Importance of Cowpea to the Livelihoods of Smallholder Farmers in Burkina Faso and INERA’s Research Efforts to Address Challenges and Opportunities Facing the Cowpea Sector

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Room Waongo 1: 11:00 AM
1. Context
2. Importance of cowpea to the livelihoods of smallholder farmers in Burkina Faso
3. INERA’s research efforts to address challenges and opportunities facing the cowpea sector
4. Conclusion
1. Context
Characteristics of Agriculture in Burkina Faso

- A landlocked country located in the Sahelian zone in West Africa
- Population: more than 18 million persons with a strong demographic growth (3.1% per year; INSD, 2015);
- Prevalence of subsistence agriculture practised on small family farms
- Nearly 86% of the population involved in agriculture which contributes to 35-40% of the GDP
- High pressure on natural resources due to high population growth and the extensive nature of agriculture
- Rapid degradation of soil fertility and other natural resources as a result of combined effects of successive droughts and poor farming practices;
- Dependent on agro-climatic conditions since it is mainly based on rainfed crops (sorghum, pearl millet, maize, cowpea, Yam etc.)
Effect of Climate change on the isohytes
Agriculture performance and impact on rural poverty

- Significant progress made in recent years on a sustainable improvement of agricultural production through the implementation of various sectoral policies especially the PNSR-2011-2015
  - Average increase in cereal production by 2% per year (2011-2015)
  - Average increase in cowpea production by 5.3% per year (2011-2015)
  - Average growth of agricultural GDP by 1.8% per year during the same period

- Reducing the incidence of rural poverty (52.8% in 2009 to 47.5% in 2014)
Challenges to address for a sustainable development of agricultural sector

- **Constraints**
  - Adverse effects of climate change and variability;
  - Degradation of natural resources;
  - Low availability / Valorisation of water resources;
  - Low productivity of the production systems;
  - Poor performance of support services to producers;
  - Low professionalisation of the value chain actors;
  - Volatility of agricultural commodity prices;
  - Low valorisation of research results.

- **Challenges**
  - Several challenges still to address for a sustainable development of a productive, competitive and résilient agro-sylvo-pastoral sector in the country (PNDES, 2016)
National Policies and Opportunities for the development of Cowpea sector

Action Plan for the development of cowpea value chain adopted in 2002 (Statistika, 2003) with the following specific objectives:

- To strengthen the organizational capacities of the actors
- To improve cowpea productivity
- To improve the storage and conservation of cowpea
- To increase cowpea exports and develop the local market
National Policies and Opportunities for the development of Cowpea sector cont’d.

- PNCSA (2012) aims to capitalize the outcomes of the previous actions outlined the pathways for the development of Cowpea Sector
- National Research Program on Pulses
- National demand growth (2.7% per annum)
- Cowpea’s Farmer Organizations
- Regular exhibitions and fairs on Cowpea
- Political support (JNP, engagement of the first Lady)
Cowpea field visit by the first Lady
Opportunities at international level

- The International Year of Pulses 2016
  - Has helped raise awareness of the many benefits of pulses
  - February 10th, proposed at the closing of IYP 2016 in Ouagadougou and adopted as the International Pulse Day by UN

- Continental & Regional Agriculture Policies (AU, ECOWAS, UEMOA)

- SRO & Regional Agencies (CORAF/WECARD, INSAH..)

- International Agriculture Research Programs (CGIAR Centers, CRP on GLDC, FtF LIL, AATF, etc.)

