

## A BULLETIN OF THE TROPICAL LEGUMES II PROJECT

### About the Bulletin

The Bulletin of Tropical Legumes is a monthly publication of the Tropical Legumes II (TL II) project, funded by the Bill & Melinda Gates Foundation, and jointly implemented by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), the International Center for Tropical Agriculture (CIAT) and the International Institute of Tropical Agriculture (IITA) in close collaboration with partners in the National Agricultural Research Systems of target countries in sub-Saharan Africa and South Asia. TL II aims to improve the livelihoods of smallholder farmers in drought-prone areas of the two regions through enhanced grain legumes productivity and production.

## Tropical legume farming in Niger

### Cowpea production in Niger

Cowpea is one of the most important grain legumes of Niger, which is the second largest producer of the crop in Africa. About 764,000 MT of cowpea are produced annually on about 4,132,000 ha (Figure 1). Local consumption has grown significantly in recent years. This is bound to have a positive impact on people's nutrition and health. Cowpea haulms are used as animal feed, helping to increase livestock productivity. Farmers often grow long-duration spreading varieties for fodder (Singh et al., 2003).

The major cowpea production areas in Niger are Dosso (Sudano Savanna) and Maradi and Zinder in the Sahel, where the annual rainfall is 400-600 mm. These regions account for about 80% of cowpea production in the country. Crop productivity, of cowpea in particular,

is very low. The annual growth rate of cowpea yield from 1985-87 to 2005-07 was about 2.5%, whereas the area has been growing at 7.4%. Cowpea production in Niger is projected to grow at 4.2% between 2010 and 2020. The current national production of 142,000 MT is expected to increase at 3.7% per annum.

### Contribution to national GDP, farmer incomes, food and nutrition security

Cowpea is an important cash crop in Niger after onions. Its consumption is 7.82 kg/capita/year. Niger is the largest cowpea exporter in the world with an estimated 215,000 MT exported annually, mainly to Nigeria. During 2001-2005, the crop contributed about 12% of the monetary value of the country's total export (Ibro, 2011). It has an attractive market price except following harvest when supply outstrips demand. Farmers sell

more than 88% of the produce in most of the cases.

Cowpea production in sub-Saharan Africa (SSA) is projected to grow at nearly 3% per annum – from 6 million MT in 2010 to 8 million MT in 2020, with Niger predicted to continue to dominate its production in this region. High rates of growth (4.2%) are projected for Niger.

Despite its contribution to cash incomes of farmers and to the national budget, cowpea is becoming more of a national food crop which can significantly enhance the food security of the

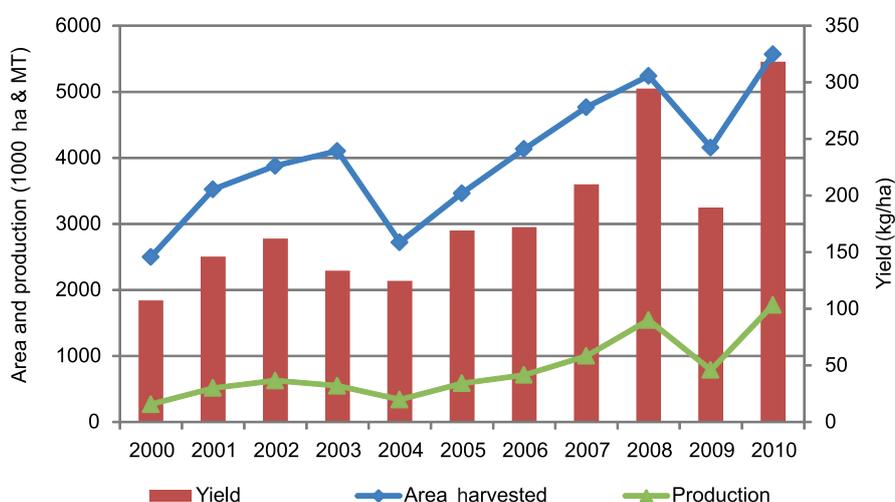


Figure 1: Cowpea area, production and yield in Niger, 2000-2010 (FAOSTAT, 2012).

