
- Invest more in organic cotton research itself and in sharing lessons between different production systems.

References

Eyhorn, F. Organic Farming for Sustainable Livelihoods in Developing Countries? The Case of Cotton in India vdf Hochschulverlag AG 2007.

Ferrigno S., *et al*., Price Discussion Document, Internal Working Paper, Organic Exchange: O'Donnell 2007, Unpublished.

Ferrigno, S. "The worldwide development of organic cotton cultivation: progress and future challenges" paper presented at IFOAM Congress on Fiber and Textiles, 16th and 17th of June 2008, Carpi, Italy.

Ferrigno, S. G. Ratter, Peter Ton, Davo Simplice Vodouhê, Stéphanie Williamson and John Wilson, Organic Cotton: A new development path for African smallholders, Gatekeeper Series 120, IIED: London 2005.

IFOAM IFOAM Basic Standards for Organic Production and Processing, Online, http://www.uni-kassel.de/fb11/fnt/download/frei/dII/IFOAM%20Standards.pdf.

Monday, P. and Lizarraga, A., Soil Fertility Management in Organic Cotton: an overview, Forthcoming, Organic Exchange: O'Donnell 2008.

Myers, D.,and Stolton, S. (Eds.) Organic Cotton: From Field to Final Product, Intermediate Technology Publications Ltd: London 1999.

Organic Exchange Farm and Fibre Report 2007 Organic Exchange: Berkeley 2007.

Organic Exchange Farm and Fibre Report 2008 Organic Exchange: O'Donnell 2008.

Organic Exchange Fibre Report 2006 Organic Exchange: Berkeley 2006.

Pesticide Action Network, UK, The Dependency Syndrome: pesticides use by African smallholders, PAN, UK, London 2003.

Roa, C. Selecting Genetic Material, Presentation at Organic Exchange Regional Meeting, Asunción, Paraguay, April 2007.

Ton, P. Organic cotton production in sub-Saharan Africa: the need for scaling-up PAN UK: London August 2002.

Truscott, L. Organic Cotton Farm System Crops, Draft report, Organic Exchange: O'Donnell, 2008.

Van Elzakker, B. Organic Cotton Production, Chapter in Myers, D.,and Stolton, S. (Eds.) Organic Cotton: From Field to Final Product Intermediate Technology Publications Ltd: London 1999.

VanLoom, Gary W., S. G. Patil and L. B. Hugar: Agricultural Sustainability, Strategies for Assessment, Sage Publications, India Pvt., 2005.