- Technical and Financial Development Partners (FAO, WFP, USAID, BMGF, WB, AfDB, etc.)
2. IMPORTANCE OF COWPEA TO THE LIVELIHOODS OF SMALLHOLDER FARMERS IN BURKINA FASO
Vigna unguiculata is one of the most important GLC (Pulses) which global demand is growing and, currently, about one fourth of the world’s pulses are produced in Africa (FAO, 2017)
Cowpea is produced in the arid and semi-arid zones

### Cowpea production in Africa

- West Africa produces more than 84% of the African production
- Burkina Faso ranks third country in cowpea production (FAOSTAT, 2014)
- Cowpea is the first most important grain legume in Burkina Faso
- Yield per hectare is still very low in farmers’ field in Burkina (<1000Kg/ha)

<table>
<thead>
<tr>
<th>Country</th>
<th>Rank</th>
<th>Cow peas, dry, production quantity (tons)</th>
<th>Value as Number</th>
<th>Value as Bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>World</td>
<td>1</td>
<td>5,589,216</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nigeria</td>
<td>2</td>
<td>2,137,900</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Niger</td>
<td>3</td>
<td>1,593,166</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burkina Faso</td>
<td>4</td>
<td>573,048</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tanzania</td>
<td>5</td>
<td>190,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cameroon</td>
<td>6</td>
<td>174,251</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mali</td>
<td>7</td>
<td>149,248</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kenya</td>
<td>8</td>
<td>138,673</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Burma</td>
<td>9</td>
<td>115,200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mozambique</td>
<td>10</td>
<td>103,837</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sudan</td>
<td>11</td>
<td>80,000</td>
<td></td>
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</table>
Upward trend in cowpea production in Burkina Faso

Since the late 1990s, cowpea production has increased inconstantly with a growing trend

Figure: Cowpea production over a period of 10 years
Geographical distribution of cowpea production in Burkina Faso

Figure: Cowpea production in different regions of Burkina Faso, 2014
Main uses and benefits of cowpea in Burkina Faso

- Rich in minerals & vitamins
- Source of cash income
- ‘Hungry-season’ crop
- Improve soil fertility
- High protein food
- Excellent fodder
70% of its production is oriented mainly towards the satisfaction of self-consumption playing an important role in the food basket as “Hungry-season” crop.

A main source of protein (22-27%) for the majority of the population which absorbs 90% of the production.

Generally produced by vulnerable groups, especially women.
Traditional dishes contributing to food security and nutrition
Traditional dishes contributing to food security and nutrition cont’d.
New products derived from cowpea processing

- Cowpea flour
- Semolina of cowpea
- Cowpea-based bread
- Cowpea-based cakes
- Biscuits made with cowpea
- Spaghetti with cowpea
- Couscous
- Drinks
Cowpea remains the major sources of income to small farmers, retailers and women in the country. With an average of 60,000.00 Tons marketed, and the increasingly prices, is an important source of income, especially for the most vulnerable households. Its sale accounted for 2.1% of agricultural cash income in 2010, which itself accounted for nearly 31% of the GDP. Given its importance for women, its sale contributes greatly to their empowerment by improving their incomes.
Cash income sources cont’d.

- Cowpea price has been relatively stable over the past decade and since 2015 has been rising with a peak of 346 F CFA (USD 0.5) in July 2016.
- Average prices /kg are highest in BF compared to other countries (Niger, Mali, Togo).
- Cowpea price is twice that of cereals, allowing farmers to meet their needs and fulfill their obligations (Tapsoba, 1986).
<table>
<thead>
<tr>
<th>Type of constraints</th>
<th>Main Constraints of cowpea sector</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Abiotic</strong></td>
<td>o Poor soil fertility;</td>
</tr>
<tr>
<td></td>
<td>o Climate effects (droughts, water stresses, excess moisture);</td>
</tr>
<tr>
<td></td>
<td>o Low adoption rate of the appropriated production technologies;</td>
</tr>
<tr>
<td><strong>Biotic</strong></td>
<td>o Prevalence of local varieties with low productivity;</td>
</tr>
<tr>
<td></td>
<td>o Persistence of several pests in the fields and during storage (insects, diseases and striga).</td>
</tr>
<tr>
<td><strong>Socio-economic</strong></td>
<td>o Difficulties in accessing to main inputs;</td>
</tr>
<tr>
<td></td>
<td>o Lack/Inappropriate equipments (sowing, harvesting, threshing)</td>
</tr>
<tr>
<td></td>
<td>o Lack of reliable marketing structures;</td>
</tr>
<tr>
<td></td>
<td>o Weakness of advisory structures;</td>
</tr>
<tr>
<td><strong>Processing</strong></td>
<td>o Weak organization and capacity of the actors involved in processing;</td>
</tr>
<tr>
<td></td>
<td>o Inappropriate packaging;</td>
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<td></td>
<td>o Weak industrialization</td>
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</tbody>
</table>
3. Inera’s research effort to address challenges and opportunities facing the cowpea sector
Organization of INERA/CNRST