country's 66% poor farmers. It is widely consumed by both rural and urban people. In general, the grain can be cooked alone or mixed with rice and consumed as the main meal. The grain can also be processed into flour which is used for a variety of recipes such as "Kossai", a popular breakfast meal in West and Central Africa which contributes significantly to women's incomes. Ibro et al., (2006) estimated that up to 3,500 kg of cowpea is processed into "Kossai" daily in Niamey, Maradi and Zinder, Niger's three main cities, representing an annual combined market of 3,800 MT.

Developing cowpea production in the five regions of Niger (Zinder, Maradi, Tahoua, Tilaberi and Dosso) is mainly justified because of its good export market. Cowpea is exported unfinished and provides an average income of \$147/ha from the sale of grains to producers and traders. Since they are difficult to store due to weevil attack, chemicals are used to protect them. The PIC Storage technology is being promoted among cowpea growers and traders. State intervention in the cowpea sub-sector is mainly confined to the regulation of trade (about 30 major

traders). There are many active informal distribution and sales channels of cowpea.

Niger mainly exports cowpea to Nigeria (strong demand, continuous growth), Ghana, Benin and Togo (lower export and market growth). Prices and production vary widely from one year to the next (EU, 2002).

## Cowpea research in Niger

Institut National de la Recherche Agronomique du Niger (INRAN) was created in 1975 to serve as the national agricultural research center of Niger. Research in food crops (millet, sorghum, cowpea, peanut) started before 1928 with IRAT, but important cowpea breeding efforts only began after INRAN came into being. Its main objectives are to develop cowpea varieties resistant to *Striga*, insect pests (aphids, thrips) and tolerant to drought and low soil fertility. Longstanding and harmonious ties between INRAN and the International Institute of Tropical Agriculture (IITA) in cowpea research will enhance progress in this project. Table 1 shows the improved cowpea varieties registered in the country.

**Table 1: Characteristics of common cowpea varieties developed by the Niger research system.**

Official name of release	Year of release	Source	Genetic background	Area of potential coverage (ha)	Area of actual adoption estimate (ha)	Spillover to national boundaries	Average on-farm yield potential (kg/ha)	Varietal traits
IT90K-372-1-2	2002	IITA	IT90K-372-1-2	148,315	3,500	Yes	300	Semi-erect, white grain, moderately resistant to aphids
IT99K-573-1-1	2008	IITA	IT99K-573-1-1	111,236	2,000	Yes	350	Semi-erect, white grains, resistant to <i>Striga</i> , high grain yield
IT98K-205-8	2008	IITA	IT98K-205-8	111,236	2,000	Yes	300	Resistant to <i>Striga</i> and drought, grain yield, early maturing
IT89KD-374-57	2002	IITA	IT89KD-374-57	148,315	3,500	Yes	350	Tolerant to aphids and drought
IT97K-499-38	2008	IITA	IT97K-499-38	111,236	2,000	Yes	400	Semi-erect, resistant to <i>Striga</i> and drought, grain yield, early maturing
IT97K-499-35	2008	IITA	IT97K-499-35	111,236	2,000	Yes	400	Semi-erect, white grain, resistant to <i>Striga</i> and drought, grain yield, early maturing

## Major constraints to production

The major constraints to cowpea production in Niger include:

- Biotic stresses: Insect pests (aphid, flower thrips, pod sucking bugs, maruca, and bruchid) and diseases (bacterial and viral) and *Striga*
- Abiotic stresses: Drought, heat and low soil fertility
- Poorly organized producers, limited access of farmers to inputs (especially seeds of improved varieties, insecticides and fertilizers at affordable prices)
- High labor costs for planting, weeding and harvesting.

