

Feeding *the* Future

Getting maize production moving in Africa

Maize is the most widely grown food crop in Sub-Saharan Africa (SSA). It is planted on 100,000 ha or more in 24 countries, and in total, is grown on about 21 million ha (Table 1). It accounts for 41 percent of the total cereal area in Eastern and Southern Africa and 21 percent in Western and Central Africa. Maize is primarily used for human consumption. Its caloric contribution to national diets ranges from a low of 4 percent in Guinea (where rice is the primary staple) to a high of 54 percent in Malawi.



Technology exists to double and triple maize yields.

Sub-Saharan maize production grew 55 percent between 1985 and 2000—from 18.2 to 28.2 million tonnes, slightly ahead of population growth. In Eastern and Southern Africa, rising yields accounted for 75 percent of the production gains. In Western and Central Africa, the situation was exactly the opposite, with area expansions accounting for most production gains (75 percent).

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Working with NEPAD

The Sasakawa Africa Association (SAA)/ Global 2000 (SG 2000) and the New Partnership for Africa's Development (NEPAD) are jointly sponsoring an international workshop in Johannesburg in November entitled, "from subsistence to sustainable agriculture – policies, strategies and implementation".

Dr Norman E Borlaug, President of SAA, and Professor Wiseman Nkuhlu, Chairman of the Steering Committee of NEPAD, will chair the meeting. Attendees will include some Ministers of Agriculture from NEPAD member countries and representatives from the World Bank, bilateral development agencies, international research centres and agribusiness companies.

"We share many of NEPAD's objectives for the future of African agriculture," comments

Marco Quiñones, SAA Regional Director for Africa. "We, too, want to improve the productivity of agriculture, with particular attention to small-scale and women farmers. We want to ensure food security and increase access for the poor to adequate food and nutrition. We believe that these goals are best achieved by integrating as many of the rural poor as possible into the market economy."

The workshop will provide a forum to share experiences and good practices as well as identifying possible



Women farmers will be given particular emphasis.

implementation strategies and frameworks.

"We are delighted to be associated with NEPAD," says Norman Borlaug. "We subscribe to its vision and applaud its determination to address the major challenges confronting African agriculture."

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Getting maize production moving in Africa

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International and national research institutions have developed several hundred improved maize varieties and hybrids—of varying maturity, high yield potential, enhanced disease resistance, and greater drought tolerance. Modern varieties are available with resistance to maize streak virus, downy mildew, and Grey Leaf Spot, and tolerance of the parasitic weed, striga spp.

Poor quality seed systems remain a major bottleneck to adoption. Only about 36 percent of the SSA maize area (excluding South Africa) is planted to modern varieties (60 percent to improved open-pollinated varieties and 40 percent to hybrids). Maize seed supply systems are seriously underdeveloped in most countries. The development of private seed companies in general has gone slowly. However, SeedCo in Zimbabwe has shown that it is possible to supply smallholder farmers with hybrids every year, efficiently, effectively, and profitably for both the farmer and seed grower.

Limited fertiliser use is perhaps

Table 1. Key maize statistics in SG 2000 project countries, 1999-2001

Country	Area 000 ha	Yield t/ha	Prod. 000 t	% Total cereal area	Maize, as % total diet (calories)
Benin	603	1.1	668	73	24
Burkina Faso	274	1.7	465	9	10
Ethiopia	1,671	1.7	2,824	23	16
Ghana	695	1.5	1,012	52	16
Guinea	91	1.0	94	12	4
Malawi	1,485	1.7	2,495	89	54
Mali	295	1.4	419	10	9
Mozambique	1,171	1.0	1,136	62	20
Nigeria	3,988	1.4	5,543	22	13
Tanzania	1,655	1.5	2,483	45	26
Uganda	630	1.8	1,109	56	9
SSA*	21,101	1.3	28,242	31	18

* Sub-Saharan Africa (excluding South Africa).

Sources: FAOSTAT, June 2002; FAO Food Balances (for maize dietary contributions).

the single-most important constraint for higher yield levels. In SG 2000 countries, many farmers still do not use fertiliser on food crops, and when they do, in only small amounts.

“Ethiopia is a notable exception,” says Marco Quiñones, SAA Regional Director for Africa.

“Thanks to strong government leadership and the massive national extension intensive production programme, fertiliser use on food crops has been steadily increasing.”

Large yield “gap” persists

Improved technology exists to double and triple the yield levels of traditional subsistence farmers for most growing conditions. Unfortunately, the gap between experimental and actual maize yields remains large in most

countries (Table 2).

Typically, African smallholders are forced to sell their maize at much lower prices (often 30-50 percent lower) than farmers in OECD countries, while also paying two to three times more for fertiliser than the world price.

“As long as farm gate prices for fertiliser are so high and grain prices so low,” comments Marco Quiñones, “many smallholders will be unable to fully embrace high-yield technology.”

Table 2. Average maize yields in SG 2000 crop demonstrations compared to traditional practices (in brackets), t/ha

Region/Country	Highland	Mid altitude/ Subtropical	Tropical Lowland
Eastern Africa			
Tanzania	6-7 (1.6)	5-6 (1.5)	-
Ethiopia	6-7 (1.8)	5-6 (1.7)	-
Uganda	-	3-4 (1.7)	-
Southern Africa			
Malawi	-	5-6 (1.8)	-
Mozambique	-	3-4 (1.5)	3-4 (1.0)
West Africa			
Benin/Togo	-	-	3-4 (1.1)
Ghana	-	-	3-4 (1.5)
Guinea	-	-	3-4 (1.0)
Nigeria	-	-	5-6 (1.4)
Mali/Burkina Faso	-	-	3-4 (1.6)

Source: SG 2000 crop demonstration data.

Varying fertiliser dosages are applied to demonstration plots in different project countries.

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African smallholders are often forced to sell maize for 30-50 percent less than OECD farmers.

Time to reconsider fertiliser subsidies

Fertiliser subsidies have been a hotly debated issue in development circles. As part of structural adjustment programmes introduced by the IMF and World Bank during the 1980s and 1990s, African governments removed subsidies and got out of the input delivery business. Arguments against subsidies include 1) they are hard to administer and target towards intended beneficiaries, 2) they are very costly and politically difficult to remove once in place, and 3) they discourage the development of a private sector, which cannot compete with subsidised prices.

The retreat of African governments from supplying fertiliser at subsidised prices was not followed by a sound programme of exchange rate stability, access to credit, or capacity building in the private sector. Consequently, the anticipated surge in private sector investment has not materialised and fertiliser consumption over the past 15 years in Sub-Saharan Africa (SSA) has stayed the same, despite a 50 percent increase in population. In contrast, fertiliser consumption in the Association of Southeast Asian Nations (ASEAN) countries has more than doubled—to 8.8 million nutrient tonnes—compared to only 1.3 million nutrient tonnes currently consumed in SSA.

In many countries—including some SG 2000 project countries—fertiliser consumption has declined over the past ten years. In others, such as Ethiopia and

Benin, consumption has grown appreciably. Overall, fertiliser consumption in SSA remains the lowest in the world—only about nine kg of nutrients per ha of arable land. Food crops, on average, receive only about half this dosage.

Current rates of nutrient mining (depletion) and soil erosion in Africa are environmental disasters. To reverse these trends, integrated soil restoration strategies involving organic and non-organic nutrient sources are required. Integration of more grain legumes into crop rotations with cereals and roots and tubers can help. Agroforestry solutions, such as improved fallows using nitrogen-fixing plants, shrubs and trees, also have a role to play, especially in farmlands far from roads.

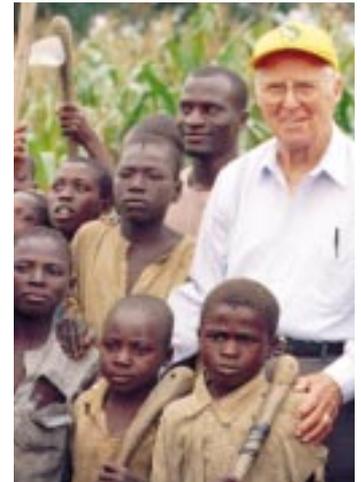
Conservation tillage with mulch can also build up the organic matter content of the soil and reduce erosion, both beneficial to

soil fertility. However, organic sources of nutrients alone cannot halt soil degradation and ensure food security. At the very least, inorganic fertiliser consumption in SSA must double by 2010, and preferably triple.

Bio-chemically, it makes no difference to a plant whether the nitrate ion it “eats” comes from a bag of fertiliser or from decomposing organic matter. Properly applied, most smallholder farmers can get 12-15 kg of increased grain for each kg of fertiliser nutrients applied. African farmers should not have to pay more than twice world market prices. To meet this criterion, fertiliser prices in most SSA countries need to come down by 30-50 percent.

Governments can help to reduce fertiliser prices through greater investments in rural transport systems and streamlined regulatory processes. Important savings can also be realised in the procurement process—buying larger quantities of high-analysis standard grades, and at optimum times. While such cost-reducing strategies should be vigorously pursued, they alone are not likely to be sufficient.

While it is the relative prices between fertiliser and the crop that determine profitability, high prices deny many smallholder farmers access, and the prospects for mounting effective credit programmes are not promising in



Dr Norman E Borlaug,
SAA President

Governments can help to reduce fertiliser prices through greater investments in rural transport systems and streamlined regulatory processes.

the near term. In addition, high inflation rates and significant loan defaults have resulted in very high interest rates. Dysfunctional rural financial systems are another argument for reintroducing fertiliser subsidies.

For subsidies to work, they need to be applied broadly in Africa and designed so that they encourage private sector activity in distribution and retailing. It is for those with more expertise than I to determine the best format and for how long they should last.

Sustained and co-ordinated donor and national support are essential to making subsidies work. With them, significant poverty reduction and environmental benefits can be achieved. Without them, Africa's future looks increasingly bleak.