Research center & Directorates

- DRREA DU SAHEL
  - Katchari

- DRREA DU NORD-OUEST
  - Di
  - CREAIF de Kamboinsé

- CREAIF/Kamboinsé
  - DRREA de l’Ouest/Farako-Bâ (Bobo-Dioulasso)
  - DRREA du Centre/Saria (Koudougou)
  - DRREA de l’Est/Kouaré (Fada-N’gourma)
  - DRREA du Nord-Ouest/Di (Tougan)
  - DRREA du Sahel/Katchari (Dori)
18 Research Programs organized around 05 Scientific Departments comprising 01 Center of specialization:

- Department of Crop Productions (DPV)
- Department of Environment and Forest (DEF)
- Department of Animal Productions (DPA)
- Department of NRM/Production System (GRN/SP)
- National Center of Specialization on Fruits and Vegetables (CNS-FL)

Central laboratories, Remote sensing and Macro-economy Units as support tools to the Scientific Departments.

224 Scientists out of a total of 476 staff
Before 1978: IRAT (French Research Institute)

1978-1985: Research on cowpea strengthened

- Sorghum-Pearl Millet-Maize-Cowpea ‘s Improvement and IPM Projects launched by CILSS
- PC 31 OUA/CSTR-SAFGRAD, IITA being the technical arm
- Cowpea Improvement and Storage Projects launched by IDRC

Institutional change on cowpea research (1978-1985)
1985: Establishment of National Research Program on pulses following the creation and restructuration of INERA

- All previous initiatives integrated and coordinated by the Program built on a multidisciplinary research team on cowpea
A multidisciplinary research team established

<table>
<thead>
<tr>
<th>Scientific domains</th>
<th>Names</th>
</tr>
</thead>
</table>
| Breeders           | • Dr Benoit Joseph Batieno  
• Dr Jeremy.T. Ouédraogo  
• Dr Jean-Baptiste Tignegré  
• Late Dr Issa Drabo  
• Mr. Hamadou Sidibé, Serge Zida, Hamadou Zongo, Soumabere Coulibaly, Mme Karidiatou Gnankambary |
| Breeding technicians | • Bambio Kama  
• Bernard Tapsoba  
• Lamine Ouédraogo |
| Current students   | • Dieni Zakaria  
• Sanou Adelaide |
A multidisciplinary research team established cont’d.

<table>
<thead>
<tr>
<th>Scientific domains</th>
<th>Names</th>
</tr>
</thead>
</table>
| Entomologists           | • Dr Clémentine Dabiré  
                          • Dr Fousséni Traoré  
                          • Dr Antoine Waongo  
                          • Dr Malick N. Ba  
                          • Pr Antoine Sanon |
| Entomology technicians  | • Herve Bama, Theodore Ouedraogo, Simon Tarpilga                     |
| Current student         | • Edouard Drabo; Appolline Sanou                                    |
| Mycology & Virology     | • Dr James B. Neya  
                          • Dr Elisabeth P. Zida  
                          • Dr Paco Sérémé  
                          • Diasso Gabriel  
                          • Romain Soalla  
                          • Thio Gilles     |
|                          | • Séni Bilgo                                                        |
| Socio-economy           | • Dr Ilboudo Dieudonné  
                          • Dr Sawadogo Compaore Eveline                                     |
Collaborations with various partners

