Arab-Africa Cooperation in Food Security:
Mutual Challenges and Cooperation Opportunities in Cereal Production

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Executive Summary

The global challenges of food security and high food prices, particularly of major cereal crops, are seriously affecting both Arab and Sub-Saharan countries as they rely heavily on grain imports. Their trade balances were amongst the worst hit during the 2008 food crisis and they continue to have a widening gap between food production and consumption. In Arab countries, poverty is reported at about 22.7% with food productivity inherently restricted by their severe water scarcity and limited arable land. In Africa, on the other hand, hunger and poverty are far more serious, but countries are better off in natural resources in terms of water and arable land, although they face an economic water scarcity. Even as the profiles vary, the complementarities and comparative advantages of the two regions lend to substantial collaboration opportunities and shared gains on food security and sustainable agricultural development.

Food security can be achieved either by expanding acreage horizontally, which is only feasible in Sub-Saharan Africa and Sudan, or the more robust approach of vertical improvement in productivity by closing the yield gap between the low actual and potential productivity levels – a path that holds high potential in both Arab and Sub-Saharan African countries, though far more in the latter. The paper presents examples and projects that demonstrate such a potential in cereals production. The example of Syria proves the potential of adopting improved technologies and enabling policies in turning around wheat production and transitioning from import to export status. Similarly, the SARD-SC project in Sub-Saharan Africa showed the high potential of improving wheat, rice, maze and cassava. Results like these are demonstrative of a suite of improved technology solutions available today for various agro-ecosystems that can sustainably ramp up agricultural productivity in both Arab and African countries. Investment in both agricultural research and sustainable agriculture development, therefore, is a win-win strategy for both Arab and African countries.

In terms of capability for horizontal expansion in production, Sub-Saharan African and Arab countries have distinct comparative advantages ideal for mutually beneficial collaboration. Sub-Saharan Africa has the largest amount of arable land available. They also enjoy an abundance of water resources and better climatic conditions as opposed to Arab countries, thus a higher potential to increase food productivity and production with relatively less investments. On the flip side, Arab countries are severely limited by their available arable land (except Sudan) but some of them have the financial resources to make large-scale investments. These countries are, as a result, already investing in large food production projects in Sub-Saharan African countries – eleven reported 2006-2009 – negotiated as government-to-government deals. However, only a tiny percentage of the agricultural land area has been signed off for foreign development investment. Thus there is a tremendous opportunity for far more such collaborative investment projects between Arab and Sub-Saharan African countries for mutual gains.

Further, focusing on smallholder farmers is in their common interest as they contribute to more than 80% of food production in both regions. By the same token, it’s important for both regions to weigh in large-scale, high-tech agriculture investment projects that could threaten interests of small farmers, e.g., land holdings.

Finally, with cereals as key to food security, bridging cereal yield gap for small farmers through sustainable agriculture will offer most returns in both regions – food security, poverty reduction and
rural development. Along with technology, an enabling policy environment, capacity development and market linkages are all essential and potential focal points for cooperation.
 التعاون العربي الأفريقي في مجال الأمن الغذائي:
التحديات المشتركة وفرص إنتاج الحبوب