About Sasakawa-Global 2000

Agricultural projects of Sasakawa-Global 2000 are operated as joint ventures of two organisations—Sasakawa Africa Association (SAA) and the Global 2000 programme of The Carter Center in Atlanta. SAA, whose president is Dr Norman E Borlaug, serves as the lead management organisation for the SG 2000 projects in Africa. Working through The Carter Center's Global 2000 programme, former US President Jimmy Carter and his advisers provide policy advice to national political leaders in support of programme objectives. Funding for SG 2000 projects comes from the Nippon Foundation of Japan whose chairperson is Ayako Sono and president is Yohei Sasakawa.

Africa's crops hunger for improved nutrition

Mineral fertiliser use in Sub-Saharan Africa (SSA) is the lowest in the world (Figure 1). On average, less than 5 kg/ha of fertiliser nutrients are applied to food crops, even though population pressures have caused traditional systems of shifting cultivation to break down. Soil nutrients are being depleted at an alarming rate, leading to environmental degradation and food insecurity.



There has been an excellent response to fertilisers in all SG 2000 countries.

To simultaneously reduce poverty and assure food security, African agriculture must grow at 5-6 percent per year, more than twice the rate of recent decades. This growth is unattainable without using significantly greater quantities of chemical fertiliser.

There has been little change in fertiliser consumption in SSA over the past several decades. Since 1980, consumption increased less than one percent per year, even though population grew 75 percent—from 345 to 607 million people (Table 1). In comparison, Southeast Asia, which has a slightly smaller population than SSA, uses seven times more fertiliser. Moreover, fertiliser consumption grew at more than 12 percent per year in Southeast Asia, compared to only 0.64 percent in SSA.

As part of a “structural adjustment programme” many African governments ended subsidies and direct participation in fertiliser supply in the late 1980s. It was hoped that this action would stimulate development of a private

sector, which would lead to improved efficiency in fertiliser delivery systems, and eventually more accessible prices. This has not happened.

The price a SSA farmer must pay for fertiliser is often two or three times higher than the world market price. Combine this with the low prices that farmers actually receive for their grain, and fertiliser use frequently becomes uneconomic, at least on food crops.

For a multitude of reasons—some related to poor transport systems and others to unfavourable economic policies and conditions—the profitability of using fertiliser for many key crops in Africa has worsened over the past 15 years.

This is not because fertilisers do not work or due to a lack of high-yielding, fertiliser-responsive varieties. To the contrary, SG 2000 staff and Ministry of Agriculture colleagues have observed excellent agronomic response to fertilisers in 12 countries on several million demonstration and production plots.



More efficient delivery systems could reduce the cost of fertilisers for African farmers.



Perhaps 40 percent of the world's population are alive thanks to chemical nitrogen fertilisers.

“By all means, use all available organic sources of nutrients,” says SAA President Norman Borlaug, “but also remember that perhaps 40 percent of the present world population are alive thanks to chemical nitrogen fertilisers. There just isn’t enough organic fertiliser available to replace the 80 million nutrient tonnes of nitrogen fertilisers consumed worldwide each year.”

Attention must be given to improving the efficiency of use and supply of fertilisers to make them more affordable to farmers. “On the use side, dynamic research and extension programmes are needed to develop and transfer integrated nutrient management practices in which all nutrient sources are judiciously integrated and losses to the environment are minimised,” states Marco Quiñones, SAA Regional Director for Africa.

On the supply side, cost reductions can be achieved all along the supply line—from procurement, to shipping, to unloading and bagging, to transportation to the farmgate.

“In many cases,” notes Balu Bumb, senior economist at the International Fertiliser Development Centre (IFDC), “policy changes don’t require a lot of money, just better rules and regulations, and better enforcement.”

Governments must participate more pro-actively in private fertiliser sector development. Financial and technical assistance should be provided to help develop input dealer (stockist) networks, which cater to the product and packaging needs of smallholder farmers. Easier access to foreign exchange and affordable interest rates are key prerequisites for fertiliser importers to expand inventories.

Governments can help to improve the efficiency of fertiliser use through much more dynamic and effective research and extension programmes. This will require greatly expanded on-farm research activities, aimed at developing crop management recommendations that integrate organic and inorganic nutrient sources. More location-specific fertiliser use recommendations can also help to tailor fertiliser use more efficiently. Recommendations are also needed for farmers with very low incomes or facing drought and other high-risk production situations.

Africa's crops hunger for improved nutrition

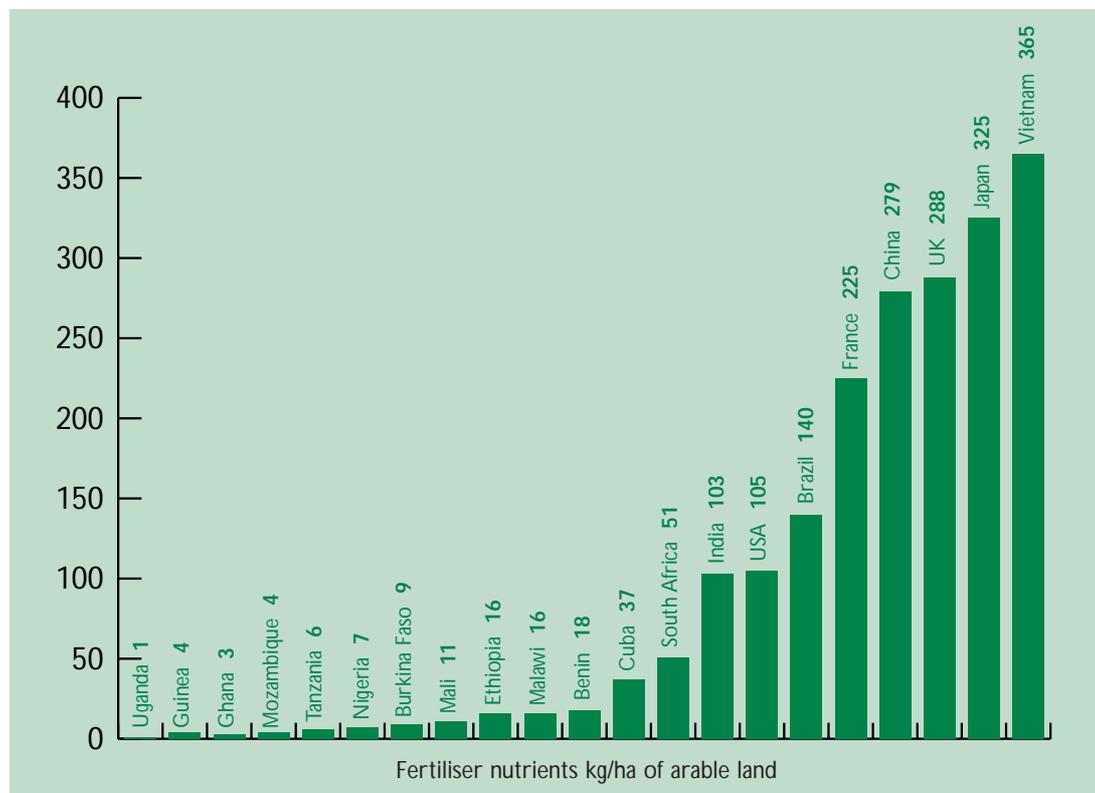
Strong training programmes are required to improve diagnostic and remedial skills in soil fertility management for researchers, extension workers, and farmers. Input-assisted crop demonstration programmes—along the lines of the SG 2000/Ministry of Agriculture (MOA) field programmes underway in ten countries—are an effective means of teaching farmers how to get maximum benefit from new nutrient management strategies. Current low-yielding production practices neither provide farmers with adequate incomes nor consumers with food at accessible prices. Productivity-led expansions in food production can increase farmer incomes and reduce rural poverty, while simultaneously lowering consumer prices. Thus increased fertiliser use can make African agriculture a powerful engine for economic growth.

It has been amply demonstrated that chemical fertilisers, when properly used, are not only beneficial for productivity enhancement but are also environmentally friendly. By permitting production on the same land, migration of farmers to marginal soils in search of plant nutrients is prevented. Increasing fertiliser use in Africa is surely not an environmental problem but rather a central component in SSA's environmental solution.



African agriculture must grow at 5 to 6 percent per year to ensure food security.

Figure 1. Fertiliser nutrient consumption per hectare of land in selected countries, 2000



Source: FAOSTAT, July 2002

Table 1. Fertiliser consumption in SG 2000 project countries

	Total nutrient tonnes				
	1980	1985	1990	1995	2000
Benin	862	111,492	11,003	36,000	35,200
Burkina Faso	4,308	12,136	21,166	24,308	33,923
Eritrea	-	-	-	1,614	10,900
Ethiopia	43,200	65,988	77,100	134,300	157,480
Ghana	12,000	12,500	13,000	9,700	11,886
Guinea	280	360	1,161	5,106	3,200
Malawi	33,264	34,028	48,000	43,519	32,790
Mali	14,191	19,706	15,200	27,000	52,000
Mozambique	27,600	3,803	2,600	7,800	14,300
Nigeria	173,900	292,000	400,380	183,000	186,700
Sudan	80,700	93,400	81,900	51,700	37,600
Tanzania	35,500	38,927	46,800	27,000	22,404
Togo	2,653	9,800	11,500	16,433	19,838
Uganda	800	200	192	1,300	4,800
Zambia	78,600	80,200	59,500	55,000	30,278
Sub-Saharan Africa	956,059	1,203,823	1,245,932	1,074,694	1,230,296
SE Asia (ASEAN)	2,507,540	3,887,725	5,681,291	7,141,180	8,835,193

Source: FAOSTAT, July 2002

Evaluating SG 2000 in the field

Last year, SAA's board of directors commissioned the International Cooperation Centre for Agricultural Education (ICCAE) at Nagoya University, Japan, to undertake an external evaluation of all ongoing SG 2000 country projects. Previously, independent evaluations of Ghana (1990) and Tanzania (1992) projects were done. This time, after 16 years of operation, the SAA board has decided to review all projects and selected ICCAE to do the job.



