Farming dynamics

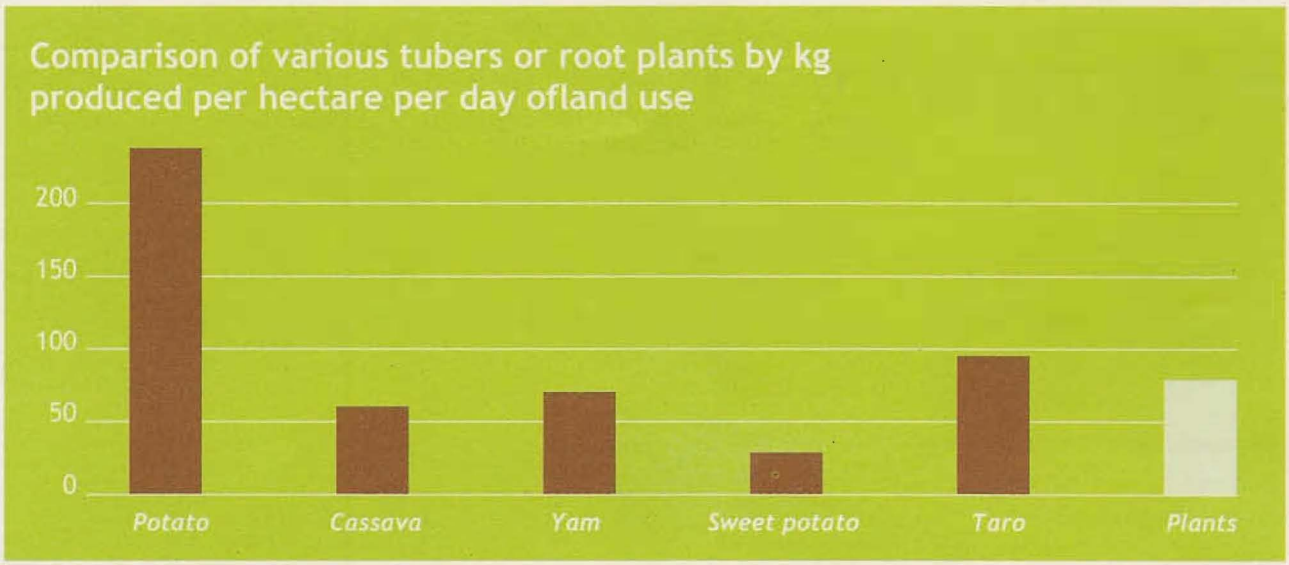
The development of the potato production chain in the Sahel Belt: strengths, constraints... a challenge

Watering with a calabash.

A major constraint to the development of Africa's Sahel is erratic rain fall which, in some years, causes grain food shortages. In a region where cereal production is the main nutritional resource, and more than 85 % of the population is dependent on local agriculture, it seems illusory to believe that sustainable economic development might commence without first meeting basic needs. This being the case, irrigated dry season production seems an interesting response as it can help reduce the pressure on cereals, diversify diet and provide income.

Following the International Year of the Potato (2008), the time has come to ask whether, in West Africa and particularly in countries of the Sahel, development of this sector's production chain would not only increase producer incomes but also promote food security.

In any case, these factors are already driving potato production's increased share in the Sahel Belt's market garden systems.



Characteristics of potato cultivation

A crop with many strengths...

Potato cultivation has many attractions, from an agronomical point of view potatoes grow easily, and in the cool dry season their yield potential is significant (20 to 30 t/ha). Moreover, cultivation is carried out in a period when the farmer can afford to invest the necessary time (outside of the rainy season). From a nutritional point of view: potatoes are one of the most nutritious root or tuber plants. Of note, the potato is a plant that produces the largest quantity of tubers per day of land use (see Figure 1). From a commercial point of view, they are much appreciated by people and it is a cash crop for farmers who obtain satisfactory yields.

Straightaway, it is clear that an attraction of the potato is that it is produced locally, therefore it is less sensitive to the vagaries of the world food market (such as for rice, wheat, maize ...). Therefore, one can assume that increased cultivation will lead to increased food security in producer countries.

