

An Integrated IT Management System to Provide Full Product Traceability from Field to Overseas Market

Tobias Bandel

Sekem Group, Egypt
P.O.B. 2834 El Horreya
Heliopolis, Cairo, Egypt
Fax: +20 (0)2 656 4123
Email: tobias.bandel@sekem.com

Abstract

Libra Co., a member of the Sekem Group, Egypt decided in 2003 to invest into an IT based farm and produce management planning, follow-up, control and traceability solution to overcome its existing problems in sourcing and distributing fresh produce. The Sekem Group includes 8 companies, which cultivate, process and distribute organic certified fresh produce, foods and beverages, herbs and spices, textile fabrics, pharmaceuticals, cereals and seeds, grafted vegetable plants and IT-Business solutions. The Sekem Group is part of the Sekem initiative, which realizes its holistic vision of human development through many social and cultural activities such as kindergarten, school, medical centre, research centre etc. besides its commercial businesses within the Sekem Group.

Libra has chosen a software package called Produce Manager and CropWalker which is on the one hand a server based planning tool but on the other hand a pocket pc application, used by agronomists on the fields to follow up tasks and to report about crop inspections, production forecasts and various agricultural and business related data and send it back to Produce Manager using land-line or GPRS synchronization tools. Using these two components every process, task, problem, treatment and product within the entire agricultural process from planning until delivery is digitally kept in the Produce Manager database and can be used planning, follow-up, control and traceability. Following a traceability request all data related to one specific product is available within seconds, from planting date and place, field problems, applied treatments to harvest date quantity and quality.

Introduction

The case study about “An integrated IT management system to provide full product traceability from field to overseas market” has been conducted by Libra Organic Co. in Egypt, a member of the Sekem Group which is the commercial part of the Sekem-Initiative in Egypt. Since its foundation in 1977 through Dr. Ibrahim Abouleish, the Sekem-Initiative has been developed into three different fields of activity: cultural, economic and social. The cultural and social activities include a kindergarten, a school, a handicapped class, a vocational training centre, a medical centre, a cooperative for Sekem employees, an academy for applied research in art and science and an university (in foundation). Through these cultural and social activities, Sekem reaches about 40.000 beneficiaries in and outside Cairo.

At the same time Sekem developed its economic part, which is organized as a holding company and includes today a group of eight companies, cultivating, manufacturing and distributing various products in to local and export markets. From the very beginning Sekem followed in its agricultural and manufacturing activities the international guidelines for organic cultivation and processing. Today all Sekem and its products is certified according to most of the international organic guidelines like EU-organic, Demeter, Biosuisse, NOP, Skal, EuroGap and through the implementation of a comprehensive corporate social responsibility management certified Fairtrade as well since many years. In addition, all Sekem facilities are certified ISO 9001:2000, ISO 14001:2004, OHSAS 18001:1999, HACCP and TQM.

The eight companies of the Sekem Group are ATOS for phyto-pharmaceuticals, Conytex for textile fabrics, Hator for fresh fruit and vegetables, ISIS for processed foods and beverages, Libra Co. for cultivation and processing of cereals and seeds, Mizan for grafting young vegetable plants, Sekem Co. for herbs and spices and Salis for IT business solution. For sourcing its raw materials, the Sekem companies are using Sekem’s own farms and external organic certified contract farms in Egypt. Since 1977 this agricultural sector grew up to 350 contracted small farmers all over Egypt, cultivating 3500 ha organic certified land producing about 200 different raw materials. Taking this huge amount of farms raw materials, certificates and the for organic agriculture practices obligatory crop rotation into consideration, the requirements of planning, follow-up, control and traceability were too complex to be managed without a proper system. Therefore Sekem decided to setup a project to develop an adequate IT solution to support the agricultural planning, follow-up, control and traceability process.

Project Setup

Due to above mentioned issues the Libra Co. agricultural department suffered from various problems such as that the customer demand wasn’t allocated efficiently to the available area and there was a high risk in doing mistakes when allocating demand with specific constraints like target market certificates, crop rotation requirements etc. As well the follow-up and control procedures weren’t done properly resulting in missing documents, wrong harvest forecast, incomplete quality reports and incorrect cultivation and farm information. All this caused a lot of problems for the daily work but had as well remarkable commercial effects as customers weren’t satisfied due to issues in quality and delay and finally not entirely transparent traceability.

