

Promoting smallholder seed enterprises: quality seed production of rice, maize, sorghum and millet in northern Cameroon

Robert G. Guei^{1*}, Abdoulaye Barra² and Drissa Silué³

¹ Plant Production and Protection Division (AGP), Food and Agriculture Organization (FAO), Room C715, FAO, Rome, Italy

² Ministry of Agriculture and Rural Development, Head Office of Agricultural Development, Garoua, Cameroon

³ The World Vegetable Center, Regional Center for Africa, P.O. Box 1044, Arusha, Tanzania

Food and Agriculture Organization of the United Nations (FAO) conducted two projects in Cameroon on strengthening rice, and sorghum, maize and millet seed production by smallholder seed enterprises (SSEs). Farmer groups (respectively, 25 SSEs and 114 SSEs) were formed or strengthened and trained. Sixty-six selected lead farmers were trained on the administering and managing of revolving funds. The groups were then linked to the Extension Service (for continuous technical advice), Agriculture Research for Development Institution (continuous supply of needed seed), National Seed Service (seed certification) and to financial institutions (financial support). The results obtained showed that 60 and 59.6 per cent, respectively, of the groups sustained their activities two to three years after the projects ended. Total certified rice seed produced increased to 800 tonnes (t) against 267t at the beginning. For the other cereal project, the total certified seed produced was 719.2t against 497t at its beginning. The use of quality seed rice together with good agronomic practices increased yields (up to 8.0t/ha against a scant 2t/ha before). All interviewed farmers stressed that the seed business was profitable and helped achieve higher living standards and diversify their activities. Seasonal incomes were more than US\$1,783.31. Finally, both FAO projects helped generate farmers' income to about US\$2,114.871, produced 447,954t of cereal grain and thus improved food security and alleviated poverty. The Cameroonian success could be repeated elsewhere.

Keywords: Cameroon; farmer groups; maize; millet; quality seed production and supply; revolving funds; rice; seed certification; smallholder seed enterprises; sorghum

Foreword

One of the major problems constraining agricultural development in Africa, particularly in the face of climate change when access to new and genetically diverse varieties is critical, is the lack of an efficient seed production and distribution system. This constraint is the capability of providing farmers, including those in remote areas, with quality seeds of adapted varieties. In recent years, however, many governments in Africa curtailed public-sector investment in the seed sector, hoping that the private sector would take over. However, the private sector

has generally not taken up the challenge as expected. This is particularly true for self-pollinated and open-pollinated crops, and vegetatively propagated crops that are not attractive to private investment because of low profit. As a result farmers are left without access to seeds of new and improved varieties of their local food security crops. For the Food and Agriculture Organization of the United Nations (FAO), supporting, developing and promoting smallholder seed enterprises (SSEs), which are close enough to the beneficiaries, could be an alternative.

The objective of this paper is to describe the methodologies used and the success achieved during the

*Corresponding author. Email: Gouantoueu.Guei@fao.org

projects aimed at promoting smallholder sustainable quality seed production and supply enterprises in Cameroon. The success of the model is based on the development of technical and managerial capacities of seed producers' organizations as well as their ability to build strategic and functional business linkages with service providers in the community and the country. This paper is meant for:

- the general public, in order to promote similar approaches among stakeholders wishing to embark on quality seed production of local varieties;
- policy makers and government organizations, in order to formulate, reform and implement adapted policies and legislation necessary to promote the production and dissemination of quality seed of local crops; and
- potential donors in order to attract and encourage them to support the development of SSEs as an alternative in the absence of private sector investment.

Introduction

In Africa, smallholder farmers face several problems when the time comes to establish new crops. These include a limited access to quality seeds. However, where seed is available, its quality is low. Furthermore, the supply of seed is even more limited or completely absent when it comes to indigenous or local crops, which sometimes play an important role in food security. In addition, national seed production and dissemination systems insufficiently meet seed demand and farmers have to largely rely on their own saved seeds.

Most of the time, for varieties developed locally, basic seed necessary for producing certified seed is available in limited quantities and for this reason seed enterprises cannot produce large quantities of certified seed (Jones and Rakotoarisaona, 2007). The seed control and certification process is costly and not always conducted in a timely manner. This has seriously hindered commercialization. Furthermore, agencies responsible for seed quality control and certification often do not know their clients or do not have qualified personnel and equipment necessary for performing the required functions. Finally, although seed policies and legislation are important for promoting the seed industry, such policies and legislation are not adequately adapted to the level of the seed industry development or are not adequately implemented.