المبادئ التنفيذية

تؤثر تحديات الأمن الغذائي العالمية وارتفاع أسعار المواد الغذائية، لا سيما محاصيل الحبوب الرئيسية، بشكل خطير على كل من البلدان العربية والدول الأفريقية جنوب الصحراء أولاً، مما جلب صعوبات كبيرة على أوراق الحبوب. ولا تزال الفجوة بين إنتاج الغذاء واستهلاكه في هذه الدول في ارتفاع، بالإضافة إلى أن موادرها التجارية كانت من بين الأسوأ في جميع أنحاء العالم خلال الأزمة الغذائية عام 2008. تقدّر مصادر الفقر في الدول العربية بعدد 22.7% مع إنتاجها غذاء محدوداً بطبيعتها ولكنه يرتبط السياحة أو التوسع الرئيسي في إنتاج الحبوب، وهذا الإنتاج هو الأكثر فعالية وحماية مكانته عالمياً في البلدان العربية والأفريقية جنوب الصحراء على حد سواء، وإن كان أكثر بكثير في تلك الأوقات. تقدم هذه الفرقة أملية مشاريع تعمل في زيادة إنتاج الحبوب، وتمتلك نوعية تأكد تحسن الطبيعة والحاسمة على النباتات الدقيقة والشمولية في الانتقاء في SC-SARD في أفريقيا جنوب الصحراء. تمكنت معروض إمكانيات عالية تحسين الفجوة والأزمات الكبيرة، وتاريخ مثل هذه تحقى بنجاح ما هو مراد على مجموعة من الحلول التقنية ومماثلة اليوم في مختلف النظم البيئية الزراعية التي يمكن أن تسهم في الإنتاجية الزراعية بشكل مستدام في كل من البلدان العربية والأفريقية. إن الاستثمار في كل من البحوث الزراعية والتنمية الزراعية المستدامة، هو استراتيجية رابحة لكل من البلدان العربية والأفريقية.

جنوب الصحراء.

يتوفر لدى كل من البلدان العربية والأفريقية جنوب الصحراء مزايا نسبية تميزية مثالية للتعاون وتبادل المنفتوع من حيث الفترة على التوسع النهائي في الإنتاج، كما تتمتع دول أفريقية جنوب الصحراء بأكبر قدر من الأراضي الصالحة للزراعة، وتوفر في موادر المياه والظروف المناخية مقارنة مع الدول العربية، وبالتالي فإن لديها أكبر على زيادة الإنتاجية ونتائج الأغذية مع استمرار أقل نسبياً. والمقال، فإن الموارد المتاحة لدى الدول العربية محدودة للغاية بسبب ندرة الأراضي الزراعية تجاه أخرى لاستثمار الأراضي وانحناء النباتات الصغرى، بينما يتوفر لدى البعض الآخر TAR الصغرى للقيام بالأنشطة وأعمال البناء.

وعند تلك الأوقات، فإن بعض البلدان تقوم بالفعل في مشاريع الإنتاجية الزراعية جنوب الصحراء الكبرى، إذ تم في الفترة بين 2009-2013 التفاوض والانفصال على أحد عشر مشروعاً استثمارياً على مستوى الحكومات، ومع ذلك لم يتم الاتفاق على نسبة متساوية من مساحة الأراضي الزراعية المتوفرة لوضعها في الاستثمار التنموي الأجنبي، وبالتالي فإن هناك فرص هائلة في هذا المشروع الاستثماري الإقليمي بين الدول العربية والدول الأفريقية جنوب الصحراء يغبة تحقيق المكاسب المتبادلة.

علاقة على ذلك، فإن من الممكن تحقيق المصلحة المتبادلة لكل من الدول العربية والدول الأفريقية جنوب الصحراء وتوفر 80% من إنتاج الغذاء في كل المناطق من خلال التركيز على صغار المزارعين. وعلى نفس القدر، فإنه من الاهتمام لكلا
المناطقين أن تلقى بثقلها في مشاريع استثمارية واسعة النطاق، ذات تكنولوجيا متقدمة لكنها قد تكون متضاربة المصالح أحيانا" مع صغار المزارعين، كحيازات الأراضي على سبيل المثال.