The evaluation team, including Michio Ito of SAA and Dr Ernie Sprague of Global 2000, look on as Nick Sichinga, an agricultural specialist for SG 2000 Malawi, gives a demonstration to farmers at a Management Training Plot (MTP) in Blantyre.

The evaluation exercise began in Ghana in September 2001 and has continued in Malawi, Mozambique, Uganda, Nigeria and Ethiopia. SG 2000 projects in three Francophone countries (Burkina Faso, Mali and Guinea) were reviewed during October - November, 2002.

Dr Tetsuo Matsumoto at ICCAE leads the evaluation team. Those travelling with Dr Matsumoto have included Dr Donald Plucknett, of Agricultural Research and Development International, USA, Dr Hiroyuki Takeya from ICCAE, Dr Kunio Takase at the International Development Centre of Japan, and Dr Shuichi Asanuma from the Japan International Research Centre for Agricultural Sciences (JIRCAS).

From the SG 2000 side, Dr Marco Quiñones, SAA Regional Director, Dr Ernest Sprague, Senior Advisor for Food Security at The Carter Center, and Michio Ito, SAA administrative officer, have travelled with the external evaluation team as facilitators.

Ito interviewed Dr Matsumoto at his office in Nagoya, Japan, on 11 July.

Ito: You have quite often said that the SG 2000 project is unique. Could you tell us why?

Matsumoto: SG 2000 is a professional organisation that transfers available technology to farmers. Rather than talking, SG 2000 implements effective and practical technology demonstrations on farmers' own fields. Working at grass roots level, as well as with top level policy makers, makes SG 2000 more effective than other NGOs. Many NGOs have their own development objectives which do not necessarily align with those of host governments. But SG 2000 has made it clear that it works with governmental organisations to build the capacity of national agricultural extension services. In addition, SG 2000 trains extension staff and farmers. A size of 0.1-0.2 ha for a demonstration plot is realistic, visible and measurable to all extensionists and participating

farmers. Close supervision and monitoring of activities are carefully maintained, and who is responsible for what is very clear to all concerned.

Ito: How do you see the performance of our country directors?

Matsumoto: Country directors enjoy great autonomy and I believe it is one of the strengths of SG 2000. In each SG 2000 project, it is a country director who makes almost all decisions depending upon each country's situation. It is a country director who identifies the problems that many farmers are facing every day and brings solutions promptly. Of course, SG 2000 has a standard technology transfer approach and its basic objectives are the same in all countries. But because each country director has decision-making authority, each project is able to identify the best way to disseminate modern technology within that country.

Ito: As you know, an SG 2000 project won't stay in one country forever. You argue that phasing-out should be determined not from a time frame only, but from an achievement standpoint. How can SG 2000 judge that it has made sufficient progress in one country to leave?

Matsumoto: You have three stages of the project cycle—Phase I, Phase II, and then, Phase-out. You might have a rough measure of how many years each phase should last. However, you shouldn't simply apply that measure regardless of how the actual project has been

progressing in each country. I'm not only talking about phasing-out, but also about other phases. After all, it is the host government which must continue the work SG 2000 has been doing and must show a willingness to do so from the beginning. At the same time, host government institutes must make an effort to build up national capacity to continue the SG 2000 project on their own. Willingness is important, but alone it is not enough. A host government has to improve its level of technology and human capacity. If a host is not enthusiastic and fails to show any sign of improvement, SG 2000 must consider an immediate phase-out or withdrawal regardless of the phase.

Working at grass roots level, as well as with top level policy makers, makes SG 2000 more effective than other NGOs.

Ito: In 1986, SG 2000 dreamed of a Green Revolution in Africa. After 16 years of operation, Sub-Saharan African countries have not achieved the production impacts reached in Asia. Do you think the so-called Green Revolution is possible on the African continent?

Matsumoto: Yes, it is possible. But you can't simply compare African countries with other



The evaluation team visit Lilongwe Agricultural Development Division (ADD).

Evaluating SG 2000 in the field

countries that accomplished Green Revolutions. As early as the 1960s, human capital and physical infrastructure such as irrigation, roads and markets in India and Pakistan were relatively well developed and farmers were ready to respond to market opportunities. Extension networks backed up by good research and input delivery systems ensured that farmers were able to access the necessary technology and inputs on time. All those factors, which brought a successful Green Revolution in India, Pakistan and Mexico, are

very limited in African countries. It is a tremendous task to transform Sub-Saharan smallholder agriculture to a commercial-scale one, and it certainly takes time. SG 2000 is working as a facilitator for local stakeholders including both public and private sectors and has a vision of transferring ownership to them. What SG 2000 alone can do is limited, but close collaboration with local people will expand the capacity of national institutes. In time it will indeed lead to a Green Revolution in Africa.



Dr Donald Plucknett (left) and Professor Tetsuo Matsumoto (right) interview farmers in Kano, Nigeria.

Getting maize production moving in Africa

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Improved roads, transport and communications will encourage private suppliers of seed, fertilisers and other inputs to become more active in serving smallholder maize producers.

Enhanced on-farm storage capacity can help to reduce damage from insects, molds, and pests and hold grain until higher prices normally can be obtained. Promoting increased maize

utilisation for poultry and livestock feeding can expand commercial market demand. More maize can also be used in starch manufacture and food processing (cereals and snack foods). In addition, maize can be substituted for imported barley as the carbohydrate source in beer, thus saving scarce foreign exchange. Finally, expanded maize trade between African countries is another option, if yields can be raised and transport costs lowered.



Maize is the most widely grown food crop in Sub-Saharan Africa.

QPM maize research

During the 1990s, increasing research activity in quality protein maize (QPM) has led to the release of varieties and hybrids in 12 SSA countries. Within five years, the QPM area is likely to double.

QPM research and development in sub-Saharan Africa

Country	QPM breeding	QPM release	2002/03 area, ha
Benin	No	Yes	1,000
Burkina Faso	No	Yes	5,000
Ghana	Yes	Yes	200,000
Guinea	No	Yes	5,000
Ethiopia	Yes	Yes	5,000
Malawi	No	Yes	1,000
Mali	No	Yes	5,000
Mozambique	Yes	Yes	10,000
Nigeria	Yes	No	-
Uganda	No	Yes	30,000
Tanzania	No	Yes	1,000
South Africa	Yes	Yes	7,000
Zimbabwe	Yes	No	-
Total			270,000

Source: SG 2000 data

Table 3. Maize production statistics in SG 2000 project countries

Country	1988-99 growth rates (%/yr) production	1988-99 yield	1999 area planted to MVs ¹
Benin	1.9	0.4	25
Burkina Faso	6.1	3.5	46
Ethiopia	12.3	3.4	31
Ghana	4.3	1.5	53
Guinea	2.5	1.5	23
Malawi	3.4	3.1	20
Mali	5.5	1.3	25
Mozambique	14.5	12.3	20
Nigeria	0.4	-0.2	40
Tanzania	-0.5	0.1	15
Uganda	4.3	-1.1	55
SSA*	0.8	0.4	36

*Excludes South Africa.

Sources: FAOSTAT, July 2002; ¹Area planted to modern varieties (MVs) mainly comes from CIMMYT 1999/2000 World Maize Facts and Trends.

Now in its ninth year, the Sasakawa Africa Fund for Extension Education (SAFE) continues to raise the standards of extension education at African universities, develop linkages with employers and strengthen co-operation between academic institutions. To date, around 875 extensionists have graduated from, or are currently participating in, the programme (see table).

The mid-career programme at Alemaya University in Ethiopia completed its fourth cycle on 6 July with the graduation of 32 students, including seven women. For the second time in four years, it produced the best student for the entire university, with a cumulative grade point average of 3.76 out of a maximum of 4. Three students passed with “great distinction” and five with “distinction”. This brings to 103 the number of extension professionals who have completed the BSc Agricultural Extension degree programme at Alemaya University.

Increasing employer participation

At Uganda’s Makerere University, the SAFE programme held its first workshop on Supervised Enterprise Projects (SEPs), where

a very positive response was noted from employers. Some of their specific observations were that: SEPs were raising important issues and challenges that needed addressing; SEPs were generating valuable data for planning purposes and students were displaying impressive communication skills and presenting convincing data. The Dean of the Faculty of Agriculture, Professor Eric Sabiiti, promised to examine the SEP model with a view to making it a faculty-wide requirement for all students.

Representatives from Alemaya University in Ethiopia and Sokoine University of Agriculture in Tanzania also attended the workshop. This provided an excellent opportunity for consolidating the linkages



Courage Quashigah, Ghana's Minister of Food and Agriculture, addresses the first SAFE Alumni Congress at UCC, Ghana.

between the three universities. Meanwhile, Tanzania’s Sokoine University of Agriculture (SUA) held its second stakeholder workshop to further explore ways of realising employer participation in the BSc programme for mid-career extension professionals. Employers provided useful suggestions on how SEPs could assist the districts in achieving their development objectives.

Expansion of programmes

Two new SAFE programmes were launched in West Africa in October 2002 at Ahmadu Bello University (ABU) in Zaria, Nigeria, and the Rural Polytechnic Institute for Training and Applied Research (IPR/IFRA) in Katibougou, Mali.

The Short-Term Capacity Building Course for Lecturers in SAFE Training Institutions is another new SAFE initiative. Organised by the University of Cape Coast (UCC), this formal short training course aims to enhance the capacity of teaching staff at the colleges and universities involved in the programme. Specifically designed for those with limited training in agricultural and extension education, it will cover participatory training needs; assessment and curriculum planning; methodologies for facilitating adult learning and planning and implementing and management of SAFE-type training programmes. The first

batch of participants in the course, which was held at the University of Cape Coast from 7 July to 31 August, included two lecturers from IPR/IFRA in Mali, and two from the Polytechnic University of Bobo-Dioulasso in Burkina Faso.