Communities in remote areas do not have access to certified seeds of the crop varieties they wish to grow since the formal sector does not conduct varietal demonstrations in these locations. Thus, seed dealers do not have enough information to advise farmers on the attributes and advantages of varieties they are selling. On the other hand, it is costly for seed companies to provide remote communities with certified seeds as this market is scarce because of limited demand resulting from high seed prices. Furthermore, poor road infrastructure inhibits extension of seed marketing entrepreneurs into these areas.

The private sector is less interested in developing varieties of self-pollinated or vegetatively propagated crops with low market value since such varieties yield low profits as farmers often use part of their harvested material as seed for the subsequent growing seasons. In most sub-Saharan African countries including Cameroon, governments have disengaged themselves from seed production. This left the big private seed companies to be the sole sources of commercial seeds, which are often expensive and consequently inaccessible to limited resource farmers. Furthermore, in the face of dwindling agribusiness, the private big seed companies have withdrawn from the quality seed market of local crop varieties and small holder seed supply entities have sprung up as alternatives and are endeavouring to meet the increasing demand for quality local seeds. An alternative to fill the smallholder quality seed gaps is to strengthen the capacities of selected farmers or farmer organizations who will produce and manage the distribution of quality seeds of both improved and good local varieties (Buruchara and Kimani, 2009). The expectation is that the seed produced will cover part of the seed demand for the main food security crops.

Several public agricultural research organizations and non-governmental organizations have given their support for this type of approach that is being practised in many countries (including Kenya, Uganda and Ethiopia). For example, CIMMYT (International Maize and Wheat Improvement Center) has successfully chosen to multiply seed of two open-pollinated maize varieties with two groups of farmers based in Kenya and Uganda, with a seed price far lower than that of private commercial seed companies (CIMMYT, 2009). In Ethiopia, an SSE system is known to be promoting such seed production, as well as the distribution and use by farmers of quality seeds of vegetable crops (Mulatu *et al.*, 2005), and this system could also be applied to other agricultural commodities such as rice, sorghum and maize.

However, these emerging smallholder enterprises face a lot of problems in conducting their activities. These problems relate to access to equipment; technical and managerial knowledge; quality basic seeds; agricultural land; credits and other financial facilities necessary for developing their seed activity; strong support from the public sector and policy makers is often lacking. The two projects implemented by FAO in Cameroon from 2005 to 2008 aimed at building seed enterprises to produce and distribute quality seeds of rice, sorghum, millet and maize.

Project concept and methodology

It is noteworthy that most smallholder seed system development work done by many development actors has not always been very successful and sustainable. This is because more emphasis is put on only training farmers and farmer groups to produce quality seeds. It is expected that as they are close to the beneficiaries, they can naturally distribute seeds within their communities. Unfortunately, less emphasis has been put on the development of their managerial skills to produce and to market efficiently their products as a business.

The projects, as described below, were designed by FAO in partnership with the Cameroonian Government to set up a sustainable seed system in food-insecure and drought-prone provinces of the north and far north of Cameroon for rice, sorghum, millet and maize. The methodology consisted of mobilizing, training and building the capacities in quality seed production for local quality seed production and marketing. The training covered all technical aspects of seed production including organizing farmers into autonomous seed producers' groups, selection of seed production sites, nursery management, crop management, fertilization, isolation distance, weed control and crop protection, rouging, seed harvesting, seed drying, cleaning, treatment and packaging and storage, revolving fund management and marketing. The emphasis is on the development of the groups as business entities

Building a sustainable SSE

Why focus on smallholder seed producers?

The two projects initiated by FAO in Cameroon covered non-hybrid varieties of rice, millet, sorghum and maize. The rice project was on strengthening the multiplication and dissemination of improved

and healthy rice seed and the other projects were on strengthening farmer organizations for the multiplication and dissemination of early maturing varieties of maize, sorghum and millet. Targeting smallholder seed producers and building their entrepreneurial capacities were necessary because the crops concerned are either self-pollinated (rice) or open-pollinated (millet, sorghum, maize) crops whose seeds are not handled by bigger private companies and also not efficiently supported by the public sector. Building the capacities of smallholder seed producers to produce and distribute quality seeds as a business activity is the best alternative as a means of promoting agriculture and national as well as local food security. For this reason, the following components are important for seed production and marketing sustainability.