وفي الختام وبالنظر إلى الدور الكبير الذي تلعبه الحبوب في تحقيق الأمن الغذائي، فإن التركيز علىسد الفجوة في انتاجية المحاصيل الحبوبية من خلال تطوير الزراعة المستدامة لصغار المزارعين هو الاستثمار الأمل من حيث القمة لكل من البلدان العربية والدول الإفريقية جنوب الصحراء - تحقيق الأمن الغذائي، الحد من الفقر والتنمية الريفية، وأن استخدام نقل التفقات الحديثة، وتوفير البيئة السياسية الداعمة مع العمل على تنمية القدرات البشرية وتوفير الروابط القوية مع الأسواق، تشكل بمجملها العناصر الرئيسية المهينة للتعاون وتحقيق الأمن الغذائي بين المنطقتين.
The global challenges of food security and high food prices, particularly of major cereal crops, are seriously affecting both Arab and Sub-Saharan countries as they rely heavily on grain imports. Even as they manifest in the regions in different ways, the current trends reflect a serious neglect of agriculture development over the past several decades. The incidence of poverty has been on the rise in Africa, reversing several decades of decline. More than 70% of Africa’s poor population lives in rural areas and depends on agriculture for food and livelihood. In Sub-Saharan Africa, where dependence on agriculture is even higher with most of it being smallholder farming, one-third of the population is chronically hungry. The drop in food production per person by 10% from 1960s levels clearly indicates a lack of investment in the agriculture sector.

In Arab countries too, agriculture sector represents less than 1 percent of the investments made in Middle East.* Though poverty is not a predominant issue as in Africa, food productivity is inherently restricted by scarce water and land resources. As a result, Arab countries heavily rely on food imports and self-sufficiency ratios of cereal average about 50%. The cost of their food imports is estimated to reach $115 billion by 2020, exposing the region to global food price fluctuations, not to mention the lagging development in rural parts where crops and livestock are primary source of income.

The following discussion throws light on the importance of cereal production in food security in the regions, current policies, the challenges, best value solutions and the comparative advantages of Arab and Sub-Saharan African countries as the common meeting grounds for cooperation and mutual gains.

1. **Vulnerability of Arab and Sub-Saharan Africa in the Changing World**

Ever since the 2008 global food crisis, high and volatile food prices have become the new normal. According to the UN’s Food and Agriculture Organization, the world prices for wheat and maize rose 115% and 204% respectively, between 2005 and 2011. Africa and Arab countries took the biggest hit from the spiraling food prices in 2007-2008, impacted by their heavy dependence on imports of major food crops, particularly wheat (Figure 1).

**Figure 1: Impact of 2008 food crisis on trade balances and its direct relationship to cereal imports**

† Source for worldwide 2008 trade balances: World Bank; Cereal imports data adapted from USDA 2011

<table>
<thead>
<tr>
<th>Net Cereal Imports, 2010 (in million tons)</th>
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<tr>
<td>Arab Countries (W. Asia and N. Africa)</td>
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<tr>
<td>Asia</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
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<tr>
<td>Latin America + Caribbean</td>
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<td>Former Soviet Union</td>
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<td>Oceania</td>
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The Arab and African countries are the highest food deficit regions in the world. Taking cereals as the proxy for current and projected food needs, these regions will continue to be the largest cereal importers in the world (Figure 2) – a scenario that makes them the most vulnerable to food prices and the many global forces that rule them: expanding economies of heavily populated countries like India and China, changing patterns in food diets, rising fuel prices, extreme weather events from climate change, growing use of food crops for biofuel production, and economic and political instabilities the world over.

The fallout from rising food prices is hitting the low-income countries the hardest where there are poor safety nets. Families are spending larger percentage of their incomes on grains leaving less for other food items like vegetables and dairy products, which is taking a toll on their nutrition. In Arab countries, grains and their derivatives account for 42% of expenditure of food basket in 2007. Increased grain prices in 2008 resulted in increasing the proportion of income spent on this commodity group by 32%, and thus reduced the proportion of income spent on other food commodities and services. Working toward increased food self-sufficiency should therefore rank high on the agenda as Arab and African countries seek to shape robust national economies in their regions. With today’s advances in science and vast demonstration of benefits from modern agricultural technologies and practices, this is entirely within the reach.