## Planned phase II activities and their contribution to national efforts

In phase II of the TL II project, it is planned to implement available cowpea technologies in important cowpea production environments or agro-ecologies. It is targeted to achieve cowpea productivity of 0.9 t/ha in the intervention areas and to influence national productivity from the current level of 0.2 to 0.5 t/ha by 2014.

## Expected outcomes in production and productivity

Phase II of the project will yield greater incomes for cowpea farmers and farming practitioners, increase national cowpea production to more than 862,455 MT by 2014 and productivity of 0.5t/ha. The excess production over and above national demand would allow for more exports.

## Agro-ecologies for cowpea cultivation

Cowpea is grown mainly in the Sudan Savanna and Sahel Savanna agro-ecologies of Niger. Figures 2 and 3 show cowpea production areas and yield distribution, respectively.

There are regions with cowpea coverage of more than 90,000 ha but there are very few regions where the average productivity levels are between 0.21 to 0.36 t/ha. Niger is one of the countries with very low cowpea grain yield, possibly because farmers plant cowpea at very low population density. In addition, the cultivated areas are overestimated. Cowpea is usually intercropped with sorghum, millets and groundnut and areas attributed to cowpea may be areas where the crops are grown together.

## Seed systems for a legumes green revolution in Niger

Niger is second to Nigeria in cowpea production but all of its crop is produced in the short rainy season (June–September). There is a shortage of quality seed and farmers plant whatever seeds they receive, leading to

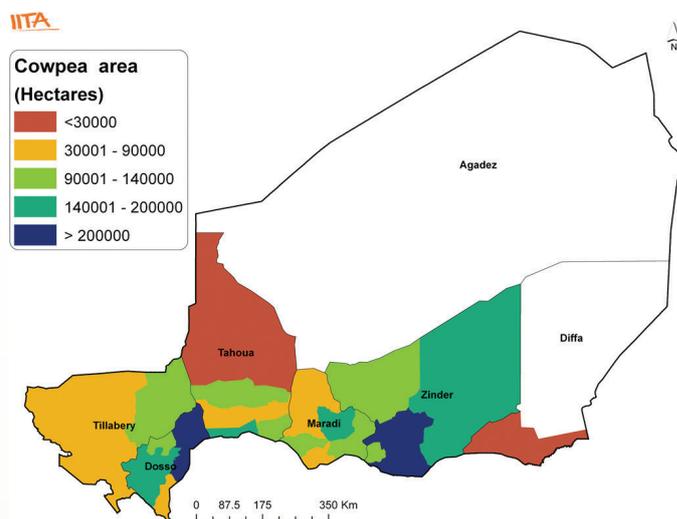


Figure 2: Cowpea production areas in Niger.

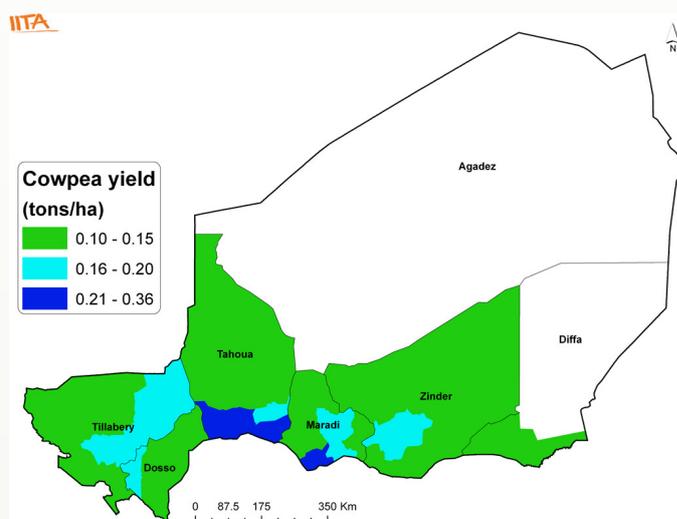


Figure 3: Cowpea yield distribution in Niger.