Sustainability issues

Group strengthening and institutional capacity building: organizing producers' groups and enhancing their technical and managerial capacities

This component is very crucial and puts emphasis on making producers' organizations solid institutions. Strengthening producers' organizations consisted first of sensitizing the farmers to the interest in embarking on seed production as a group and as a lucrative business activity. The second step is, in a participative way, to organize them into better structured groups with all legal constitutions. The groups are then assisted to officially register and have a legal and recognized status. This step is crucial as it is the backbone of the smallholder enterprise. It brings trust and a sense of security. A weak group will not sustain its existence for a longer period. Also, having a legal status empowers the groups and facilitates the groups' access to local financial services for savings and access to loans. Having social activities within the groups is highly recommended, to reinforce their cohesion. All groups received training in capacity building in farmers' cooperatives management.

Technical and managerial training: reinforcing the technical knowledge of seed producers' groups

Groups are given technical training on quality seed production in line with the current Cameroonian quality seed production guidelines for rice, maize, sorghum and millet, ranging from sowing rate determination to sowing methods; fertilization; weed and pest management; isolation distance; rouging and

harvesting; drying; treating; packaging and storage of the seeds. These farmer organizations are also trained in business management including marketing approaches.

Creation of structural and strategic partnerships

Creating strategic linkages and partnerships with the national seed certification service, extension and research: this is also a very important step towards building farmers' groups autonomy and self-reliance. Linkages and partnerships are built through the projects with research, extension, seed certification agency and financial institutions, as described below.

Linkages with research

Structural links through contractual arrangements were established with the research and development organization and the national research institute (Institut de Recherche Agronomique pour le Développement [Institute of Agricultural Research for Development, Cameroun] IRAD) in order to sustain the supply of early generation seeds necessary for the production of certified seeds. IRAD also participated in the capacity-building activities of the projects. It is absolutely important for these agricultural producers' organizations to sustain a continued access to new germplasm from IRAD through the acquisition of breeder and foundation seeds.

Linkages with the extension system

Similar arrangements were established between SEMRY (Société d'Expansion et de Modernisation de la Riziculture de Yagoua [Rice Development Authority in Yagoua]) and MEADEN (Mission d'Etude pour l'Aménagement et le Développement de la province Nord/Projet Hydro-agricole de Lagdo [Development Authority of the Northern Province/Lagdo Hydro-agricultural Project]), the rural development authorities in north and far north of Cameroon, to ensure that seed producers are better supervised and are technically assisted in quality seed production. Both institutions also promote the commercialization of the seed produced by creating links between seed producers and seed users.

Linkages with the National Seed Service

District-level seed certification agents were further trained by the project in quality control and a contractual arrangement was made to facilitate their continued support and interaction with seed producers' groups in order to perform this task for the enterprises

even after the project has ended. The quality of seed produced by the groups is therefore controlled and certified by the National Seed Service. This National Seed Service then becomes a vital partner that ensures the quality and prevents fraudulent seeds entering the seed market.

Linkages with the finance and credit institutions and the establishment of revolving funds

One of the most crucial bottlenecks to SSE establishment and growth is the lack of financial services for savings and loans. It is often the case that smallholder seed production fails after the project is completed. In order for seed producers to sustain cash flow into their seed business, a revolving fund was established. Farmers received inputs from the projects as a loan, the reimbursement of which is used to open a savings bank account in a local micro-finance institution to serve as a revolving fund. Farmers are encouraged to top up the fund with 15 per cent of the financial returns from seed sales. They are trained to manage the fund, which is used to finance all subsequent production and marketing activities of the groups.

The fund is managed by a committee set up by each group whose members were trained in the creation and management of revolving funds. When the fund becomes significant, it serves for funding social activities or for the establishment of micro-credits for its members at lower interest rates. Each group was able to open a bank account with the help of the technical and extension institutions MEADEN and SEMRY. These institutions encouraged the groups to increase the level of their contributions to the funds to facilitate access to loans.

The success of this model and its sustainability are based on several outcomes: strengthening the institutional, technical and managerial capacities of the group; access to financial services; as well as the partnership mode with the public sector for seed quality control; and the provision of basic seeds as described above.