2. The Support from Policy-Makers to Enhance Food Security in the Arab and African Countries

In the Arab world, the Kuwait Declaration announced at the Arab Economic Summit in Kuwait in 2011, "Elevating the Standard of Living for Arab Citizens“ underlines the importance recognized by national leaders of prioritizing an emergency food security program as a key strategy in raising living standards. On water security, the Council of Arab Water Ministers was tasked with preparing a strategy for water security in the Arab region to address challenges and requirements for sustainable development. To tackle poverty, the declaration called for implementing a four-year program while urging Arab finance institutions to play a more active role in increasing funding and investments in the agriculture sector.
In Africa, countries are forging ahead with investment in sustainable development to enhance food security within the framework of the New Partnership for Africa's Development (NEPAD) that envisions the continent to make the following progress by 2015:\(^2\):

- Attain food security;
- Improve agricultural productivity to attain a 6% annual growth rate;
- Develop dynamic regional and sub-regional agricultural markets;
- Integrate farmers into a market economy; and
- Achieve a more equitable distribution of wealth.

NEPAD’s Comprehensive Africa Agriculture Development Program (CAADP) is the primary initiative implementing collaborative activities to promote agriculture as a path to development, poverty alleviation, national food security and economic growth. Endorsed by African Heads of State and Governments in 2003, CAADP is tasked with delivering on the NEPAD’s 6% annual growth rate goal. CAADP’s activities are anchored around four pillars to address key issues: sustainable land and water management; improving market access; increasing food security and the well-being of the poor; and enhancing research and knowledge dissemination capacity for greater agricultural productivity.

3. **Major Cereals in Arab and Sub-Saharan Countries: Production, Consumption & Import Trends**

The major cereals consumed in Arab and Sub-Saharan African countries are wheat, rice, maize, barley and sorghum, with wheat being distinctly the largest component in the diets in Arab countries (Figure 3). In Sub-Saharan Africa, wheat is followed closely by maize and rice.

![Figure 3: A glimpse at per capita consumption of major cereals utilized for food (2009)](source: FAO Statistics Division)

The dependence on imports is probably the most distinct in case of wheat where both the regions’ domestic productions fall far short of their consumption needs. While Sub-Saharan African countries are strong producers of maize with little dependence on imports, Arab countries are able to produce less than 50% of their demand. Both regions also rely to a fair extent on rice imports (Figure 4).

\(^2\) Source: [www.nepad-caadp.net](http://www.nepad-caadp.net)
The Widening Gap in Wheat: a Key Player in Food Security

Both Arab and the Sub-Saharan African regions are significant importers of wheat with a gap between production and consumption of 65 million tonnes and 17.5 million tonnes respectively in 2009. The gaps are widening as trends of increase in wheat consumption are higher than increase in domestic production (Figure 5).

Figure 5: Widening gap in wheat production & consumption in Arab Countries and SS Africa (million MT)

In Arab countries, domestic wheat has been covering 38-57% of total consumption from 2000-2013. Average annual wheat import was 38 million tons during 2010-2013 while the exported wheat was only 1.2 million tons during the same period. Egypt, Algeria, and Iraq are the main importers in the Arab countries accounting for more than 50% of the total imports.
In Sub-Saharan Africa, although production has increased at an average annual rate of 6% since 2000, reaching 21.7 million tons in 2010, the trend was marred with very high fluctuations recording negative growth in 4 out of 10 years. Further, consumption has also increased at about the same rate as production (5% per year), increasing from 36 million tons in 2000 to 60 million tons in 2010. As a result, the self-sufficiency ratio remained unchanged at about 36%.

4. Challenges Facing Arab and Sub-Saharan Countries in Achieving Food Security

Abiotic and Biotic Conditions

Water, the lifeline of agriculture, is a major crippling factor to agricultural productivity in Arab and Sub-Saharan Africa – either because of its physical scarcity or economic as in Sub-Saharan Africa where poor infrastructure limits the access to water resources for rural people. The non-tropical dry areas prevalent in Arab and Sub-Saharan Africa are the most water scarce areas of the world with mean annual per capita share below 2000 m$^3$. With resources depleting further at an alarming rate from increasing populations, greater intensity of ground water abstraction, and diversion of ever more fresh water resources for farming uses, the per capita share has crossed the water poverty line to below 1000 m$^3$ in many countries – most of them in Sub-Saharan Africa.