poor crop stands and low yields. There are few private seed companies that produce and market cowpea seed. Only Alheri Seed used to produce and market improved cowpea seed in Niger. Other private seeds companies such as Fusaha, APPSN, and Manoma SA which mainly produce cereal seed, have lately begun producing legumes seeds. In general, farmers mostly rely on NGOs to source and distribute improved cowpea seeds in Dosso, Maradi, and Zinder areas. Cowpea yields are low because of drought, the parasitic weed *Striga* and a number of diseases and insect pests. In collaboration with INRAN, IITA has developed a number of improved cowpea varieties that combine resistance to multiple biotic and abiotic stresses, particularly drought and *Striga*. Despite the availability of improved varieties, adoption is low due to seed shortage and the lack of information on their availability in the areas they are produced.

It is possible to increase cowpea productivity by promoting a wide range of productive varieties and crop management options. Access to and availability of seed of preferred varieties can be improved by undertaking sustainable seed production and delivery schemes. Developing the seed

sub-sector and closing the yield gap between on station and farmers' fields through improved agronomic practices and better insect pest control should be targeted.

## Niger seed system strategy (2012-2014)

The TL II project has built a seed production and distribution platform in Niger to enhance production and effective distribution of cowpea in the country. Central to this platform are INRAN, Alheri Seed Company, Ministry of Agriculture and the Dutch NGO, SNV. It is expected that more NGOs will join the platform at a later stage. INRAN produces and supplies foundation seed to Alheri Seed Company and the NGOs involved in agricultural development in the country. While Alheri produces and sells certified seeds, the NGOs, particularly SNV and World Vision, will disseminate the varieties by setting up demonstration plots, production of seeds through

community seed schemes and the promotion of seed marketing.

Majority of seed will be produced by Alheri Seed Co, other small scale seed companies and community seed producers. Three seed companies are now actively involved in cowpea seed production. IITA and INRAN will supply foundation seed to the various seed companies. Details of seed production in Niger and the production plan for certified seed are show in Tables 2 and 3, respectively.

Area: 4,774,250 ha  
 Seed rate mean: 20kg/ha  
 National demand: 95,485 MT (2012-14)  
 Capacity to deliver 20% of 945,850 ha ≈ 19,097 MT  
 Productivity target: 0.9 t/ha at intervention sites and 0.5t/ha at the national level  
 Total production target: 2,769,000 MT

**Table 2: Seed production (tons) in Niger.**

Agro-ecological demand	Variety demand	Yield (kg/ha)	Seed production					
			Breeder seed in 2012		Foundation seed in 2013		Certified seed for use in 2014	
			Area (ha)	Production (t)	Area (ha)	Production (t)	Area (ha)	Production (t)
Sahel Savannah (Maradi) 1425046	IT90K-372-1-2	900	0.52	0.47	23.46	21.11	1055.59	950.03
	IT89KD-374-57	900	0.52	0.47	23.46	21.11	1055.59	950.03
	IT98K-205-8	900	0.52	0.47	23.46	21.11	1055.59	950.03
	IT97K-499-35	900	0.52	0.47	23.46	21.11	1055.59	950.03
	IT97K-499-38	900	0.52	0.47	23.46	21.11	1055.59	950.03
	IT99K-573-1-1	900	0.52	0.47	23.46	21.11	1055.59	950.03
Sudan Savannah (Dosso) 1161065	IT90K-372-1-2	900	0.42	0.38	19.11	17.20	860.05	774.04
	IT89KD-374-57	900	0.42	0.38	19.11	17.20	860.05	774.04
	IT98K-205-8	900	0.42	0.38	19.11	17.20	860.05	774.04
	IT97K-499-35	900	0.42	0.38	19.11	17.20	860.05	774.04
	IT97K-499-38	900	0.42	0.38	19.11	17.20	860.05	774.04
	IT99K-573-1-1	900	0.42	0.38	19.11	17.20	860.05	774.04
Sahel Savannah (Zinder) 1121783	IT90K-372-1-2	900	0.41	0.37	18.47	16.62	830.95	747.86
	IT89KD-374-57	900	0.41	0.37	18.47	16.62	830.95	747.86
	IT98K-205-8	900	0.41	0.37	18.47	16.62	830.95	747.86
	IT97K-499-35	900	0.41	0.37	18.47	16.62	830.95	747.86
	IT97K-499-38	900	0.41	0.37	18.47	16.62	830.95	747.86
	IT99K-573-1-1	900	0.41	0.37	18.47	16.62	830.95	747.86
<b>Total</b>			<b>8.14</b>	<b>7.32</b>	<b>366.21</b>	<b>329.59</b>	<b>16,479.53</b>	<b>14,831.58</b>