In order to overcome these problems and gain back markets the following objectives were defined to develop an IT solution to support Libra's planning, control and traceability cycle: to professionalize the overall farm- and crop management concerning planning, cultivation, productivity and to improve the efficiency at all levels for a better production capacity utilization. This all leads to one goal, which is to upgrade the small-farm-businesses to meet international market requirements and improve commercial competitiveness, profitability of all partners along the supply-chain and traceability.

Based on these requirements and objectives a market study was carried out which led to a product called CropWalker and Produce Manager provided by an UK software company called Muddy Boots Ltd. Together with them the technical layout of the software was defined and customized according to the need of Libra Co.

Technical Setup

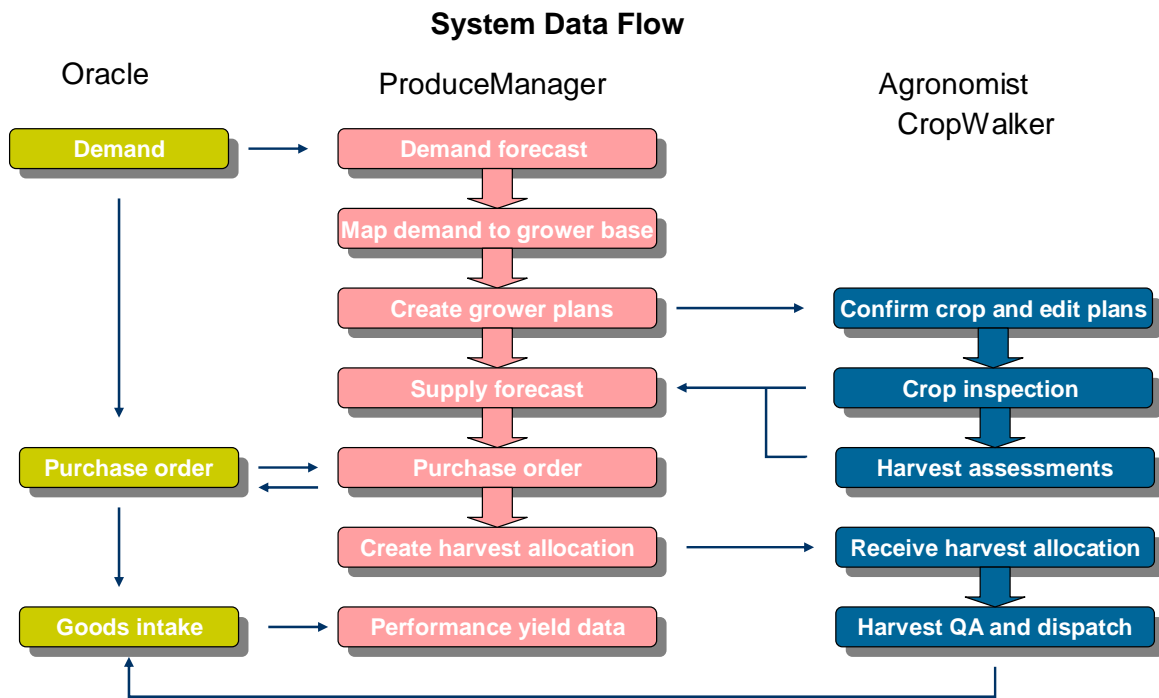
The two software solutions, Produce Manager and CropWalker provided by Muddy Boots were customized according to the defined requirements as follows. Produce Manager is a planning, control and reporting tool installed at Libra Co. server whereas CropWalker is a data collection and reminder tool, installed on pocket pc's which are used by the agronomist on the fields. Both systems communicate together using telephone landlines or through mobile GPRS. The process and information flow was designed as follows:

About three months prior to the harvest season, which equals the cultivation duration, Produce Manager imports the customer demand forecast from Libra Co. ERP solution Oracle. At that time the Produce Manager database already contains cultivation related information such as expected yields per farm per region and time of the year, detailed growing programs for the various products, product requirements such as seeds, compost, treatments or any other agricultural input and cultivation constraints such as crop rotation, certification, soil condition, availability of water etc. Taking all this into consideration Produce Manager transforms the received customer demand forecast into a proposed cultivation plan which will be confirmed and allocated to available farms within Produce Manager by Libra Co. cultivation planner. At that stage Produce Manager is generating a cultivation plan, a growing program as well as a product requirement plan about which inputs are required to grow a product on a specific farm. Through the approval of the Libra Co. cultivation planner this information is synchronized with the CropWalker program at the agronomist's pocket pc on the farms, so he knows what to plant where and how to treat it.

The agronomist on the field gets through these synchronized data instructions for his daily tasks. Every programmed task or treatment must be confirmed by him using the pocket pc or he is able to add tasks in emergency cases which all are synchronized back to Produce Manager to be controlled by the cultivation supervisor. The agronomist reports as well about any problems like pests, rots, growth problems, deficiencies etc. which after being synchronized is evaluated by the cultivation supervisor at Libra Co. office who will instruct the agronomist accordingly. Short before and during the harvest season, the agronomist is asked to submit a quality and quantity based supply forecast which is evaluated and approved by Produce Manager and further

on forwarded through Oracle to the customers. The customer sends back the order and Produce Manager allocates the order to a specific farm according to the supply forecast and sends it to the CropWalker at the agronomists pocket pc. The agronomist receives this harvest instruction, instructs the grower to harvest and reports back to Produce Manager on the actually harvested quantity and quality and when the product dispatched from the farm and with which driver. At goods in take at the packhouse the received quantity is checked again and reported back to Produce Manager.

Please see the data flow within the system in diagram below:



Through that design, the whole business cycle is closed from customer planning, allocating plans to farms, follow-up and control of the agricultural process, production forecast, harvest and transport. At any stage during the whole process this data can be used as a pre-warning system of any agricultural problems leading to corrective actions, to learn about productivity performance of the different farms which helps for next seasons planning, for a faster and more accurate documentation for the various inspections and above all it provide full traceability. If a supermarket initiates a random based trace based on a batch number printed on the product carton and wants a full traceability report back within 24 hours according to his internal policy, Produce Manager is able to provide all data related to this batch number within seconds from the database: when the product arrived at the packhouse, when and with which driver it left from the farm, when it was harvested, if there were any deviations from supply forecast and actual harvested quantity, any field problems during the cultivation period and the products applied to treat them, application date and rate of compost and compost tea, planting date and plant density, at which plot on the farm the product is planted and what was planted before.

The implementation of this IT-solution at Libra Co. and its growers remarkably improved the agronomic input resulting in improved output in terms of quantity and quality which maximizes the return from the cropped areas for the grower and secures him on the long term access to local and international markets as he meets now the customers requirements and is known as a reliable supplier.

In order to evaluate the impact of the project for the growers and for Libra Co., 10 growers were selected to use the Produce Manager and CropWalker solution. Their performance concerning the set objectives was evaluated before, during and after the implementation of the IT solution and has been compared with 10 control farms, which continued their management during the whole time without implementation of the new solution. The following tables are highlithening the major outcomes from this evaluation.

Evaluation

The expected change in 'control farm' revenue (2005) is expected to be as planned, with no significant change; estimated at an 11% increase from baseline revenue. All values are in Egyptian Pouds (LE); 1 US\$ = 6 LE:

Control Group Suppliers	1	2	3	4	5	6	7	8	9	10	TOTAL	% Change from Baseline
2002 Baseline Annual Revenue (LE)	25,000	23,000	55,000	65,000	8,000	200,000	150,000	100,000	100,000	80,000	806,000	
2005 Baseline Revenue Estimate (Change)	2,250	2,300	5,500	6,500	1,000	23,000	20,000	10,000	12,000	8,000	90,550	11%
2005 Current Revenue Estimate (Change)	2,250	2,300	5,500	6,500	1,000	23,000	20,000	10,000	12,000	8,000	90,550	11%