Aside from water availability, rapid land degradation and salinity are a severe cause for concern especially in marginal and irrigated areas where the agro-ecosystems are particularly fragile. Frequent droughts further add to the woes of the farmers in these regions. Climate change is estimated to worsen the agricultural production capability as uncertain weather patterns are setting in – excessive rainfall and flooding and more intense droughts. The overall annual precipitation is expected to fall, more markedly in Arab region (Figure 6).

Figure 6: Estimated relative change of mean annual precipitation from 1980/1999 to 2080/2099

![Figure 6: Estimated relative change of mean annual precipitation from 1980/1999 to 2080/2099](image)

The temperatures are expected to rise by an average of 2.5°C, more pronounced in Arab and Sub-Saharan Africa (Figure 7), which will shorten the growing seasons and reduce crop productivity even further. Higher temperatures will also lead to new threats to the crops in the form of new varieties of pests and diseases, not to mention pests like yellow rust that are already a major danger after having reemerged in 2010 after 50 years and causing widespread epidemic and crisis.
Farm Inputs and Market Constraints

Most developing countries have a weak farmer support system and infrastructure needed to facilitate the cropping cycle, such as availability of quality seeds, fertilizers and timely application of pesticides and weed control. Additionally, smallholder farmers often do not have access to suitable machinery, adequate credit or competitive markets. All these constraints in the value chain offer little opportunity for the smallholder farmers to increase their yields and secure higher profits – a key enabler of rural development.

Institutional Constraints and Political Instabilities

The role of policy and institutions is critical to changing the course and bringing about large-scale impacts in development. Currently, there is a deep and widespread void for policy enablers to incentivize sustainable agriculture and effective water management practices in arid, low-income countries. Another deterrent has been insufficient investment in agricultural research and development. Developing countries typically have weak national agriculture research institutions with a shortage in the number of qualified researchers, for e.g., the budget allocated for research in Arab countries is less than 0.4 of the GDP while the level in developed countries exceeds 3%.

Being in a geo-political volatile region poses an additional challenge to food security since food security is implicitly dependent on economic and political stability (Figure 8).
5. Sources for Increasing Food Production in Arab and Sub-Saharan African Countries

The challenge of increasing agricultural productivity is daunting but well within reach. More targeted research and investment can help not only manage risk but significantly improve agricultural outputs, despite climate change, as proven in several initiatives under ICARDA’s partnership with a number of countries both in Arab and Sub-Saharan Africa.

Technically, food security can be achieved either by expanding acreage horizontally, which is only feasible in Sub-Saharan Africa and Sudan with access to large amounts of arable lands, or through the more robust path of vertical improvement in productivity by closing the yield gap between the low actual and potential productivity levels.

5.1 Best bet for both regions: Closing the yield gap through sustainable agriculture intensification

As per FAO analysis, our best opportunity for increasing food production is agricultural intensification. The study indicates largest amount of land potentially suitable for rainfed agriculture is in Sub-Saharan Africa, followed by Latin America and the Caribbean, with Arab countries offering the least at less than 2% of that in Africa. However, increase in the area of arable land might only contribute 7% to an increase in food production (Figure 9). This might even be an optimistic figure because unsustainable land use, overexploitation of natural resources, and climate change has the potential to “desertify” millions of hectares of arable land. Since sustainability must be at the heart of all development activities, the most promising path forward is intensifying cropping or producing more with less – a paradigm especially relevant in dry areas.