**Table 3: The three-year production plan (t) for certified seed.**

Variety	2012	2013	2014
IT99K-573-1-2	1,200	1,800	2,471.93
IT98K-205-8	1,200	1,800	2,471.93
IT90K-372-1-3	700	1,300	2,471.93
IT89KD-374-57	750	1,400	2,471.93
IT97K-499-39	700	1,350	2,471.93
IT97K-499-36	700	1,300	2,471.93
Total	5,250	8,950	14,831.58

### Vision of success for cowpea in Niger

The vision of success for cowpea in Niger is to attain highest productivity (0.5 t/ha) at national and global levels that contribute to the wealth of producer farmers and significantly add to domestic consumption. The overall production will fulfill national demand thereby contributing to the GDP with greater exports and/or agro-processing.

### Opportunities for and constraints to covering 20% of cowpea agro-ecology with improved seed

#### Opportunities

- High consumption in the country
- High demand as part of the daily staple
- Good market access
- Liberalization of foundation seed production
- Availability of suitable varieties in major cowpea growing areas
- Favorable ecology (drylands) for production
- Cowpea haulm as fodder for livestock

#### Constraints

- Dominated by an informal system that has technical and infrastructural challenges
- No mechanization
- Unpredictable market price
- Low yield due to biotic and abiotic constraints
- Seed production and marketing is picking up slowly
- National seed council's inadequate capacity to certify seed
- Insect pests from the field to the store

- Poor seed distribution systems (lack of seed dealers in communities)
- Irregular rains, especially early in the season.

## Groundnut production in Niger

Groundnut is an important crop due to its contribution to poverty reduction and food security. It is a basic food and a cash crop and also contributes to livestock feed. Recent surveys (Ndjeunga et al., 2010) in major groundnut regions of Niger have shown that the crop is planted on about 15% of the country's total cultivated area and contributes 66% of household cash revenue. It accounts for 31% of the total value of crop production in Niger.

Groundnut is a major source of dietary protein, oil/fat, and vitamins such as thiamine, riboflavin and niacin. Groundnut paste is an important source of calories for small children, particularly those being weaned. Groundnut cake and haulms (straw, stems) are used as livestock feed, helping to increase livestock productivity. The crop season is short (June-September) and the end-of-season drought is frequent. Table 4 presents average area, production and yield of groundnut along with national demand and growth in production in Niger. Figure 4 shows trends in area, production and yield between 1961 and 2009.

**Table 4: Average area, production and yield of groundnut along with national demand and growth in production in Niger.**

Parameter	Units
Average area (ha)	625,213
Average production (MT)	302,319
Average yield (current, kg/ha)	473
Average yield (2015, kg/ha)	600
National demand (MT)	229,206
Expected growth in production (%)	4.46
Proportion of produce sold (%)	76

Source: FAOSTAT 2005-08.