- CGIAR: IITA, ICRISAT, etc..
- Research Networks: RENACO, PEDUNE, PRONAF, OFDA, Kirkhouse Trust Foundation
- Universities and ARI: Universities of California Riverside, Illinois UC, Michigan State, Purdue, JIRCAS etc..
- Regional Research Institutions and Programs: CORAF/WECARD, INSAH/CILSS, AATF
- International Development Agencies: IDRC, JICA, USAID etc.
Use of landraces in the improvement program for their large adaptation, resistance to insect and seed quality

Early adoption and successful implementation of the innovation system approach using different tools and mechanisms and putting farmers at the center of the research activities
Innovation system approaches

- FFS, a group-based experimental learning process for capacity building
- Farmers PVS for speeding up the release and adoption of new products
- PRAs conducted to determine farmers preferences and needs
- Innovative multi-stakeholders platforms established and scaled up for technology adoption and dissemination
Significant change in research methodology

Moderns breeding technologies introduced in products development pathways

### Ideotype for 8 traits- linked to markers

<table>
<thead>
<tr>
<th>PolyMarker</th>
<th>Favorable Allele</th>
<th>LG</th>
<th>Position (cM)</th>
<th>Resistance Trait</th>
<th>IT93K-503-1</th>
<th>IT84S-2246</th>
<th>Ideotype</th>
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<tbody>
<tr>
<td>1_0482</td>
<td>A</td>
<td>2</td>
<td>54.8</td>
<td>Macrophomina</td>
<td>AA</td>
<td>BB</td>
<td>AA</td>
</tr>
<tr>
<td>1_1138</td>
<td>A</td>
<td>4</td>
<td>19.5</td>
<td>Thrips</td>
<td>AA</td>
<td>BB</td>
<td>AA</td>
</tr>
<tr>
<td>1_0678</td>
<td>B</td>
<td>4</td>
<td>34.15</td>
<td>Macrophomina</td>
<td>BB</td>
<td>AA</td>
<td>BB</td>
</tr>
<tr>
<td>1_0804</td>
<td>A</td>
<td>4</td>
<td>59.27</td>
<td>Macrophomina</td>
<td>BB</td>
<td>AA</td>
<td>AA</td>
</tr>
<tr>
<td>1_1492</td>
<td>A</td>
<td>5</td>
<td>27.18</td>
<td>Thrips</td>
<td>AA</td>
<td>BB</td>
<td>AA</td>
</tr>
<tr>
<td>1_0566</td>
<td>B</td>
<td>8</td>
<td>39.48</td>
<td>Flower Thrips</td>
<td>AA</td>
<td>BB</td>
<td>BB</td>
</tr>
<tr>
<td>1_1202</td>
<td>A</td>
<td>9</td>
<td>22.8</td>
<td>Bacterial canker</td>
<td>BB</td>
<td>AA</td>
<td>AA</td>
</tr>
<tr>
<td>1_0025</td>
<td>A</td>
<td>9</td>
<td>16.53</td>
<td>Thrips</td>
<td>BB</td>
<td>AA</td>
<td>AA</td>
</tr>
</tbody>
</table>
Several varieties developed and or released for their resistance/tolerance to Striga, drought, insects, diseases (1980-2010)