As a way to bridge yield gaps, agricultural intensification offers huge opportunity in enhancing food security in all the developing countries. However, it will be disastrous to the environment and natural resources (biodiversity, water, land, and soil) if not practiced in a sustainable manner particularly in dry areas. Thus, the key to food security lies in sustainable agricultural intensification of production systems.

Sustainable agriculture offers a solution good for both people and the planet, and science-driven solutions are the key force for bringing the change. It calls for a more systemic and holistic approach to managing natural resources that can enable both water and food security for nations while promoting rural development. It combines natural resource management, crop improvement and socio- economics and policy solutions (Figure 10) and research is critical for their effective integration at field level and eventual scaling out of tested intervention packages for nationwide impacts.

Improving food security in Arab and Sub-Saharan African countries requires investment along two main strategies in sustainable agriculture suited to the two major agro-ecologies in the regions:
• *In high potential areas*, where there is relatively higher rainfall or areas where irrigation water is available, the approach must be sustainable intensification and diversification of production systems.

• *In low potential dry areas or marginal lands*, where rainfall is scanty, the focus needs to be toward building resilience of production system to climate change and reducing risk and vulnerability of rural communities.

Both Arab and Sub-Saharan African countries have significant potential, far more in the latter region, to increase their productivity and productions as demonstrated by ICARDA’s research for development projects in the regions (see section 6 on page 9). A suite of improved technology solutions are available today suitable for various agro-ecosystems that can sustainably ramp up agricultural productivity, with the support of an enabling policy environment. *Investment in both agricultural research and sustainable agriculture development, therefore, is a win-win strategy for both Arab and African countries.*

**The Potential of Bridging Yield Gap in Enhancing Food Security**

*The case of wheat as an example*

In Arab countries, actual farm yields of crops are far below their potential and if production of wheat is to exceed population growth rates, yields must increase significantly. With limited scope for expansion in cultivable area, increases in productivity per unit of water and land are especially important to keep up with the demands in Arab countries.

The potential impacts from science and enabling policy environment on cereal crop yields in even the most resource-challenged places was remarkably demonstrated in the case of Syria. Under the country’s collaboration with ICARDA, use of improved wheat varieties combined with improved water management, timely inputs, and appropriate policies showed impressive results. The nation experienced almost four-fold increase in wheat yield since the 1970s, from about 1.2 million to more than 4.5 million tons in 2006 (Figure 11). Over 80 improved wheat varieties now cover about 90% of the total wheat area in the country. Syria was able to transform its status of wheat-importing to wheat-exporting country. A similar partnership with Morocco demonstrated 88% increase in crop yield on rainfed fields and 45% in irrigated parts (Figure 12).

**Figure 11: Potential increase in wheat yield between national average and progressive farming practices**
5.2 Mutual opportunity in horizontal expansion of agriculture

Sub-Saharan African countries have the largest amount of land potentially suitable for expansion agriculture (more than 200 million hectares). Fifteen countries have more than one million hectare of land for agriculture expansion with Mozambique and the D.R. of Congo having the highest potential arable land for expansion. These countries also have generally more favourable weather conditions and are less affected by climate change compared to Arab countries, thus a higher potential to increase food productivity and production with relatively less investments compared to the Arab countries.

On the contrary, Arab countries, except for Sudan, have no or very limited arable land (less than 3 million hectares) to expand agricultural production. But some of the Arab countries have the financial resources to invest substantially in agricultural lands in Sub-Saharan Africa for food production. Based on these comparative advantages, there is a sizeable opportunity for the two regions in collaborative sustainable agriculture projects through land investments. Some economically strong Arab countries are, as a result, already investing in large food production projects in Sub-Saharan African countries – eleven reported between 2006 and 2009 – negotiated as government-to-government deals (see section 7.2 on page 11 for detailed discussion on investments).