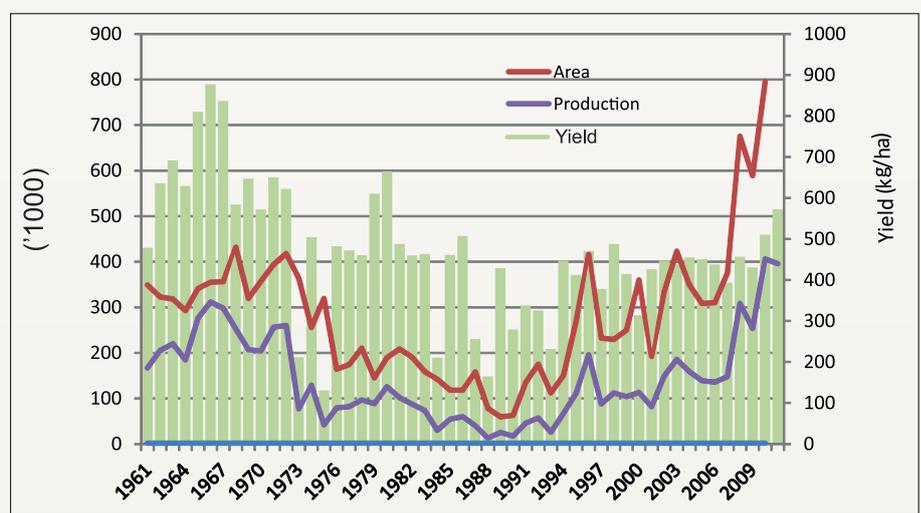


Figure 4: Trends in groundnut area, production and yields in Niger, 1961-2009.

**Table 5: Agro-ecological zones and biotic constraints to groundnut production in Niger.**

Regions	Area (ha)	Key constraints	Total area (ha)	Key biotic constraints
Dosso	21,006	Drought	4,122,000	Poor soil fertility, drought, rosette disease, aphids
Maradi	175,000	Drought		Poor soil fertility, drought, rosette disease, aphids
Zinder	136,155	Drought		Poor soil fertility, drought, rosette disease, aphids

## Research and dissemination process

Groundnut research in Niger was initiated by Institut de Recherche pour Les Huiles et Oleagineux (IRHO), a French research organization in 1960 with the introduction of germplasm from other French territories such as Bambey in Senegal and Niangoloko in Burkina Faso. Groundnut improvement got a boost after ICRISAT set up its research station in Niger in 1988. The lack of technical staff for groundnut research has led to the limited use of germplasm from ICRISAT. However, through projects implemented by ICRISAT including TL II, new varieties are now being adopted by farmers.

The most widely grown groundnut variety in Niger is 55-437 followed by TS 32-1. However, four new varieties including Fleur 11, RRB, J11 and ICG 9643 have been released in 2011. Among these, RRB is the most popular. The last release of varieties in the national catalog was more than two decades ago.

## Agro-ecologies for groundnut cultivation

The arable land in Niger is a thin belt bordering Nigeria, Benin and Burkina Faso below the Sahara desert. It is predominantly Sahelian with a very short growing cycle (June-September). Groundnut is largely grown under rainfed conditions in the regions of Dosso, Maradi and Zinder (Table 5) all lying in the Sahel Savanna agro-ecology with average annual rainfall of 400-600 mm. These regions account for more than 75% of groundnut production in Niger.

## Perspectives for phase II

Niger is one of the countries where phase I of the project was implemented for groundnut. Activities will continue with more vigor in the second phase of TL II. Efforts will be made to increase the level of drought tolerance and facilitate the process of variety release and registration to ensure that farmers have access to improved groundnut varieties.

## Seed strategy

The total amount is estimated to cover 23% of the demand. This can only be attained assuming no drought spells occur during the four years, However, considering the fact that the frequency of drought in Niger is high, risks are also very high and this may be mitigated by using

available irrigation facilities at the various seed farms. The more secure site of Bengou research station in the Sudan savanna will be increasingly used for seed production. Table 6 shows the current and projected groundnut seed production (2012-2015).