Achievements

Strengthening capacities Seed producers and technicians

A total of 360 rice seed producers received practical training in seed production, harvest and post-harvest operations; conditioning and storage of seeds. For the millet, sorghum and maize project, 500 seed producers were given on-the-job training in seed production,

harvesting, processing and storage techniques as well. Furthermore, 40 extension staff from the development and certification agencies were trained on improved quality seed production, field inspection, quality control and seed certification techniques.

Management of revolving funds

For the rice project, 66 lead farmers were chosen as groups' representatives. They were trained on methodologies for administering and managing revolving funds. Four technical staff were also trained on the management of revolving funds and seed marketing in order for them to continue supporting producers' organizations. For the millet, sorghum and maize project, 228 group members, extension agents and group managers were trained in revolving funds management and marketing.

Seed control and certification

Eight technical staff from the Rice Development Authorities in charge of Extension Services of SEMRY and MEADEN together with 17 other staff from rural development organizations in charge of managing the rice-growing areas were given on-the-job training in seed production techniques, seed fields inspection, seed quality control and certification.

Research scientist staff of research, development and extension institutions

A research scientist from IRAD was trained at Africa Rice in Senegal in conventional breeding techniques, techniques of pre-basic and basic seed production, seed field inspection techniques, and rice seed control and certification. The objective of this was to strengthen the capacity of the National Research for Development Institute in order to continue the timely production of breeder and foundation seeds necessary to renew the seed capital of seed producers.

Establishment and evolution of SSEs

At the end of the rice project in 2006, 25 SSEs were set up or revitalized with a total of 360 members at Maga and Yagoua and 60 at Lagdo. It is noteworthy that, contrary to most smallholder seed projects where the lifetime of the groups is usually equal to that of the project duration, 15 SSEs (60 per cent success) (Table 1) consolidated their seed production and distribution activities and are still continuing to do seed business.

The maize, sorghum and millet project created 114 SSEs with 1,648 members (869 women and 362 rural youths). At the end of the year 2009, 68 were still very

Table 1 | Evolution of the number of SSEs during and after the project on rice seed production (2005–2009)

Regions	Years				
	2005	2006	2007	2008	2009
<i>Lagdo</i>					
Number of SSEs created	0	4	0	0	0
Number of SSEs currently active	0	4	3	3	3
<i>Maga</i>					
Number of SSEs created	4	8	0	0	0
Number of SSEs currently active	4	12	3	7	7
<i>Yagoua</i>					
Number of SSEs created	4	5	0	0	0
Number of SSEs currently active	4	9	2	2	5
Total number of active SSEs	8	25	8	12	15

Source: FAO final project report 'Appui à la multiplication et à la diffusion de semences améliorées et saines de riz' or 'Strengthening the multiplication and dissemination of improved and healthy rice seed', TCP/CMR/3002 (A), September 2004–June 2006.

Table 2 | Evolution of the number of SSEs during and after the project on maize, sorghum and millet seed production (2007–2009)

Regions	Years		
	2007	2008	2009
<i>North</i>			
Number of SSEs created	32	9	0
Number of SSEs currently active	32	35	32
<i>Far north</i>			
Number of SSEs created	85	0	0
Number of SSEs currently active	85	76	36
Total number of active SSEs	117	111	68

Source: FAO final project report 'Appui aux Organisations Paysannes pour la multiplication et la diffusion de variétés précoces de maïs, de sorgho et de mil dans les provinces du Nord et de l'Extrême Nord' or 'Strengthening farmer organizations for the multiplication and dissemination of early maturing varieties of maize, sorghum and millet in northern and far northern provinces of Cameroon', TCP/CMR/3102 (D), December 2006–November 2008.

Table 3 | Total rice seed produced (tonnes) during and after the rice seed production project (2005–2009)

	Years					Total amount of seed produced
	2005	2006	2007 ¹	2008	2009	
Lagdo	0.00	100.00	80.00	92.00	54.00	326.00
Maga	150.00	395.00	197.00	148.00	243.00	1,133.00
Yagoua	117.00	305.00	84.00	37.80	226.00	769.80
Total	267.00	800.00	361.00	277.80	523.00	2,228.80

Source: FAO final project report 'Appui à la multiplication et à la diffusion de semences améliorées et saines de riz' or 'Strengthening the multiplication and dissemination of improved and healthy rice seed', TCP/CMR/3002 (A), September 2004–June 2006.