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<tbody>
<tr>
<td>KN1</td>
<td>TVx 3236</td>
<td>KVx404-8-1</td>
</tr>
<tr>
<td>Local Gorom (SUVITA 2)</td>
<td>KVx30-309-6G</td>
<td>Moussa local</td>
</tr>
<tr>
<td>IT81D-994</td>
<td>KVx 396-4-4</td>
<td>IT86D-716,</td>
</tr>
<tr>
<td>TVx 3236</td>
<td>KVx396-4-5-2D</td>
<td>KVx421-2J</td>
</tr>
<tr>
<td>IT86F 2246</td>
<td>KVx414-22-2</td>
<td>KVX165-14-1</td>
</tr>
<tr>
<td>KVx61-1</td>
<td>KVx414-22-72</td>
<td>KVx745-11P</td>
</tr>
<tr>
<td>Bousse local</td>
<td>Melakh</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>Cycle</td>
<td>Yield</td>
</tr>
<tr>
<td>-----------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>Tiligré</td>
<td>70</td>
<td>3 t/ha</td>
</tr>
<tr>
<td>Komcallé</td>
<td>60</td>
<td>2 t/ha</td>
</tr>
<tr>
<td>Nafi</td>
<td>67</td>
<td>2.5 t/ha</td>
</tr>
<tr>
<td>Gourgou</td>
<td>75</td>
<td>4 t/ha</td>
</tr>
<tr>
<td>Niizwe</td>
<td>60</td>
<td>1.8 t/ha</td>
</tr>
<tr>
<td>Yisyande</td>
<td>60</td>
<td>2 t/ha</td>
</tr>
</tbody>
</table>
With the adoption rate of the improved varieties estimated to 15%, the following quantities of the different seeds were required:

- 640 Kg of breeder seeds,
- 27 Tons of foundation seeds,
- 1,800.00 Tons of certified seeds were necessary for achieving the 628 000T expected in 2011.
Key achievements in pest management

Better knowledge of the bio-ecology of the main pests used to breed improved varieties

**Entomology**
- Screening for insect resistance to Bruchids, Aphids, Pod sucking Bugs, Thrips, Maruca

**Pathology**
- Screening for diseases resistance (viruses & brown blotch disease)

**Weed**
- Screening for Striga resistance
Key achievements in pest management cont’d.

Technologies for pest management developed and or disseminated

**Entomology**

- Minimum spraying/ecological zone
- Storage technologies
  - Traditional, neem oil, solar sanitation
  - PICS Technology
Effective control of seed-borne diseases (Brown blotch, Charcoal rot etc.) by the aqueous extracts of indigenous plants

Several technologies in Agronomy

- Crop density,
- Fertilizer application,
- Roch phosphate and compost application,
- Relay cropping
Training activities and technology dissemination

Training
- Technicians, Farmers, Seed producers

Technology dissemination
- On farm tests
- PVS
- Seed fairs
Study carried out in 2016 by INERA and coordinated by Dr Ouédraogo Souleymane

Use of economic surplus model which is defined as the sum of money that the consumer would have paid for each unit consumed minus the amount of money that the producer would paid for each unit produced before reaching the balance between price and the quantity on the market (Masters & al., 1996)
Investments in cowpea varietal research and extension are gainful and profitable

- significant increase in yields and a reduction in consumer prices (a consequence of the reduction in unit production costs)
- internal return rate of 89% with a net profit of more than 206 billion CFA francs in 2013 for the society (Producers, traders, consumers, state)

Improved varieties of cowpea meet not only the needs of producers but also adapt to their socio-economic conditions.
Challenges for the research program on Cowpea

- Increasing demand for the facilitation of INERA in the implementation of multi-stakeholder innovation platforms
- Maintaining the standard of the Moderns breeding and Pest Management
- Release of Pod-borer resistant cowpea (Bt – cowpea)
- Strengthen the research of cowpea processing
- Assuring a sustainable financing
4. Conclusion

- Sectorial reforms in Burkina Faso are affecting positively agriculture performance;

- Political support to cowpea sector is an opportunity for the development of the value chain;

- In assuring food security, income generation, gender equity, resilience to the adverse effects of climate change and soil degradation, cowpea sector is highly contributing to the improvement of the livelihoods of smallholder farmers in B. Faso;

- Change in research approach and methodology led not only to the impressive results generated but is also playing a key role for their adoption;
4. Conclusion cont’d.

- The gain and profitability of the research on cowpea, in addition to the challenges it is facing, call for a priority investment on cowpea research program;

- INERA could play a role of Center of excellence given to the institutional capacity of its cowpea research program and its dynamic partnership.
THANK YOU