Irrigated dry season production seems an interesting response

... but also significant constraints:

More detailed analyses of production chains in these countries always highlight the same major constraints: first, the difficulty in obtaining quality plants, but also a lack of means of production, little understood and poorly controlled parasitism, poor means for conserving product and finally, in new areas, little or no training nor organisation. Indeed, outside of specialised areas of cultivation over several decades (Sikasso in Mali, Fouta Djallon in Guinea ...), technical deficiencies are an obstacle to profitable production.

It appears that these constraints are closely related. Indeed, traditionally, high quality plants are imported from Europe but at a price that exceeds, in most cases, 50 % of the cost of cultivation. As a result, the producer is obliged to go into debt to purchase them. European planting cycles mean this plant is rarely available on site until mid-November. However, African farmers must plant before the end of December to enjoy the cool nights of December and February. This results in crops closely grouped in time.

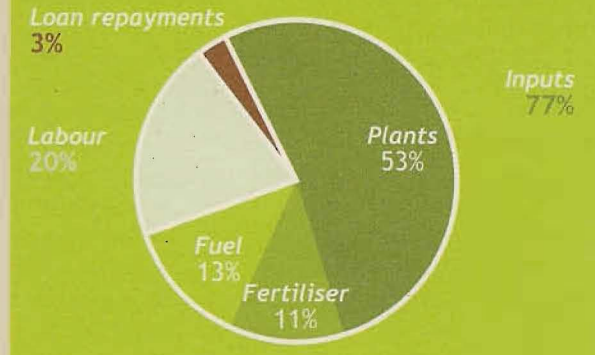
Potatoes are almost all sold in late February to early April with the result that, in major production areas, prices fall. To lengthen the marketing period, it would be profitable for producers, not only able to start planting earlier

Overview of the profitability of potato cultivation in West Africa

The average cost of cultivating one hectare of crop is estimated at €3000. Figure 2 breaks down this estimate into its component parts. Inputs account for over three-quarters of costs and the purchase of plants alone accounts for more than half of total spending.

Farm gate prices and market prices can vary significantly depending on supply as shown in Figure 3. From March to April, in the midst of harvest, prices are low with an average floor of €0.30/kg. Then, prices will rise to double or triple during periods of product shortage (July to October). However, at such prices, volumes are very low, and, potatoes are consumed only by a very small margin of the population with high purchasing power and by the catering industry.