¹Production data were not properly recorded for 2007 as the Project Manager was absent for the whole year.

active and judged most successful (Table 2) (59.6 per cent success).

The survey conducted by FAO in 2010 revealed that the decrease in the number of groups was due to several factors:

- some SSEs decided to merge to form a large group for economy of scale;
- SSEs that did not succeed in managing and increasing the level of their revolving fund were not efficient in production and distribution of quality seeds; and
- others did not sustain their land as landowners decided to embark on seed production for themselves.

This demonstrates the value and crucial importance of access to financial services and land in the sustainability of SSEs. However, it is important to note that after a number of years a large number of SSEs created by both projects are still active and producing successfully quality seed in north Cameroon.

Certified seed production

Rice

Rice seed production increased from 267 tonnes (t) at the beginning of the project in 2005 to 800t at the end of the project in 2006 (Table 3). Seed production has been sustained since the project ended. Although there were some difficulties in collecting data for 2007, the rice seed production since the initiation of the project in 2005 went beyond 2,000t (Table 3).

With a seeding rate of 35kg/ha, this quantity of certified seed produced and distributed in four years may have allowed the cultivation of 63,680ha and an estimated paddy production of more than 300,000t. In addition, before the project, farmers in the north were getting around 2 t/ha as mean rice yield.

Because of the technical training provided and closer supervision during and after the project, the mean seed yield went up to 5.22t/ha at Lagdo, 5.06t/ha at Yagoua and 6.16t/ha at Maga. The choice of varieties and the quality of the seed used, the weather conditions, the quality of supervision and farmer's know-how can explain these high seed yields as observed.

Rice seed production is only conducted during one season in a year as the available varieties are of longer duration and not adapted to double cropping. With

Table 4 | Total (tonnes) maize, sorghum and millet seed produced during and after the project (2007–2009)

Regions	Years			Total seed produced by commodity
	2007	2008	2009	
<i>Commodities</i>				
Maize	101.20	58.50	113.50	273.20
Sorghum	8.50	4.00	3.10	15.60
Millet	0.00	0.00	0.00	0.00
<i>Commodities</i>				
Maize	128.80	143.10	93.00	364.90
Sorghum	32.50	13.70	12.60	58.80
Millet	4.00	2.70	0.00	6.70
Total	275.00	222.00	222.20	

Source: FAO final project report 'Appui aux Organisations Paysannes pour la multiplication et la diffusion de variétés précoces de maïs, de sorgho et de mil dans les provinces du Nord et de l'Extrême Nord' or 'Strengthening farmer organizations for the multiplication and dissemination of early maturing varieties of maize, sorghum and millet in northern and far northern provinces of Cameroon', TCP/CMR/3102 (D), December 2006–November 2008.

short duration varieties the seed production capacity will double as dry or rainy season (depending on the location) production would be possible. Also, the FAO study report showed that more seeds would have been produced if access to land was not a limiting factor, especially in the Maga region where the demand for land was higher than the 6,500ha available for both the seed and the paddy production.

Maize, sorghum and millet

For the maize, sorghum and millet project, the total certified seed produced by the end of 2008 was 497t with 431.6t for maize, 58.7t for sorghum and 6.7t for millet. At the end of 2009, the total certified seed

production was around 719.2t (Table 4), showing an increase of about 30 per cent as compared to 2008.

Total seed produced with the two projects up to 2009 was 2,228,800kg for rice, 638,100kg for maize, 74,400kg for sorghum and 6,700kg for millet (Table 5). Seed production was higher in Maga for rice with 1,133,000kg and Lagdo was the lowest producing zone with only 326,000kg. For maize and sorghum, the far north area produced the most with 364,900 and 58,800kg, respectively.

The recent FAO survey indicated that if the current prices are maintained or increased, more farmers will engage in seed production activity. Further, policy changes are necessary for developing, strengthening

Table 5 | Quantity of seed of the target crops produced in the different regions, financial resources generated from seed sales and potential quantity of grain produced from 2005 to 2009