Sharing of experience

The graduates of the SAFE programmes in Ghana attended their first annual alumni congress and homecoming at the Sasakawa Centre, UCC, from 24-26 April. As part of the homecoming activities, the graduates formally organised themselves into a SAFE Alumni Association. The main aims of the Association are to provide feedback to UCC and Kwadaso Agricultural College (KAC) for programme improvement, to provide an avenue for graduates to network, and to support the SAFE/Ghana programmes.

SAFE sponsored ten lecturers from SAFE institutions in East and West Africa to participate in an International Agricultural and Extension Education Conference in Durban, South Africa, from 26-31 May. The group included lecturers from Burkina Faso, Ethiopia, Ghana, Mali, Nigeria, Tanzania and Uganda. It allowed SAFE delegates the opportunity to meet and share the experiences of the SAFE programme at their respective institutions. It also enabled them to interact with world leaders in the field of agricultural extension and education.

SAFE statistics, 1993-2002

Mid-career BSc and Diploma Courses	Graduated	Current	Total
University of Cape Coast, Ghana	177	57	234
Alemaya University, Ethiopia	104	66	170
Makerere University, Uganda	32	50	82
Sokoine University, Tanzania	12	136	148
University of Mali	-	15	15
Kwadaso Agricultural College, Ghana	63	78	141
Sub total	388	402	790
Scholarships	Graduated	Current	Total
BSc	16	8	24
MSc	42	16	58
PhD	3	-	3
Sub total	61	24	85
TOTAL	449	426	875

Agroprocessing programme

SAA has been working with the International Institute of Tropical Agriculture (IITA) for the past nine years to introduce better agroprocessing equipment to small-scale farmers.

Manufacturers network in Benin and Ghana

The bi-annual project review meeting was held from 23-25 July in Benin in order for project members to consider project activity and its impact. An increasingly important issue is the capacity of local manufacturers to produce good quality equipment and to promote their products. In order to face these challenges, project members in each country formed a Manufacturers' Network this year.

The Manufacturers' Network in Ghana consists of the GRATIS Foundation, nine Regional Technology Transfer Centres (RTTCs), three Rural Technology Service Centres (RTSCs), and two private workshops (ENTESEL and Mawuli Engineering). Kwabena Dankyi-Dafoor, President of the Manufacturers' Network in Ghana and Executive Director of the GRATIS Foundation, reported that GRATIS would apply the standardisation of all the parts as quality control. He stressed that "it is crucial to train operators to make the best use of the equipment, and to provide a good after-sales service, such as mobile maintenance." Dankyi-Dafoor also mentioned GRATIS's effort to promote their products through trade fairs and field demonstrations. He said that "the Ministry of Women's Affairs and Children in Ghana recently ordered 200 units of Cassava (Gari) processors from us in order to support income generating activities for rural women."

The Manufacturers' Network in Benin consists of *Association pour la Promotion de Matières Agricoles et Hydraulique (APROMAH)*, *Centre d'Ajustage, Menuiserie Metallique et Clouterie (CAMEMEC)*, *Centre de Formation Technique Mgr.*

Steinmetz (CFTS), Centre Beninois pour la Normalisation (CEBENOR) and *Cooperative Beninoise de Matières Agricoles (COBEMAG)*. Sabirou Djara, President of the Manufacturers' Network in Benin and Director of COBEMAG, reported that "the Cabinet of Benin officially recognises the Network and considers agroprocessing to be one of the major components of agricultural development and poverty alleviation strategies in the country." He added that "the National Agricultural Research Institute in Benin acknowledges the Network as a collaborative member."

An increasingly important issue is the capacity of local manufacturers to produce good quality equipment and to promote their products.

"The Manufacturers' Networks in both countries will increase the capacity of technology dissemination," reports Toshiro Mado, SAA agroprocessing team leader. Initially, IITA and SAA trained manufacturers in new design developments. Today, the Manufacturers' Networks have incorporated the extension activities into their product promotion. And, in both countries, the Network is very active in introducing new designs of equipment while requesting IITA to develop new designs based on their needs.

Agroprocessing equipment sales record in Benin and Ghana (as of July 2002)

	Benin	Ghana	Total
Grater	187	125	312
Double screw press	149	152	301
Fermentation rack	35	56	91
Bagging stand	22	60	82
Sifter	36	66	102
Chipper	3	34	37
Thresher	47	13	60
Digester	5	51	56
Wet-type grinder	39	7	46
Rice mill	1	2	3

Agroprocessing in Ethiopia

The agroprocessing project's activities in collaboration with the Ministry of Agriculture, Ethiopian Agricultural Research Organisation (EARO) and national NGOs, such as Selam Vocational Training Centre, are in full swing. Selam VTC was established in 1985 to provide vocational training to orphans in Addis Ababa. It has good technical staff and production facilities to help introduce several types of IITA-designed postharvest and agroprocessing equipment.

Ato Ayele Hirpho from Shashemene is the first Ethiopian farmer in Ethiopia to buy one of the IITA-designed multi-crop threshers produced by Selam

VTC. According to Ayele, mechanical threshing of tef allows him to meet family cash requirements for inputs in a more timely way, as well as offer a custom threshing service to farmers. His mother reports that before seeing the performance of the thresher, Ayele was saving his money to buy a flourmill. However, after seeing its performance, he became convinced that the thresher would give him a better business opportunity. "By making the thresher lighter and more mobile," notes Toshiro Mado, "it is now easier to move it from farm to farm, thus making it much more suited for providing contract threshing services, as a business enterprise or to support a farmers' group that collectively purchases the machine."



In Northern Ghana, women farmers are using wet-type grinders to process shea-nut butter.

SG 2000 country profiles



Burkina Faso

The rains were delayed in 2002, with five of the eight agricultural regions in which SG 2000 is working receiving significantly less rainfall than in 2001. Particularly hard hit were the regions Boucle du Mouhoun, with a deficit of 122mm compared with last year, and Centre Ouest, with a deficit of 100mm. Thirty-five villages in the two regions were adversely affected.



Burkina Faso's Minister of Agriculture, Water and Fisheries, Salif Diallo, visits a Masongo (QPM) Plot under small irrigation in Hauts Bassins.

"This is an indication, yet again, of the fickle nature of the weather in Sahelian countries," says country director Marcel Galiba.

"With good rains in 2001, an excess of 222,000 t of cereals was recorded compared with 2000, which had a deficit of 98,000 t."

"The SG 2000/Ministry of Agriculture programme in 2002 again concentrated on soil fertility," says Galiba, "by protecting fragile soils against erosion and using local resources to address phosphorus deficiency and low pH in most of the soils."

Two hundred and eighty-one villages were involved in the programme—with 168 ha of dykes being built around 29 villages in five of the agricultural regions. In the eight agricultural regions of the programme, 863 compost pits, enriched with rock phosphate, were demonstrated in 153 villages.

The promotion of pulses with rock phosphate was used in collaboration with 130 villages in seven regions.

Otherwise, 1,354 Production Test Plots (PTPs) of 0.25 ha and 869 Production Plots of 1 ha were planted as part of the agricultural intensification programme.

Fifty-eight villages were involved in these maize demonstrations

with inputs being provided on a cash basis.

The off-season was marked by two activities—seed production and small irrigation projects for villages, the latter to try and combat the chronic problems caused by erratic rainfall. "The Ministry of Agriculture has developed a national strategy for this," comments Galiba. "The involvement of small-scale farmers in small-scale irrigation could play a major role in developing food security for Burkina Faso. We intend to be a major partner in this strategy, mainly by providing good seed, fertiliser and appropriate husbandry."

Yield performance of the 2001 PTPs is shown in the table below. In general, PTP yields were running at twice the yield of the check plots, with six crops targeted for attention.

Galiba instigated a major policy change in 2002. "We have removed," he says, "the credit component from our field demonstration programme, following the success of the production plots." Farmers can now well afford to procure inputs on a cash basis, although there will be a small number of demonstration plots for villages newly involved in the programme.

In addition, in order to encourage a market-driven approach, the policy of establishing commercial contracts with farmers' groups has been extended to millet and sorghum. Last year, 115 ha of the Quality Protein Maize Ma Songo were planted by the farmers' association Nuyéré of Boura in the agricultural region of Centre Ouest. By agreement with CTRAPA (*Centrale de Transformation des Produits Agricoles*), the farmers produced 72 t of maize. This year, in partnership with ROCAFREMI, SG 2000 brought together millet and sorghum processors with 13 farmers' groups to sign a contract providing for 32 t of millet and 80 t of sorghum.

Earlier this year, the government launched PNGT II – the *Programme National de Gestion des Terroirs*. All 45 provinces of Burkina Faso will be involved. PNGT II is financed by the World Bank, IFAD, DANIDA, UNDP and the Burkina government.

The programme will cost US\$105m (CFA 173 bn) over five years with two additional five-year phases anticipated. The overall objective is to reduce rural poverty and promote sustainable development. The other important parts of the programme include water control to boost production and the use of fertilisers at competitive prices.

PTP and check plot yields, 2001

Crops	Villages	No. of plots	Production test plots (PTPs), kg/ha			Check plots
			Minimum yield	Maximum yield	Average yield	Average yield, kg/ha
Maize	148	714	955	4,942	2,454	1,383
Cowpea	74	109	302	1,096	544	436
Sorghum	50	69	717	1,510	1,044	592
Groundnut	26	71	364	1,680	812	542
Upland Rice	25	66	1,303	3,758	2,314	1,212
Millet	22	36	510	1,620	965	483

Ethiopia's ambitious plans for agriculture appear to have made a major contribution to the economic development of the country. According to the Economic Report on Africa, released recently in Addis Ababa, real GDP growth has averaged 6 percent from 1992 to 2001—amongst the highest on the continent. Exports have increased by 5 percent. Annual inflation has been kept down to 4 percent while investment has grown by 16 percent.