Estimate of average crop cost of cultivating is 2,000,000 FCFA/ha or +/- €3000

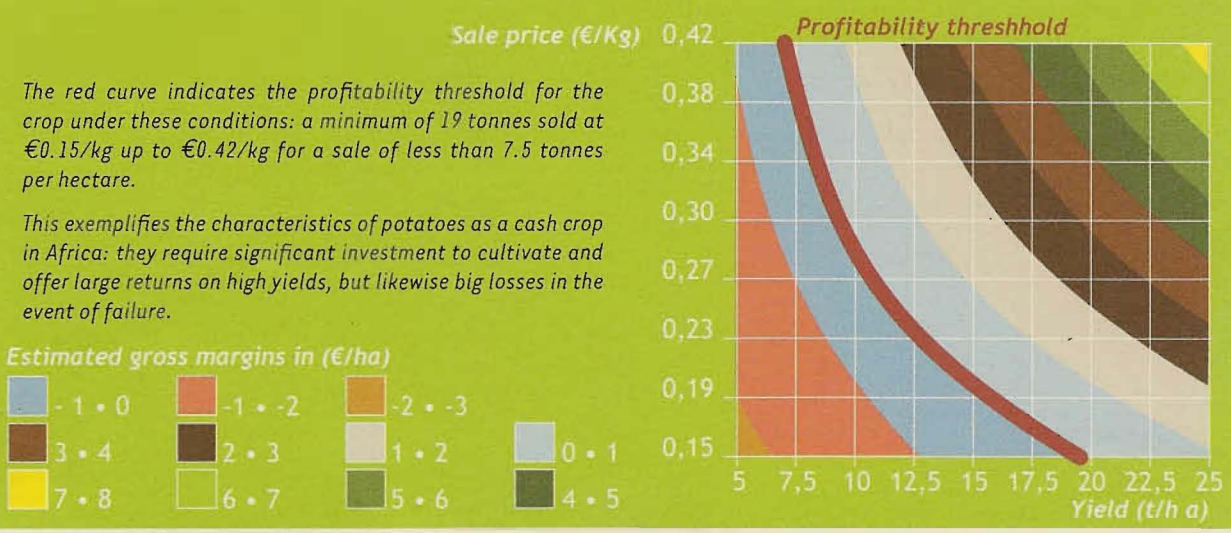


Example of average selling price per kg of potato for consumption

Evaluation of gross margins as a function of sale pric and yield at an estimated production cost of €3000 (± 2,000,000 F CFA)

The red curve indicates the profitability threshold for the crop under these conditions: a minimum of 19 tonnes sold at €0.15/kg up to €0.42/kg for a sale of less than 7.5 tonnes per hectare.

This exemplifies the characteristics of potatoes as a cash crop in Africa: they require significant investment to cultivate and offer large returns on high yields, but likewise big losses in the event of failure.



Solutions for reducing the impact of the major constraints in the sector

For the potato sector to grow on a large scale and serve as a cash crop, while ensuring greater food security, the constraints of product conservation and plant availability (period, price, variety) must be mitigated. In both cases, proven technical solutions exist.

Local production of plants:

The plant production industry in Europe uses multiplication techniques to achieve the final amount of seed potatoes needed by consumption producers. But this cannot be done in perpetuity because with each planting in the field, the next generation accumulates parasites (viruses, fungi, bacteria ...) that reduce production potential. In practice, a maximum of 10 generations are allowed after which the law determines that the chain must end with the production of potatoes for consumption (see left side of Figure 5). To supply the market each year with certified plants (sold to consumption potato producers), each level must be cultivated annually.

Note that in all sectors that use multiplication, the original material comes from in vitro laboratories.

The concept SOC International has proposed for over 20 years is to set up a very short term multiplication scheme (3 field multiplications) which requires intensifying production of pre-base material from an in vitro laboratory

producing plantlets in vitro was 5 to 6 times less expensive there than it is Europe

This short term multiplication scheme has been validated as experiments in in vitro laboratories in Mali and Burkina Faso have shown producing plantlets in vitro was 5 to 6 times less expensive there than it is Europe. The reason is of course the difference in labour costs; in Europe these can account for 80% of production cost.

This pre-base material should be planted and conserved for 2 to 3 times. Several technical solutions exist for tackling the major constraint which conserving plants between field multiplication cycles:

- *If the multiplications are carried out in high altitude areas (800 to 1300 m), the problem of conservation is not a factor, since the multiplier can plant each month of the year;*
- *Outside these areas, the conservation period between two multiplications in the cool dry season is far longer than the natural dormancy of the potato. Here two solutions are proposed:*

Refrigeration *to extend the dormancy period, in order to produce the majority of free varieties*

The use of a variety selected *for its long dormancy, allowing for conservation of 7 to 8 months without the need to refrigerate.*

Both solutions are being implemented in light of the potential of the country concerned.

Note that the base material could also be imported from Europe and be multiplied in a single go in Africa. The adoption of this solution at the start of a project, allows for plants to be sold at the end of the first year. However, this base material is difficult to obtain in the market for public domain varieties, and it is not available for protected varieties.

Conserving potatoes for consumption:

Appropriate technologies[1] for the conservation of potatoes for consumption have existed for over 10 years. Large scale experiments show that by imposing some simple principles producers may keep their produce for 3 to 4 months.