6. Successes with Increasing Food Security and Incomes for Smallholder Farmer Incomes: Demonstrated Large-Scale Results

I. Food Security Program in Arab Countries

This multi-nation project aims to increase productivity and production of wheat-based systems on large scale through integrated research and development, an approach that is bringing together different disciplines and partners – scientists/researchers, farmers, extensions staff and policy makers. Designed around impact pathways, the program is delivering activities on following fronts:

1. Improving wheat production systems through:
   a. development and dissemination of improved wheat and food legume varieties;
   b. transfer of improved agronomic practices and conservation agriculture;
   c. efficient use of scarce water resources; and
   d. diversification of production systems.

2. Institutional capacity building. A Young Scientists Program has been put in place to train and rear a new generation of agricultural scientists. Additionally, capacity of NARES is being enhanced to increase their capability to manage food security, along with provision of up-to-date facilities.

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**Figure 12: Wheat yield gap analysis in Morocco & Syria**

<table>
<thead>
<tr>
<th>Gap Analysis</th>
<th>Morocco (rainfed)</th>
<th>Morocco (irrigated)</th>
<th>Syria (rainfed)</th>
</tr>
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<tbody>
<tr>
<td>Gap 1 (%)</td>
<td>88%</td>
<td>45%</td>
<td>82%</td>
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<tr>
<td>Gap 2 (%)</td>
<td>192%</td>
<td>82%</td>
<td>125%</td>
</tr>
</tbody>
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Results from ICARDA-Syria and ICARDA- Morocco partnerships
3. Enabling policy environment that supports the uptake of improved technologies, critical for success of food security programs.

As Phase I of the program reached completion this year, the success is already evident in the average increase seen in wheat yields of 25%, reaching a maximum of 75% in some cases. Over 7,000 farmers participating in the program are reaping higher profits, learning from field days, farm field schools and farmers traveling workshops. The results thus far demonstrate the importance and potential of integrated approach embodied in sustainable agriculture as the pathway to food security and rural development (Figure 13).

**Figure 13: Yield at demonstration fields versus farmers’ fields (2011-2012 Season)**

Irrigated (I) and Rainfed (R) Wheat Systems

<table>
<thead>
<tr>
<th>Egypt</th>
<th>Yemen</th>
<th>Morocco</th>
<th>Sudan</th>
<th>Syria</th>
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<tr>
<th>Participating Farmers</th>
<th>Egypt</th>
<th>Yemen</th>
<th>Morocco</th>
<th>Sudan</th>
<th>Syria</th>
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<td></td>
<td>20</td>
<td>13</td>
<td>30</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Ave. increase (%)</td>
<td>22</td>
<td>21</td>
<td>11</td>
<td>58</td>
<td>20</td>
<td>13</td>
</tr>
<tr>
<td>Max yield</td>
<td>9.1</td>
<td>3.2</td>
<td>6.5</td>
<td>5.6</td>
<td>4.2</td>
<td>8.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>8.8</td>
<td>3.7</td>
</tr>
</tbody>
</table>

Average Yield Increase = 25%
Maximum Yield Increase = 75%

**Adopting integrated methods for higher wheat and water productivity**

While the improved varieties of seeds contributed to higher crop yields, the efficient management of water resources is important in areas where physical water availability is not a serious concern but sustainable use of water resources must be ensured for long-term benefits. The program implemented raised bed technique (RBT), an efficient water management method, in Egypt’s Sharkia province. With mechanization of raised bed irrigation system, the wheat production increased by 20% while using 25% less water. Results like these are demonstrative of a suite of improved technology solutions available today for various agro-ecosystems that can sustainably ramp up agricultural productivity in countries in different regions.