A farmer from Oromiya Zone in Amhara Region threshes his rice crop.

“These are encouraging figures,” says Marco Quiñones, SAA Regional Director for Africa. “They owe much to the determination of the Ethiopian government to enhance market reform and support agricultural expansion.”

Yet, like so much of Africa, the country is still largely dependent on the timely arrival of the rains. This year the early *belg*, or short rains, started early in February and were generally well distributed. But the *meher* (main) season rains, which last from June to September, were below average and not sufficient in most of the crop dependent areas. Northern Ethiopia, including the Afar region, was particularly hard hit. This had an impact on cereal prices, which continued to rise in June, reversing a period of depressed prices that had persisted since August 2001.

“Other contributing factors have been the local purchase of food aid on the domestic market, a depletion in the grain stocks held by farmers and traders, inadequate food aid distribution in food insecure areas and a poor maize harvest in southern Ethiopia,” comments SG 2000 programme co-ordinator, Takele Gebre.

SG 2000 in Ethiopia continues to focus its activities on strategic interventions. One of these interventions involves the establishment of a select number of SG 2000 demonstration plots, known as “standards of excellence” plots (SOEs), in areas where yield levels have deteriorated on many of the government-sponsored demonstration plots.

“Such a deterioration in yield is not unexpected,” explains Takele Gebre, “due to the extraordinary expansion of the national extension intensification programme over the last few years. The SOE plots will help in regaining and maintaining higher standards.”

During 2001, SG 2000 established 372 Extension Management Training Plots (EMTPs), primarily to demonstrate conservation tillage technology (see table). The Ethiopian Agricultural Research Organisation (EARO) released a new Quality Protein Maize (QPM) hybrid and SG 2000 is now heavily engaged with its introduction into the farming community. Feeding trials involving children under the age of five will soon start in collaboration with the Ethiopian Health and Nutrition Research Institute.

Yields of conservation (CT) and conventional (NCT) plots (t/ha), 2001

Crop	No. EMTPs	Average yield	
		Conservation tillage	Conventional tillage
Maize	159	4.2	3.7
Wheat	44	2.9	2.1
Tef	50	1.2	1.1

“One new initiative for our programme has been the introduction of rice into the Ethiopian agricultural system,” says Takele Gebre. Although not an important crop, some Ethiopian farmers have been producing rice successfully by the shores of Lake Tana, at a medium altitude and in a relatively warm climate. During the 2001 crop season, SG 2000 financed the demonstration of rice varieties on 200 farmers’ plots where yields (unshelled) ranged from 2.2 t/ha to 4.5 t/ha—with an average yield of 3 t/ha.

“Farmers have reacted very positively,” says Takele Gebre, “and we see real prospects for rice in areas where conditions are suitable. Training in food preparation with rice is being organised in farm households.”

The Ethiopian government is currently implementing major civil service reform and decentralisation programmes,

which will have major implications for agriculture and rural development.

The district (Woreda) administrations have become the new focal points for agricultural development, and many civil servants from regional or zonal administrations have been transferred there. Frontline extensionists have been assigned to peasant associations, which will eventually become small townships or population centres providing all types of basic services.

“Government officials at all levels are talking seriously about the need to transform peasant agriculture into market-oriented commercial agriculture,” says Takele Gebre. “There is a real momentum behind this with agricultural, technical and vocational schools training thousands of young people to become specialised smallholder commercial farmers.”



Women from Oromiya Zone demonstrate food preparation from rice to women from Wereta District, South Gonder Zone.

Ghana had good rainfall during 2002. Over 30 wet days have already been recorded in the southern part of the country. The relatively drier northern parts of the country have also received an average of ten days of rainfall, adequate to facilitate tillage operations.



Over 400 farmers have received credit to produce Quality Protein Maize commercial plots.

In 2002, efforts to mainstream the Extension Test Plot (ETP) programme continued. "Ministry of Food and Agriculture/SG 2000 consultations have resulted in increased commitments from local institutions, such as district assemblies and rural banks, to finance Extension Test Plots (ETPs)," reports Benedicta Appiah-Asante, SG 2000 project co-ordinator.

Agribusiness skill development training, introduced earlier this year, continues to make progress in strengthening and transforming old SG 2000 farmers' groups into sustainable business-oriented farmer based organisations (FBOs) by encouraging professional business practices among farmers.

A total of 93 farmers from 11 FBOs in Ashanti and Central regions initiated training, which is conducted in five phases with a total of 15 days for each group, including follow-up. Topics being covered are (a) entrepreneurial awareness (b) basic management principles and (c) association development. Resource personnel from the National Board for Small Scale Industries (NBSSI) provide much of the training. This programme will be expanded to Upper West Region during the

third quarter, with a target of reaching 20 FBOs this year.

The government's grain buffer stocks have contributed to a reasonable level of food security. The price of grain stabilised and there was a good supply of other basic staples at the markets during the first half of 2002. However, the agricultural inputs market in

Ghana still suffers from low effective demand. Fertiliser use on maize is in decline in favour of high value crops, notably export horticultural crops such as pineapples. The supply situation during the major planting season was generally good except for the shortage of phosphate fertilisers experienced by groundnut farmers in the Upper West Region.

Field programme achievement

During the major season, 5,939 Extension Test Plots (ETPs) were planted in the three regions, as compared to 4,200 plots in seven regions the previous year. There was an increase in financing of farmers' ETPs by District Assemblies (41 percent), other NGOs (29 percent), and rural banks (23 percent), while percentage financing by ADB was reduced to 7 percent (see Table 2).

Over 400 farmers received credit under the Farmers' Production Plots (FPP) Programme to produce between 0.8 and 2 hectares of Quality Protein Maize (QPM) each. A total of 140 roadside Verification Demonstration Plots

(VDPs) were also planted in ten districts in the Ashanti and Central regions, at the request of agricultural extension agents who had seen the results achieved in other districts.

Other programme achievements

Sensitisation workshops for field extension staff and other stakeholders were organised in the three project regions. The objectives of the workshops were to sensitise MOFA staff on the way forward for the programme and to enlist and define their collaborative support for the programme's activities. A total of 100 officers made up of 20 District Directors of Agriculture (DDAs), 40 District Development Officers (DDOs) and 40 Agricultural Extension Agents (AEAs) participated. The stakeholders' workshops helped to forge effective partnerships between stakeholders. One hundred and thirteen participants made up of other NGOs, agricultural input dealers, District Assemblies, financial institutions and seed growers' associations attended.

Table 1. Extension test plot (ETP) yields, 2001

Commodity	No. of groups	No. of demonstration plots	Hectares	Yield/ha (national average)	Yield/ha (ETPs)
Maize (QPM)	371	4,597	1838.8	1.45	4.84
Rice	31	199	79.6	2	3.78
Groundnut	45	588	235.2	N/a	-
Soybean	3	45	18	-	-
Vegetables	25	508	203.2	8	12.3
Cassava	1	2	8	11.8	18.45
Total	476	5,939	2,382.8	-	-

Table 2. Sources of ETP financing, 2001

Financing source	ETPs financed/region			Total	%
	Ashanti	Central	Upper West		
District assemblies	1,295	1,079	84	2,458	41.4
Rural banks	425	362	558	1,345	22.6
ADB	-	199	214	413	7
Others (NGOs etc)	123	1,600	-	1,723	29
Total	1,843	3,240	856	5,939	100

The encouraging downward trend of rice imports into Guinea was dramatically reversed in 2001, with imports reaching 283,000 tonnes compared with 154,000 tonnes in the previous year.

“This reversal in rice imports reflects growing pressures on Guinea, including border instability with Liberia and Sierra Leone resulting in the displacement of thousands of farmers and the abandonment of their farms,” explains Tareke Berhe, SG 2000 country director. “National disasters, too, made an impact, including serious flooding in Kankan Region.”

The SG 2000/Government of Guinea programme, through the *Service National de Promotion Rural et Vulgarisation (SNVPRV)*, continued field demonstrations with rice (see table), with particular emphasis on the New Rices for Africa (NERICAs) from the West African Rice Development Association (WARDA). Soil fertility restoration, Quality Protein Maize (QPM), postharvest storage and agroprocessing remain key parts of this programme.

Soil restoration and improvement—using a combination of green manure crops, rock phosphate and organic fertilisers—is particularly important. The primary green manure crop is Mucuna, and efforts are underway to promote its use as a human food and animal feed.

The SG 2000 programme in Guinea has worked to introduce detoxification techniques to reduce L-Dopa levels naturally present in Mucuna to acceptable levels. Removal of L-Dopa was

accomplished by soaking the seeds in a 4 percent solution of whitewash, Ca (OH) 2, for 48 hours, employing a technique developed by Ruiz Sesma of Yucatan, Mexico.

A local group—Guinean Women in Extension and Rural Development—has used detoxification techniques and food recipes developed by the International Institute of Tropical Agriculture (IITA) in Benin.

Mucuna recipes include ragout, tau porridge and coffee. Between 1997 and 2001, over 1,900 women were trained to produce these recipes and over 8,500 people from all walks of life have consumed large quantities of Mucuna food without experiencing any negative effects.

During the year 2000, SG 2000 collaborated with two schools of agriculture and livestock in studies using Mucuna seed as a component of poultry feed ration. Fishmeal was substituted at a level of 33 percent with detoxified Mucuna seeds. Mucuna fed hens not only grew normally, but



Over 1,900 women have been trained to prepare recipes using Mucuna.

produced more eggs—an average of 1.5 grammes heavier. The hens also showed better vitality, pecked each other less, and had more attractive plumage.