The first factor is the quality of the potato to be kept. Since this is decided in the field, we can say that 90% of conservation success depends on crop husbandry and care:

- *The choice of a variety that conserves well*
- *Appropriate fertilisation (excess nitrogen causes rotting)*
- *Good irrigation and mounding (the tubers are never submerged)*
- *Harvesting at maturity,*
- *Minimise damage to tubers during harvest, transport and packaging,*
- *Strict sorting in the field and in conservation.*

After this, conservation of top quality raw material involves no more than two practical requirements:

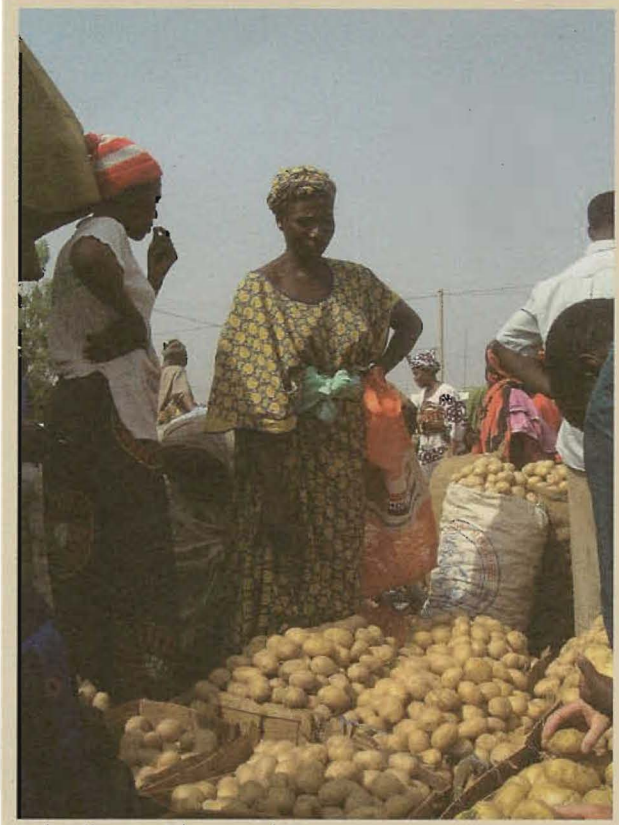
- *The use of stacked boxes of (+/ - 30 kg) to limit the warming up in the centre of mass of the tubers and allow easy sorting of the product,*
- *The storage of these boxes in a warehouse built so that temperatures do not become excessive (> 35° C). To achieve this, the following measures are proposed:*

The use of a straw roof *(not metal or covered with straw),*
A building constructed in the shade *of large trees,*
The provision of water basins *within the building for evaporation purposes which reduce the temperature by several degrees.*

Note that the use of refrigeration for consumption potatoes is often too expensive relative to the expected sale price.

1: Principles and techniques which are easily implemented by a local producer

Organising producers: a necessary step (the examples of Guinea and Mali)



Lady selling in a Sikasso market.

A rapid analysis of the organisational development of the potato sector over 15 years (the examples here are of Sikasso, in Mali, and Fouta Djallon, in Guinea), demonstrates the primary role of producer organisations and how they evolved.

Initially, cultivation of the crop required importing specific seed and fertiliser, which forced buyers to group together in order to have access to a credit system that made feasible the setting up of the large investments required for cultivation.

At the same time, support was given to producers so that they could learn specific techniques. For example, in Guinea, the Federation of Farmers of the Fouta Djallon (FPFD - Fédération des Paysans du Fouta Djallon) was created in 1992 by producers of potatoes for consumption. Similarly, in Sikasso, in Mali, the Association of Potato Farmers (APPS - Association des Producteurs de Pommes de terre de Sikasso) was launched in 1995 to attempt to minimise the impact of the devaluation of the CFA franc vis-à-vis the importing plants. These two cases demonstrate that the associations were first created to facilitate access to inputs and the resources to finance them.

Soon, support for membership was extended to the problems of commercialisation in an attempt to secure the sale of the product. From a technical view point, stores were built at the same time as conservation techniques were being disseminated to the stagger the products appearance in local markets and so maintain prices. In tandem, lobbying promoted local production over European imports of potatoes for consumption. In 1992, the FPFD got the Guinean government to ban imports as long as local potatoes were available. This measure was finally lifted in 1998 as the Fouta Djallon potato had become more competitive.