Commodities	Production locality	Quantity of seed produced (kg)	Sale price/kg (FCA francs)	Financial resources generated from seed sale (CFA francs)	Sowing rates (kg/ha)	Potential cultivated area (ha)	Potential quantity of grain produced (t)
Rice	Lagdo	326,000.00	200	65,200,000.00	35	9,314.29	57,376.03 ¹
	Maga	1,133,000.00	400	453,200,000.00	35	32,371.43	199,408.01
	Yagoua	769,800.00	400	307,920,000.00	35	21,994.29	135,484.83
Total		2,228,800.00		826,320,000.00		63,680.00	392,268.86
Maize	Nord	273,200.00	500	136,600,000.00	20	13,660.00	51,048.00 ²
	Extrême nord	364,900.00	500	182,450,000.00		18,245.00	36,490.00
	Total		638,100.00	319,050,000.00		31,905.00	87,538.00
Sorghum	Nord	15,600.00	500	7,800,000.00	10	1,560.00	1,248.00 ³
	Extrême nord	58,800.00	500	29,400,000.00	10	5,880.00	4,704.00
	Total		74,400.00	37,200,000.00		9,800.00	5,952.00
Millet	Nord	0.00	500	0.00	3–5	0.00	0.00
	Extrême nord	6,700.00	500	3,350,000.00		1,340.00	670.00 ⁴
	Total			1,185,920,000.00 or US\$ 2,114,871		95,504.00	447,954.00

Source: (1) FAO final project report 'Appui à la multiplication et à la diffusion de semences améliorées et saines de riz' or 'Strengthening the multiplication and dissemination of improved and healthy rice seed', TCP/CMR/3002 (A), September 2004–June 2006. (2) FAO final project report 'Appui aux Organisations Paysannes pour la multiplication et la diffusion de variétés précoces de maïs, de sorgho et de mil dans les provinces du Nord et de l'Extrême Nord' or 'Strengthening farmer organizations for the multiplication and dissemination of early maturing varieties of maize, sorghum and millet in northern and far northern provinces of Cameroon', TCP/CMR/3102 (D), December 2006–November 2008.

One US\$ = 560,753.

¹Yields of 2.0t/ha paddy farmers before the rice project and 6.16 t/ha (mean highest yield) obtained by seed producers were used in calculations.

²Yield of 1.18t (low mean) and 2.0 t/ha (common mean) were used for calculations.

³Yields of 0.5t (low mean) and 0.8 t/ha (common mean) were used for calculations.

⁴Yield of 0.3t (low mean) and 0.5 t/ha (common mean) were used for calculations.

and improving the seed business. These include price support, implementation of the seed law, addressing fraudulent seed trade as well as supporting and strengthening seed producer organizations and making access to farm inputs easier and cheaper. The government has committed itself to addressing these changes (MINADER, 2009).

Effects on food production and productivity

The use of quality seed by farmers is leading to increased yields in north Cameroon. Information gathered from rice farmers and extension agencies indicates that normally rice farmers obtain a yield of 2–3t/ha with farmer-saved seed, but with the use of certified seed and good farming practices, up to 6.0–8.0t/ha can be achieved. This is a tremendous productivity gain in the region and calls for an increased investment in agricultural production, including the production and distribution of improved seeds.

Contribution to food security and poverty alleviation

During the FAO survey conducted in late 2010, all interviewed farmers stressed that the seed business was profitable and has helped them achieve a higher living standard, diversify their activities (vegetable production, small animal husbandry, acquisition of new shops, etc.) to increase their income. For farmers in the Gourougou group in Lagdo area, the average income is 1,000,000 CFA (US\$1,783.31) per season. In Maga and Maroua, incomes are higher because of higher yields. Table 5 shows that the two projects have helped communities through seed sales to generate revenue in north and far northern Cameroon of about US\$2,114,871. Also farmers who purchased the seeds potentially produced 447,954t of cereal grain for consumption. This indicates clearly that the project is contributing to food security and poverty alleviation in north Cameroon.

Conclusion

The Cameroonian experience has shown that it is possible to fill the gaps left by governments and seed companies in the supply of quality seed of local crops to farmers. Supporting the establishment and the sustainable growth and development of SSEs remains a vital alternative. However, seed is not an easy task. It needs a lot of financial and technical support at the beginning. The success of the model described in this paper is based on building a good

partnership with government services for selecting, sensitizing, establishing and training seed producers' organizations. Building alliances around these organizations and establishing the necessary linkages are the keys to success. This needs the commitment of all partners and producers as well as local research and development agencies. Continued access to land by producers and the possibility of access to financial services (e.g. revolving funds) remain an important key to sustainability. Strong partnerships between public and private organizations and policy reforms for strengthening, streamlining and developing the seed business as suggested by Kugbe and Bishaw (2002) and Mulatu *et al.* (2005) also match the Cameroons initiative.