## Key issues for competitiveness

- Promotion of a wide range of productive varieties and crop management options to increase productivity
- Development of sustainable seed production and delivery schemes to increase access and availability of seed of preferred varieties
- Promote the adoption of best bet pre- and post-harvesting techniques to minimize aflatoxin contamination to improve groundnut access to international markets
- Increase awareness of the dangers of aflatoxin contamination to improve the health of rural and urban consumers.

## Mechanization: Timely planting/harvesting and processing

All groundnut production operations (land preparation, planting, weeding and harvesting) are done manually by using hand tools that severely limit the area planted. About 33% of producers own a plough, less than 1% owns a seeder and 52% own oxen. Groundnut production is a labor intensive enterprise. In this case, the returns to investment in small mechanization in the form of simple animal traction may be high. Access to suitable machinery for various small-scale field operations is essential to increase productivity and profitability.

**Table 6: Current and projected groundnut seed production (kg), 2012-2015.**

	Breeder seed	Basic seed	R1	R2	R3
2012	1543	6615	45,100	5,700	-
Projected 2013	578	15830	118,600	45,100	57,000
Projected 2014	578	5780	154,300	118,600	451,000
Projected 2015	578	5780	1,543,000	154,300	11,860,000

## Strategic partners and their roles

Strategic partner	Role
ICRISAT	Technology development (variety and crop management options) in partnership with NARES and ARIs, breeder seed production and variety maintenance; assessment and identification of sustainable seed delivery systems in partnership with NARES; assist in the promotion of measures to reduce aflatoxin contamination; provide training in priority skills (data management, impact assessment methodology, breeding methodology and Participatory Varietal Selection)
IITA	Technology development (variety and crop management options) in partnership with NARES and ARIs; assessment and identification of sustainable seed delivery systems in partnership with NARES; provide training in priority skills (data management, impact assessment methodology, breeding methodology and PVS)
Institut National de Recherche Agronomique du Niger (INRAN)	Technology development and deployment with backstopping from ICRISAT; ensure the production of breeder and/or foundation seeds; evaluate technologies using the PVS methodology; facilitate the release of new varieties
Ministry of Agriculture (SICCLA)	Formulate seed laws and regulations and well as overall inputs (fertilizers, pesticides, etc)
Ministry of Agriculture (including Extension services)	Formulate agricultural policies in the Rural Development Strategy; ensure the delivery of technologies and advisory extensions services
Association of Private Seed Producers of Niger (APPSN)	Coordinate seed production and marketing of certified /commercial seed
Small-scale vegetable oil processing units	Processing of groundnut oil and cake, soap and paste; provide market for groundnut grain units
NGOs such as World Vision, SNV	Promote improved farming practices and linking farmers with markets
Farmers' associations/small-scale seed producers	Assist in the evaluation of FPVS trials; monitor village-level seed production
AGRA and WASA	Support the development of seed enterprise and agro-dealers (enhancing the capacity of local seed traders); training agro-dealers (local seed traders) in marketing and small-scale business management

## Environmental/sustainability issues

A range of improved varieties and the exploitation of environmentally friendly and sustainable technologies (resistant varieties) will contribute to the preservation of biodiversity. High-yielding resistant varieties will reduce the need for pesticides, thus contributing to a safe and healthy environment. Higher groundnut and cowpea yields and opportunities for commercialization will lead to environmental benefits. Growth in income and employment (e.g. labor for farming, crop processing and trade) will reduce the pressure on marginal lands using sustainable agricultural practices. Poverty is a major contributor to environmental degradation. Cultivating cowpea and groundnut will ease the pressure on natural resources in fragile, drought-prone areas.

## Monitoring & Evaluation

- Groundnut production, area cultivated and yield are monitored every year through a survey of about 2,500

farming households in Niger. This sample has been found to be highly representative.

- Annual sub-regional review and planning meetings are organized.
- Groundnut varieties are monitored by ICRISAT using key resource persons involved in technology development and delivery.
- A good monitoring system is required at the national level.

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