In 2001, a second set of experiments took place, using chickens and pigs. Fishmeal was substituted with detoxified Mucuna meal at 0, 50, 75 and 100 percent for pigs. The results showed that fishmeal, an expensive and hard to find feed ingredient in Guinea, can be substituted with Mucuna meal, providing other legumes—such as soybeans and groundnuts—are

added to balance the protein and amino acid differences between Mucuna and fishmeal.

The first paper relating to these studies, as part of the proceedings of a Mucuna workshop held in Tegucigalpa, Honduras, in 2000, is now available. More recent results have been presented and published for a second Mucuna workshop, held in Mombasa, Kenya, in September, 2002.

“These exploratory studies are producing exciting results and will serve as a basis for more advanced studies with balanced rations,” comments Berhe.

Results of demonstration plots, 2001

Crop	Region	No. of plots	Yield, t/ha	
			Range	Average
Rice*	N'zérékoré	154	1.65 - 5.25	3.45
	Macenta	550	1.98 - 4.32	3.15
	Faranah	406	2.20 - 3.31	2.75
	Lab	204		
	Kindia	69	2.29 - 4.22	3.25
	Total		1,383	
	* NERICA	584	1.90 - 4.50	3.20
	* Lowland	799	2.33 - 5.25	3.79
Maize (QPM)	N'zérékoré	9	1.69 - 2.70	2.21
	Faranah	322	1.13 - 3.07	2.10
	Lab	201	1.20 - 5.16	3.18
	Mamou	4	2.44 - 3.65	3.04
	Total		536	
Cowpea (IT-5)	N'zérékoré	1		
	Kindia	10	0.83 - 1.29	1.06
	Lab	15	0.55 - 0.92	0.73
	Faranah	33	0.60 - 1.15	0.87
	Total		59	
Grand total		2,092		



Eggs from 33 percent replacement of fish meal by Mucuna meal.

The huge swings in the price of maize—from US \$111 per tonne in 1999/2000 to US \$44 per tonne in 2000/2001—have been a major disincentive to farmers in Malawi to invest in maize production, the country's staple food crop. The food crisis earlier this year, though exacerbated by the drought that hit southern Africa, was partly caused by this problem.



W Chitowe, SG 2000/ADD co-ordinator (centre), demonstrates maize technology to farmers and field assistants at an MTP in Blantyre.

“Maize accounts for half the national cropping area,” says José Antonio Valencia, SG 2000 country director. “In 2001/2002, national maize production dropped 900,000 tonnes to 1.6 million tonnes from almost the same number of hectares, with the average national yield dropping from 1.7 t/ha to 1 t/ha.” Unstable market conditions have already driven large-scale farmers—who

previously accounted for 25 percent of production—out of maize cultivation.

Valencia emphasises that the SG 2000 programme, working with the regional Agricultural Development Divisions (ADDs) under the Ministry of Agriculture and Irrigation, “has demonstrated that maize yields of over 5 t/ha are achievable by small-scale farmers right across the country.”

Table 1. QPM demonstration results, 2001/02

Hybrid/variety	No. of farmers	Total area ha	Average yield kg/ha
Obatanpa (OPV)	164	16.38	4,914
CML144/CML159/CML176	206	20.60	5,173
CML182/CML175/Obatanpa	174	17.38	4,488
CML144/CML159/Obatanpa	172	17.20	4,783

Table 2. Zero tillage demonstrations, maize season 2001/02

Agricultural development division	Plot size, ha	Average yield kg/ha	Farm gate price US\$/kg	Net income/ha US\$
Blantyre	5	6,098	0.16	824
Machinga	4.4	4,718	0.15	499
Lilongwe	4.3	4,623	0.13	425
Salima	3.0	3,944	0.13	346
Kasungu	1.0	4,040	0.16	420
Mzuzu	5.3	4,967	0.17	638
Average across ADDs and farmers		4,927	0.15	564



The QPM workshop attendees during a visit to the QPM seed multiplication at Namwera. From left to right: Dr Ahmed Falaki, SG 2000 Nigeria; Dr Jiro Aikawa, SG 2000 Tanzania; A Urio, MOFA Tanzania; Dr P Sallah, Ghana; Dr Ernie Sprague, Global 2000, and Dr M Denic, MOFA Mozambique.

SG 2000 is active in six of the country's eight ADDs. In 2001/2002, 6,395 maize Management Training Plots (MTPs) were established in the six ADDs—Blantyre, Machinga, Lilongwe, Salima, Kasungu and Mzuzu. Of these, 750 were Quality Protein Maize (QPM) demonstrations, with average yields ranging from 4.5 t/ha to 5.2 t/ha (Table 1). The National Research Institute for Agriculture in Malawi, CIMMYT in Harare and SG 2000, proposed the QPM hybrid CML 144/ CML 159/ CML 176 to the national committee for variety release, and received agreement for tentative release. SG 2000 and collaborating ADDs also conducted 230 zero tillage demonstrations, with backing from Monsanto Co (Table 2). “Farmers have reacted well to zero tillage given the labour-saving benefits and improvements in soil fertility, reduced soil erosion and greater water conservation,” says Valencia. The 2001/02 season, with its large maize production deficits, gave

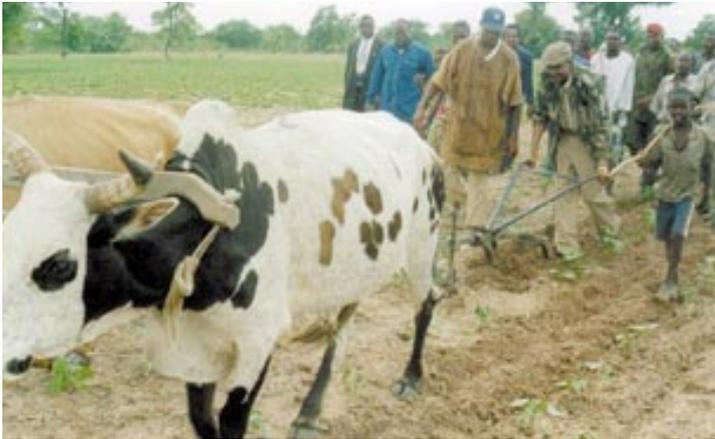
farmers employing conservation tillage technology very high profits. On average, farmers using conservation tillage have been able to make an average profit of US \$564 per ha, but Valencia emphasises that “the price of maize at the farmer's door was around US \$170/t, which was higher than in previous years.”

In September, the season began with maize in-service training courses for farmers, SG 2000/ADD co-ordinators, SG 2000/Rural Development Project (RDP) co-ordinators and field assistants from the six ADDs. Some 7,275 MTPs will be implemented by December. The MTPs include QPM hybrid seed, commercial hybrids, rice, soybean, pigeon pea and conservation tillage demonstrations.

At the end of July, SG 2000 organised a QPM workshop at Bunda College to alert researchers, politicians, farmers and the general public to the use and advantages of QPM. The workshop was attended by Dr Ernie Sprague from The Carter Center, Dr Marco Quiñones, SAA Regional Director for Africa, Dr Wayne Haag, country director for Mozambique, ministry officials and others associated with SG 2000 projects in African countries. A field day visit to QPM seed multiplication in Namwera led to good interaction with local farmers after the workshop.

“We are encouraged by the farmer reactions to QPM,” says Valencia. “We feel we are making progress.”

Following adequate rainfall in 2001, Mali's rains in 2002 have been disappointing. Four operating regions of the SG 2000/Ministry of Rural Development (MRD) programme were affected, with Sikasso showing the greatest deficits (Table 1).



Amadou Toumani Touré, Mali's Head of State, tries out a plough on an SG 2000 site in Koumantou, southern Mali.

The field programme continued to focus on improving access to inputs on a cash basis. In southern Mali, the cotton company distributed inputs for maize production to farmers. Around 1,000 ha of QPM were planted. In Nioni, one of Mali's largest irrigation rice schemes of the *Office de Niger*, 30 t of bulk blend fertilisers for maize were also provided on credit to 17 villages. Participating farmers' associations

made a 33 percent down payment, and paid the balance at the end of the season. "The recovery rate was a perfect 100 percent," reports country director Marcel Galiba.

During the off-season, 28 t of QPM seed was produced, of which one tonne was yellow QPM—the first time that this has been produced in Mali. That variety is now being tested in 30 different sites in collaboration with the maize national research

Table 1. 2001/02 rainfall (mm)

	2001	2002	Deficit
Sikasso	557	370	-187
Mopti	250	163	-87
Koulikoro	289	225	-64
Ségou	281	234	-47
Total	1,377	992	-385

programme. One tonne of cowpea seed of the variety KVx-414-2, an early-maturing type, is also being tested in a maize-cowpea inter-crop at 16 sites.

In partnership with ROCAFREMI and Winrock International, a pilot scheme linking producers and agroprocessors has been started. The villages of Kondogola in Ségou and Niamabougou in Koulikoro have been contracted to produce 100 t of a millet variety, Sanioba 03, for use by private millers. Sixty farmers are involved. Formal contracts are a major part of this market-driven approach, which is being supported by the Millet and Sorghum Initiative (MIS), with financial assistance from French Co-operation and IFAD.

"One of the serious problems in Malian agriculture is the wide fluctuation in the price of local cereals," says Galiba (see Table 2).

"The price of millet, sorghum, and maize has shot up with the result that many processors have stopped buying altogether. A signed contract on the amount of grain to be purchased at a sensible price for both parties would help to control the situation."

In partnership with ROCAFREMI and Winrock International, a pilot scheme linking producers and agroprocessors has been started.

Two major development programmes have been launched in Mali. In March 2002, a national workshop organised by the MRD, the World Bank, The Netherlands, IFDC and SG 2000, led to finalisation of a National Plan for Soil Fertility Management.

Implementation of the National Plan is estimated to cost around US\$60m (CFA 42bn) over 12 years. Much of the emphasis will be on support to farmers' organisations—with the private sector also having an important role to play. The Tilemsi Rock Phosphate (TRP) project, which uses local deposits to produce fertiliser at Markala, is being strongly recommended.