In search of other markets, the Sikasso region in Mali soon exported substantial quantities to nearby Ivory Coast, and more recently, the Fouta Djallon region has done the same to Senegal and Guinea Bissau. In these markets, producers' associations have also played a major role, as in the case of the Sikasso region where villages selling collectively enabled supply to be augmented, which is an important factor for mass exporting.

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It is remarkable to note that in the case of FPFD, the potato sector has driven the organisation of farmers in the Fouta Djallon. Thus, in 1993, the FPFD expanded its activities to the onion sector and, from 2000, it has also invested in literacy programmes for its members.

Today, throughout Africa, new areas of potato cultivation are being created. For regional organisations, the newcomers represent a medium-term risk of serious competition. If, by virtue of their seniority and degree of organisation, associations or federations claim representation for the industry at a national level, then the dilemma of prioritising national development versus developing the area of origin will arise in the sector. At that point, industry players will face a new challenge: that of repositioning themselves.

(from mid-September), but also to keep the crops in order to stagger their sale. However, this would imply the implementation of techniques and means of conservation which are most often lacking. In addition, the need to repay loans out of income generated by the harvest, means producers are forced to sell as soon as possible.

For all these reasons, potato cultivation is a challenging activity for farmers, even more so in some years, when it becomes more difficult to obtain credits from organisations that consider the sector «high risk».

Ways of developing the sector

Producers need a viable sector:

To enable the industry to grow in size, producers must be assured of a market at a fair average price by staggering the release of produce on the market. To achieve this, the use conservation techniques must become widespread and there must be investment in storage infrastructure. Trials of this type have already been developed that have enabled the development of methods appropriate to the region and producers' specific means. These have enabled produce to be conserved up to 4 months[1]. The complementary solution is to extend the planting period given this can start as of mid-September. However, this requires the supply of seed of non-European origin. In some medium altitude areas in West Africa (Guinea, northern Niger, Cameroon), it is possible to achieve more than one annual crop cycle, which somewhat reduces the problems of conservation. The potential of these areas to produce plants should also be more highly valued.

The use conservation techniques must become widespread and there must be investment in storage infrastructure

Evidence suggests that seed production in West Africa would provide multiple benefits: lower priced plants, increased availability in tandem with local production cycles and a choice of varieties to meet demand[2].

Attempts at local production of plants:

Producing sufficient quantities of good quality plants locally at a reasonable price is a real challenge, which specialists have been working on for more than 15 years.

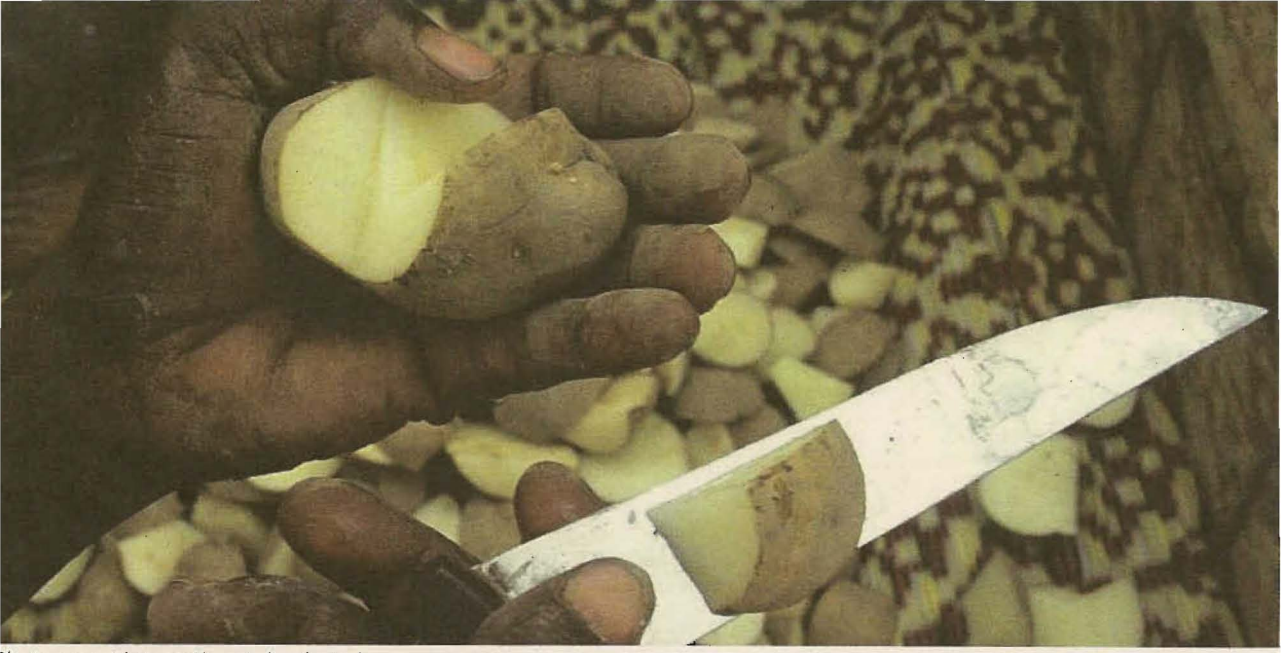
1: In constructions made of local materials without refrigeration.
2: Certain varieties that West African farmers purchase are disappearing in Europe.