This model has facilitated the creation, growth and development of SSEs, which have strengthened over the years to become autonomous, efficient and profitable. The model has not only enabled the production of 2,948t of quality seed for crops that are important for national food security (rice, maize, sorghum and millet) but it has also contributed to an improvement in the livelihoods of farmers, which was made possible with the increase of income from seed business and the diversification of their activities. It can be assumed that sustainable seed production and marketing at local level for meeting the regional demand of quality seed of improved varieties is now effective in northern and far northern Cameroon and all interviewed seed growers confirmed that the business was profitable. The evidence for this statement is that some landlords who were renting their land to seed producers have decided not to rent them any longer and have rather taken up seed production for themselves.

Seed production by SSEs is less costly and more affordable for smallholder farmers. The linkages between seed producers and research/development organizations have enabled to access farmers improved varieties. Through such linkages, rice crop yields of 8t/ha have been achieved in seed production plots compared to levels normally achieved by ordinary farmers, which rarely exceed 2t/ha. The high yields achieved by seed producers have encouraged paddy growers to use quality seed. However, the agricultural extension system has to continue sensitizing farmers to the use of quality seed in order to increase the number of farmers using it.

New rice varieties, particularly those with short growing cycles and good pest resistance, should be tested for yield and adaptation to the regions. The identification of new short-cycle rice and pest resistant

varieties, which are adapted to the growing areas, should make possible a second growing season in all areas of the projects, especially during the rainy season, and this would increase the amount of seed as well as food produced in the region.

Finally, continuous capacity building is extremely necessary. The government should continue to support the seed enterprises to ensure that capacity building, particularly in seed production and marketing, is assured. The Cameroonian model is a success story that can be adapted to similar conditions in other countries where the seed industry is at the emergence stage. It is noteworthy that for a total budget of US\$642,000 for both projects (2005–2008), seeds produced and sold to farmers generated on average US\$704,957 per annum. This means that for each dollar invested, US\$3.29 was generated.

Lessons learnt

Developing a national seed sector will require that capacities are in place at individual, institutional and policy-enabling environment levels. For various

actors, producing quality seed requires a range of skills and capacities at various levels, from planning and management of seed production to skilled farm operations. This requires cadres of skilled and knowledgeable people at all levels in the seed 'chain', and therefore training at all levels, from farmers to scientists and policy makers. Financial and technical support for seed production from governments, donors and extension services is essential during the early stages of development of seed enterprises. Improving farmers' skills and knowledge in seed storage, seed quality management, marketing, accounting and accessing new varieties could enhance uptake and spread of new varieties and improved practices. It will keep the SSE commercially viable. This paper clearly shows that the best approach for ensuring production and distribution of quality seed of local crops may be to support SSEs with lower capital investment needs and fewer overhead costs. However, the fact remains that these smallholder enterprises can only prosper if the policy environment is conducive and if the needed capacities are in place.

References

- Buruchara, R., Kimani, P., 2009, *Sustainable Seed Production – A Proposal*. [available at: www.cialca.org/files/files/TSBF%20planning%20meeting/Presentation%20%20-%20Buruchara%20-%20Seed%20systems.pdf].
- CIMMYT (International Maize and Wheat Improvement Center), 2009, *Seed Production: Can farmers Supply Themselves and Earn a Profit?* [available at: www.cimmyt.org/english/docs/ann_report/recent_ar/D_Support/community.htm].
- Jones, R. B., Rakotoarisaona, J. J., 2007, 'Supporting the development of sustainable seed systems for non-hybrid crops', *Acta Horticulturae (ISHS)* 752, 77–82.
- Kugbei, S., Bishaw, Z., 2002, 'Policy measures for stimulating indigenous seed enterprises', *Journal of New Seed* 4, 47–63.
- Mulatu, E., Ibrahim, O. E., Bekele, E., 2005, 'Policy changes to improve vegetable production and seed supply in Hararghe, Eastern Ethiopia', *Journal of Vegetable Science* 11, 81–106.
- MINADER (Ministère de l'Agriculture et du Développement Rural du Cameroun), 2009, *Stratégies nationales pour le développement de la riziculture au Cameroun*, Mouture III. [available at: www.jica.go.jp/activities/issues/agricul/pdf/NRDS/NRDS_came_F.pdf].