In May, PASAOP (*Programme d'Appui aux Services Agricoles et aux Organisations Paysannes*) was launched in Bamako. This ambitious project (US \$85 million or CFA 59.9 bn) will support research, extension and farmers' organisations. External funding comes from the World Bank, The Netherlands and the Government of Mali.

Table 2. Fluctuations in cereal prices, US \$/t

Cereal	Year	January	February	March	April	May	June	July
Millet	2001	112	119	125	158	159	159	167
	2002	165	174	178	186	191	195	205
Sorghum	2001	103	113	121	140	142	147	157
	2002	167	178	179	187	190	192	204
Maize	2001	104	112	118	139	141	145	157
	2002	157	167	173	175	178	183	195

Table 3. Planned field programme for major cereals, 2002, and PTP yields, 2001

	2002 programme		PTP yield in 2001			
	Production plots of 1 ha	Production test plots of ¼ ha	Min. (kg/ha)	Max. (kg/ha)	Average (kg/ha)	No. of observations
Maize	1780	107	1557	4518	3006	192
Millet	405	45	529	1942	901	119
Sorghum	50	47	629	1377	898	48
Rice	35	1	2800	5600	4200	10
Total	2300	350				

Like many countries in southern Africa, Mozambique has suffered from a shortage of rainfall. This has affected production in the main agricultural zones of the country. In the central region, drought has been a major problem. In the north, planting was delayed by six to eight weeks due to the late onset of the rains. There are food deficit pockets in the southern parts of Sofala and Manica Province, areas of Tete and the coastal region of Nampula. However, overall, less than five percent of the population has been affected.



A proud farmer in her well fertilised maize field.

“Surplus production is still expected in many parts of the north and central regions,” comments country director, Wayne Haag. “Much of this surplus production will flow across borders into Malawi and Zimbabwe, due to the large food deficits there.”

Yield results from the SG 2000/ Ministry of Agriculture and Rural Development (MADER) 2001/02 demonstration programme were encouraging. Data from Nampula province, for example, indicates that maize and cowpea yields were more than three times higher than traditional yields (Table 1). Peanut yields were also more than double.

The majority of demonstration plots in the programme now involves no-till technology. In the case of rice, a minimum-till strategy is used wherever possible. By the end of the 2001/02 season, conservation tillage had been

introduced into all provinces where SG 2000 is operative.

During the 2001/02 season, Mozambique collaborated with regional conservation tillage activities, including a workshop co-sponsored with the African Conservation Tillage Network, at the Agronomic Institute in Boane, while three in-service training programmes were conducted.

“Major challenges remain,” says Haag. “Inputs—glyphosate and sprayers—need to be more widely available; hand planters must be introduced, as well as animal-drawn drills for rice, and herbicide application techniques must be refined.”

The Quality Protein Maize (QPM) variety, Sussuma—Mozambique’s version of Ghana’s Obatanpa—has been further improved for streak virus resistance and protein quality. New upgraded Sussuma seed is being increased by SEMOC/SeedCo in Manica Province on 100 ha during the off-season. Two hundred tonnes of seed should be available for the coming 2002/03 season.

During the 2001/02 season, maize yield trials were conducted at

Table 1. Demonstration Plot Programme, Nampula Province, 2001/02

	Maize	Cowpea	Peanuts
Plots	984	472	43
Average yield kg/ha	3.438	899	938
Yield range t/ha	1.8-5.8	0.4-1.9	0.6-1.3
Traditional yield kg/ha	963	246	435
Traditional yield range t/ha	0.4-1.6	0.1-0.4	0.2-0.6



SG 2000 In-Service Training provides technology transfer to farmers at the grass roots level.

eight on-station sites (see Table 2). The four QPM entries competed well with the two commercial normal varieties, Manica-SR and Matuba.

A workshop was held in July, supported by SG 2000 and involving the Government of

and provision of business credit for operations.

SG 2000 is continuing to benefit from the SAFE programme. Two Mozambicans—Alvaro Abdullah and Ana Chapo—will soon complete BSc degrees in extension at the University of Cape Coast in Ghana.

For the 2002/03 season, a total of 9,049 demonstration plots covering 15 crops have been planned. Most of these will be maize (3,776), followed by cowpea (936), peanuts (916), rice (873), beans (824) and sunflowers (332). The remaining 1,392 plots are being distributed among millet, cotton, tobacco, soybean, paprika, potato, sesame, garlic and onion. Plot sizes, in the main, will be 1,000 m² with a number of plots for vegetables at 100 m². Incentive plots (0.5 ha) are also being provided for extension staff (in cereals, grain legumes or sunflowers).

SG 2000 is continuing to benefit from the SAFE programme.

Mozambique, MADER and outside consultants and entitled “Agricultural Intensification: A Soil Fertility Focus”. Workshop participants concluded that nutrient depletion continues at an alarming rate and that agricultural intensification has not yet taken off. More investments are needed in storage facilities, development of food reserves for the country,

Table 2. Maize yield research trials*

Variety	Average yield t/ha
Sussuma (Co)-QPM	4.4
Sussuma (C1)-QPM	4.3
QS-7705 (TWC)-QPM	4.5
Early Flint-QPM	4.0
Manica-SR	4.1
Matuba	3.7

* Mean data from eight locations.

Not only has the democratically elected government—now in its third year in office and headed by President Olusegun Obasanjo—commended SG 2000’s efforts in extending crop-based technologies to small-scale farmers, but it has requested a blueprint on how to expand, consolidate and sustain the programme nationwide.



The Governor of Bauchi State, Dr Ahmadu Adamu Mu’azu, test drives one of the new motorcycles he donated to SG 2000 frontline staff.

In his determination to extend SG 2000 technologies to reach more farmers in his state, the Governor of Bauchi State, Ahmadu Adamu Mu’azu, sponsored the training of 1,500 frontline extension agents and farmers. He also distributed new motorcycles to the extension agents for effective supervision of farmers’ management training plots (MTPs). In addition, all the trained farmers were provided with loan packages of seed, fertiliser and agrochemicals to establish 0.25-0.5 ha MTPs in maize, rice, millet, sorghum, cowpea and soybean. The grain yield recorded from maize MTPs averaged 5 t/ha compared to the national average yield of 1.3 t/ha. The maize MTPs in Lere Zone of Kaduna State gave a yield range of 4.2-7.5 t/ha and the highest average yield of 6.1 t/ha, followed by Katsina State with a yield range of 1.2-7.7 t/ha and the second highest average grain yield of 5.9 t/ha (Table 1). The average market price for maize (the staple food crop) in 2001 was US \$215/t at harvest but

increased to US \$300/t in the later part of the season. The cost of production was around US \$370 whereas the net income per hectare was around US \$1,196. Farmers were particularly happy with the price of maize during the season, which was considered to be reasonable.

SG 2000's partnership with other stakeholders in agriculture has also been strengthened.

During the 2001/02 dry season, farmers obtained average wheat yield range of 2.8-5.2 t/ha with an overall yield of 4.1 t/ha (Table 2). With the price of wheat rising, wheat farmers made an average net income of up to US \$1,226/ha. With the irrigated maize harvested as green cobs, farmers obtained a yield average of 40-45,000 cobs/ha. The

Table 1. SG 2000/ADP hybrid maize MTPs, 2001 wet season

State	No. of farmers	No. of hectares	Yield range (kg/ha)	Average yield (t/ha)
Bauchi	164	46	3,125-5,103	4.3
Gombe	273	111	2,213-5,381	3.8
Jigawa	282	71	1,271-6,186	4.1
Kano	468	157	369-7,153	4.8
Katsina	222	135	1,216-7,667	5.9
Kaduna				
Lere Zone	573	143	4,188-7,504	6.1
Maigana Zone	245	61	3,680-6,938	5.4
B/Gwari Zone	274	69	4,300-6,102	5.2
Total	2,501	792	-	5.0

Table 2. SG 2000/ADP wheat MTPs, 2001/02 dry season

State	No. of farmers	No. of hectares	Yield range (kg/ha)	Average yield (t/ha)
Bauchi	18	6	4,830-5,410	5.2
Gombe	1	1	4,700	4.7
Jigawa	406	105	1,760-6,250	3.9
Kano	233	61	3,250-5,530	4.1
Katsina	18	9	2,770	2.8
Kaduna				
B/Gwari Zone	6	2	3,680	3.7
Total	682	184	-	4.1

estimated cost of production was US \$410/ha whereas the average net income per hectare ranged between US \$1,300-\$1,512.

SG 2000’s partnership with other stakeholders in agriculture has also been strengthened. The project is run in partnership with the Institute for Agricultural Research (IAR/ABU) in the promotion of QPM; LCRI in promoting durum and bread wheats; IITA in soil fertility management, integrated pest management and postharvest technologies; NSPRI in storage pest control; Danhydro, Golden and Fascoms in quality fertiliser procurement; IFDC (DAIMINA Project) to evolve the active private sector to provide efficient and sustainable agricultural input marketing systems; Afri-Agric in sesame procurement for export

and CANDEL in promotion of conservation tillage. CANDEL, the Monsanto representative in Nigeria, donated herbicides (Roundup and Lasso+Atrazine) for the establishment of 120 conservation tillage demonstration plots.

With the signing of a memorandum of understanding between SAFE and Ahmadu Bello University in Zaria (see page 8), the BAgric Extension degree programme for mid-career extension staff is set to commence in October/November 2002. The university has provided hostels and classrooms and other facilities, while SAFE is in the process of acquiring the equipment, books and journals needed to ensure that the programme takes off successfully.

SG 2000 continued its work with the Ministry of Agriculture in preparation for a major new agricultural development project funded by the World Bank. “During this past season,” reports SAA agronomist, Dr Jiro Aikawa, “we have been engaged in pilot field demonstrations related to soil fertility restoration and maintenance. These have included use of locally available phosphate rock for phosphorus recapitalisation of the soil, use of the green manure crop, *Mucuna*, for building nitrogen, and introduction of conservation tillage.”