The non-governmental agencies, SOC International and Agro Sans Frontières, are developing programs for the sectors designed to improve productivity and conservation. They also seek to develop programs to produce seed potatoes locally. In recent years, important advances have been made due to these projects receiving greater resources provided by various stakeholders and / or donors: the European Union's Centre for the Development of Enterprise, the Lions Club International and TIDES foundations, the non-governmental organisation Ex-Change, and from France, local authorities (regions, departments, cities and municipalities), industry bodies, non-governmental organisations, and others.

Thus the «African potato plant promotion network» was created at the end of 2007. To date, 3 workshops have been run to help share the experiences of more than 8 countries in the sub-region.

In the short term, developers set themselves the objective of publishing a technical guide to producing potatoes in West Africa for consumption, but also to increasing local plant production using *in vitro* material within a brief multiplication programme. In March 2009, they organised a workshop to harmonise certification standards and procedures of local plants, and, supported the process providing improved knowledge of parasitic problems.

An effort to popularise good farming and conservation techniques, the availability of storage facilities and the progressive intensification of local plant production will ensure a more viable sector for farmers, while providing large volumes of affordable product to the majority of the population whose purchasing power remains low.



Plants are cut into sections to be planted.

Conclusion

While production is constantly increasing, there is even greater potential. Mali has recently published annual production figures[3] of 65,000 tonnes, Senegal 10,500, Niger 8,582 and Burkina Faso of 8,000. Guinean production can also be estimated[4] at over 10,000 tonnes. The output of these 5 countries exceeds 100,000 tonnes of potato which represents an annual turnover of at least €22.8 million[5].

The potato sector in these countries therefore is of real economic importance although it is still limited, since the annual consumption of local production does not exceed 1.6 kg a year per person. (in Belgium it is 84 kg) [6]

Finally, the example of Sikasso (see box), shows that the sector is now moving towards an «interprofessional» organisation structure which includes all stakeholders (importers of plants, farmers, traders, exporters, processors...) because the potato sector urgently requires good organisation, not only amongst producers, but throughout all the links in the production chain.

: FAOSTAT, 2006
: Authors' estimate.
: Based on an estimated minimum price of 150 F CFA / kg or 0.228 euro / kg.
: Source : http://www.aardappel2008.be/fr/in-belgie/consumenten/e-aardappel-in-belgie/

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SOS Faim and the farmers' organisations

For several years, SOS Faim supports different farmers' organisations in Africa and Latin America. As with microfinance for example, we have to analyse the aims, models and implementation conditions of supports to farmers' organisations. With this frame of mind, SOS Faim edits «*Farming Dynamics*». You can find this publication and download it in French, English and Spanish on the website of SOS Faim : *www.sosfaim.org*.

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