The expected change in 'test farm' revenue (2005) was originally estimated to increase by 17%, performing better than the 'control farm' group. Revised forecasts now estimate an increase to 33%, representing a significant impact from the Libra Co. intervention:

Test-Group Suppliers	1	2	3	4	5	6	7	8	9	10	TOTAL	% Change from Baseline
2002 Baseline Annual Revenue (LE)	553,000	302,000	510,000	220,000	127,000	750,000	550,000	400,000	300,000	400,000	4,112,000	
2005 Baseline Revenue Estimate (Change)	87,000	62,000	188,400	100,000	33,000	50,000	60,000	80,000	30,000	10,000	700,400	17%
2005 Current Revenue Estimate (Change)	147,000	62,000	240,000	280,000	33,000	250,000	200,000	80,000	30,000	50,000	1,372,000	33%

The following examples were provided by Libra Co. to support the above increases in expected revenue:

Test Farm 1 – Pepper Production: revenue expectations improved to 27% change:

Test Farm 1	2002	2005	
	Baseline Annual Revenue (LE)	Baseline Revenue Estimate (LE)	Current Revenue Estimate (LE)
	553,000	640,000	700,000
		16%	27%
		% Change	

This farm manages 86 greenhouses cultivating 50,000m² of agricultural land. Last cycle, grew a combination of chilli peppers and peppers including non-organic produce. This cycle, as a result of the increase in traceability through introducing of CropWalker technology, this producer will now supply Tesco and significantly increase its capacity to export.

The impact of selling on the export market is significant; the average price of peppers for export is LE5 per kg vs. LE3 per kg on the domestic market. Expected to generate export revenue of LE400, 000 this producer will increase its revenue by LE160, 000 through substitution between domestic and international markets.

Test Farm 3 – Rice / Cotton Production: revenue expectations improved to 37% change:

Test Farm 3	2002	2005		
	Baseline Annual Revenue (LE)	Baseline Revenue Estimate (LE)	Current Revenue Estimate (LE)	
	510,000	698,400	750,000	
		37%	47%	% Change

Cotton is a tough market; the key to improvement in revenue expected due to increased access to international markets.

Test Farm 4 – Bean Production: revenue expectations improved to 127% change:

Test Farm 4	2002	2005		
	Baseline Annual Revenue (LE)	Baseline Revenue Estimate (LE)	Current Revenue Estimate (LE)	
	220,000	320,000	500,000	
		45%	127%	% Change

Significant improvement in expected revenue estimated for this group of 4 small farms in the Giza area, cultivating a total of 25 hectares. This smallholder was previously classified by Tesco as potential risk; as a consequence they stopped using them for bean production. The key issue was simply the inability of the smallholder to manage irrigation effectively.

Through clearly documenting the irrigation schedule in the pocket pc device ‘task list’, the smallholder is provided with better guidance on when to irrigate.

Consequently, in a recent internal audit conducted by Tesco, using the data and information provided by the pocket pc tool, Tesco was able to improve their level of confidence in the smallholding, resulting in a doubling of production and increased revenue through selling the entire volume on the export market.

Test Farm 6 – Grape Production: revenue expectations improved to 33% change:

Test Farm 6	2002	2005		
	Baseline Annual Revenue (LE)	Baseline Revenue Estimate (LE)	Current Revenue Estimate (LE)	
	750,000	800,000	1,000,000	
		7%	33%	% Change

Key improvement expected through better management of refrigerated supply chain using data and information provided by tool.

Test Farm 7 – Beans, Pepper Production: revenue expectations improved to 36% change:

Test Farm 7	2002	2005		
	Baseline Annual Revenue (LE)	Baseline Revenue Estimate (LE)	Current Revenue Estimate (LE)	
	550,000	610,000	750,000	
		11%	36%	% Change

Improvement expected through increasing yield as a direct result of better crop management; estimate to increase yield from 4.5 to 6.5 kg per m². For example, tool can provide immediate advice on how to deal with problems such as ‘yellow leaf’; current alternative is generally slower (up to one week) or may provide a wrong diagnosis, resulting in the administration of inappropriate treatments.