“SG 2000 has been assisting the Government of Tanzania for the past 18 months in the development of the Soil Fertility Recapitalisation and Agricultural Intensification Project (SOFRAIP), which has been submitted to the World Bank for funding,” says Marco Quiñones, SG 2000 Regional Director for Africa.

SOFRAIP was expected to become operational by July 2002. However, re-thinking of the project has led to a project re-design that gives more emphasis to participatory approaches. This has required time to build capacity at the grass roots level for project implementation and to ensure a structure that permits full involvement of the beneficiaries.

As a result of the project re-design, the Government of Tanzania has agreed to change the name from SOFRAIP to Participatory Agricultural Development and Empowerment Project (PADEP), which will hopefully become operational in mid 2003. In the meantime, the

Ministry of Agriculture is pilot testing various approaches and methodologies before full implementation.

SG 2000 hopes to remain very active in the PADEP project once it is finally approved by the World Bank.

SG 2000 is participating in this pilot testing phase, through working with district officials and farmers on various technological options that would restore and maintain soil fertility and increase production on a sustainable basis. Various technology options were tested and demonstrated during the 2001/02 season (Table 1).

SG 2000 staff worked with Tanzanian extension workers and smallholder farmers to establish 48 demonstration plots in six regions using rock phosphate from



SG 2000 field visit to Mbeya rural.

the Tanzanian Minjingu deposits in Arusha region. Use of this high-quality indigenous source of phosphate can assist in replenishing levels in phosphorus depleted soils and help to reduce the amount of foreign exchange required to import phosphate fertilisers from abroad.

Another 60 demonstrations using the green manure crop, *Mucuna*, were implemented in seven districts in several regions. *Mucuna*, which increases nitrogen content in the soils by rhizobia N fixation, can reduce the amount of purchased nitrogen fertilisers required for higher-yielding crop production by as much as half.

Finally, six conservation tillage demonstrations were conducted in the Arumeru district in Arusha region, in combination with the demonstration of rock phosphate. These sites also served to support a two-day skills training course on conservation tillage, which was carried out in collaboration with a consulting agronomist funded by Monsanto Company. Some 46 Tanzanian extension workers participated.

For the 2002/03 cropping season, SG 2000 plans to expand its support of field demonstrations focused on the same technological components as in the current year, as well as introduce several new activities. “One new activity,” reports Dr Aikawa, “will be the introduction of new Quality Protein Maize (QPM) varieties and hybrids. Another will be the introduction of Chinese-based water harvesting and drip

irrigation technologies.”

“SG 2000 hopes to remain very active in the PADEP project once it is finally approved by the World Bank,” says Marco Quiñones. SG 2000 has a long history of working at the grass roots in Tanzania, dating back to 1988.

“This history, combined with our strong and evolving technological orientation, we believe, will permit us to assist districts and regional agricultural officials as they work with farmers to develop local technology development plans.”

SG 2000 has been asked by the Government of Tanzania to stay active in PADEP, including pilot testing of new crop technology alternatives and in assisting in field supervision to ensure effective demonstrations of the technologies selected by farmers’ groups for promotion. All these activities will be carried out using PADEP funding.



SG 2000 plans to introduce new QPM varieties in 2000/3.

Table 1. Summary of maize technology demonstrations, crop cycle 2001/02

Region	District	Rock phosphate	<i>Mucuna</i>	Conservation tillage
Ruvuma	Songa	12	12	
Mbeya	Mbarali	10	10	
Singida	Singida	3	3	
Sinyanga	Kahama	12	12	
Tabora	Tabora	5	11	
Arusha	Arumeru	6		6
Iringa	Iringa		8	
Kilimanjaro	Hai		4	
Total		48	60	6

A third consecutive bumper harvest last year has kept food crop prices relatively low—but maize prices did rise following the government’s initiative in forming a grain traders’ association which successfully exported more than 40,000 tonnes of maize to famine stricken countries in Southern Africa, such as Zambia and Malawi. The demand for maize grain has increased more recently with prices stabilising at US \$94/t. Even so, farmers have reduced maize acreage by switching to legumes and, in some cases, rice production.



Dr Wilberforce Kisamba Mugerwa, Uganda’s Minister for Agriculture, Animal Industries and Fisheries (centre), is greeted by country director, Dr Abu Michael Foster, at the opening of the first one-stop centre. More than 1,500 people attended the launch in Nakalama subcounty, Iganaga District.

“Policies that provide farmers with the requisite incentives to use productivity enhancing technology are still urgently needed,” says country director Abu Michael Foster.

Uganda has generally enjoyed increased food availability for home consumption this year. However, a prolonged dry spell has delayed planting and may reduce the planted area in the second season in 2002.

“The successful popularisation of Quality Protein Maize (QPM) production on a competitive basis throughout the country was a major achievement in 2002,” notes Foster.

The QPM variety Nalongo (based on Ghana’s Obatanpa variety) entered the seed market in May this year after intensive work between SG 2000 and researchers at the Namulonge Agricultural Research Institute (NAARI) and

Nalweyo Seed Company (NASECO). A cumulative total of 600 t of Nalongo has now been produced. Experimental feeding trials with pigs have indicated that QPM has greater feed efficiency for live weight gain than a normal maize diet, with or without supplements. This information has now been passed on to 15 farmers to compare the benefits of direct feeding of QPM to pigs at village level.

A total of 15,839 farmers participated in last season’s SG 2000/Ministry of Agriculture, Animal Industries and Fisheries (MAAIF) demonstration programme to promote improved cereal farming systems. The programme has broadened the options for farmers by including rice and pigeon peas. More than 71 percent of the 3,563 demonstrations plots focused on six crops (see table).

Yield comparisons of improved and traditional production technologies, 2002*

Crop	No. of demo plots	Total area (ha)	Average yields (kg/ha)	Traditional yields (kg/ha)
Maize (QPM)	1436	143.6	3,700	1,800
Rice	165	16.5	4,000	2,192
Pigeon Peas	153	15.3	2,260	900
Groundnuts	150	15.0	2,700	2,436
Sorghum	152	15.2	3,510	1,240
Beans	474	47.4	1,200	750
Total	2,530	253.0	-	-

* Reported estimates from extension workers.

As part of the diversification process, SG 2000 has created substantive seed banks to encourage rotations and the intercropping of legumes with cereals on an extensive scale. SG 2000’s collaboration with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) has broadened the range of legumes beyond beans and groundnuts to include pigeon peas. This has resulted in the availability of more than 40 t of pigeon pea seed, largely for eastern Uganda.

Demand for animal traction implements and postharvest machinery has increased following collaboration with Plan International and other development agencies. The total

loan recovery rate for ploughs has increased to 82 percent in 2002.

“Commercial rice growers can profit from hand-held and small engine-powered equipment for the application of fertilisers, herbicides and insecticides,” says Foster. “These will be valuable additions to our technology offerings,” he adds.

SG 2000 has begun to set up institutional mechanisms to strengthen the access of farmers’ groups to agricultural services. One key mechanism is the establishment of a network of one-stop centres as a means for the management of services to rural communities.

“One-stop centres will provide crucial access to inputs, equipment and farmers’ knowledge and skills base,” says Foster. The first one-stop centre was inaugurated in May, with three or four more planned for 2003. Twenty are planned over a five-year period.

A reorganisation of the national agricultural advisory services is being carried out in partnership with the government and development agencies. SG 2000 has provided technical and financial support for strengthening the capacity of farmers’ institutions and service providers for implementation by NAADS (National Agricultural Advisory Delivery Service) at national and sub-county level.



Farmer Peter Mwesige at his recently constructed piggery, where he breeds piglets for SG 2000’s farmer-to-farmer chain. The piggery is also used to compare pigs fed on traditional diets with those fed on QPM.

SG 2000 publications and videos

For copies please contact Raitt Orr & Associates Ltd in London

Publications



1. Proceedings of Workshop 2001: Food Security in a Changing Africa.
2. Proceedings of Workshop 2000: Extension Education - Reshaping African Universities and Colleges for the 21st Century.
3. Proceedings of Workshop 1999: The Food Chain in Sub-Saharan Africa.
4. Proceedings of Workshop 1999: Innovative Extension Education in Africa.
5. Proceedings of Workshop 1998: Partnerships for Rural Development in Sub-Saharan Africa.
6. Proceedings of Workshop 1998: Microfinance in Africa.
7. Proceedings of Workshop 1998: Enhancing Postharvest Technology Generation and Dissemination in Africa.
8. This is SAA: An introduction to the work of the Sasakawa Africa Association.

Other publications available:

- SG 2000 in Nigeria—The First Seven Years (1999).
- Proceedings of Workshop 1997: Agricultural Intensification in Sub-Saharan Africa.
- Proceedings of Workshop 1996 on Women, Agricultural Intensification, and Household Food Security.
- Proceedings of Workshop 1996: Overcoming Rural Poverty in Africa.
- Proceedings of Workshop 1995: Achieving Greater Impact from Research Investments in Africa.
- The Earth and the Sky—the change and challenges in African agriculture, (1998).

Videos



1. Setting the Grassroots on Fire—Norman Borlaug and Africa's Green Revolution, (1999).
2. Ethiopia, My Hope . . . My Future . . . The 'Green Revolution' in Ethiopia, (1998).
3. Breaking the Mould. Bringing African Universities into Development, (1997).
4. Fulfilling the Promise. How nutritionally-improved maize can alleviate malnutrition in maize-dependent countries, (1997).
5. Facing the Future. The SG 2000 Programme for Agricultural Development in Africa, (1996).
6. You Can't Eat Potential. Breaking Africa's Cycle of Poverty, (1996).

All videos are available in English, French and Japanese. Video formats are PAL, Secam and NTSC.

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