**Results from raised bed planting in Egypt (2011-2012)**

- 30% increase in grain yield
- 25% saving in irrigation water
- 72% increase in water use efficiency
Raised bed planting and irrigation offers several unique advantages:

- Can be practised on different irrigated crops (rice, wheat and summer vegetables)
- Allows diversification in the rice-wheat cropping systems
- Improves water uptake mechanisms by crops
- Allows saving of water resources, and reducing nutrients and labor inputs
- Increases productivity and income significantly in comparison with traditional planting techniques

II. Enhancing wheat productivity for increased food security, economic growth and poverty alleviation in Africa

This multi-national CGIAR effort funded and executed under the bigger umbrella of Support to Agricultural Research for Development of Strategic Crops in Africa (SARD-SC) initiative aims to benefit diverse stakeholder groups in low-income countries: individual farmers and consumers, farmers’ groups including youth and women, policy makers, private sector operators, marketers/traders, transporters, small-scale agricultural machinery manufacturers, and institutions such as NARES and NGOs.

The program has established three research for development platforms to carry out technology testing, validation and dissemination, and training in the following major wheat producing countries, selected as representative agro-ecologies:

- Highland East African areas – Ethiopia (rainfed)
- Lowland East African areas – Sudan (irrigated)
- Lowland West African areas – Nigeria

The primary activities in the program are anchored to generation and dissemination of improved technologies and knowledge for wheat-based systems; optimizing the management of scarce natural resources; and strengthening the capacities of project stakeholders, particularly NARES. The program builds on ICARDA’s past successes with wheat in Arab countries and Ethiopia on USAID-funded projects that significantly increased yields – sometimes by almost two-fold, generated higher profits for smallholder farmers and strengthened the overall cropping system. These projects tested and validated rust resistant, high yielding seed varieties and fast track seed multiplication methods.

7. Development Investment in Food Security: Commonalities and Comparative Advantages between Arab and Sub-Saharan Africa
7.1 Investment strategy for robust and sustainable food security

Given the differences in their socio-economic profiles, the driving forces for food security for Arab and Sub-Saharan countries are of a different nature, even so they meet on common grounds on the strategies to tackle it. The following factors are critical for both Arab and African countries as they gear for investments and cooperation on enhancing their food security, reducing poverty and enabling development:

- **Focusing on smallholder farmers**: Even with high economic growth developing countries in Africa, India, China, and many in Arab region, smallholder farming is a dominant feature of their rural landscape and plays a significant role in agriculture production, supporting rural livelihoods and feeding the nation. Investments to strengthen smallholder farming, therefore, is probably the most key strategic pathway to food security and development.

  Adoption of innovative methods and practices by farmers, building their capacity, improving service delivery systems, adequate infrastructure, linkages to markets and strengthening of value chains are all needed to increase agricultural productivity and enhance food security. Further, enabling policy environment along with institutional mechanisms such as microfinancing and micro-insurance are all efforts in the right direction.

- **Weighing investments in large-scale high-tech projects**: Large-scale investment in high-tech agriculture projects should factor in the importance of avoiding social negative implications for small farmers. While such investments allow needed flow of capital to the agricultural sector, there are two major concerns that must be kept in mind in decision-making:

  First, the land utilized for large-scale investment should not have conflict of interests with the local communities, such as land appropriations from farm or grazing lands, or cause reduced access to resources by the rural people. Such investments warranty failure as they will breed inequality and a widening socio-economic gap, making them unsustainable solutions for holistic development in the long term.

  Second, in the case of foreign entities investing in large-scale agricultural production with the aim of exporting it to the origin of the investment, quick gains in national economy may be attractive but again is not conducive to long-lasting impacts for the rural population and holistic growth. With sustainable increases in agricultural productivity well within reach, leveraging resources to develop domestic capability and increasing production potentially to start exporting offers far more advantages with cross-cutting benefits of rural development, food security and equitable growth.

7.2 Tapping the complementary synergies: Arab land investments in Sub-Saharan Africa for food security

Food security is particularly a major concern for Arab countries as they face increasing food demands from a growing population while their own agricultural productivity is inherently constrained by scarce natural resources. In a bid to limit their heavy dependence on food imports and fluctuating prices, many Arab countries, especially the oil producing nations, have begun investing and leasing lands in other countries, including sub-Saharan Africa, to secure a stable source for food.

The trend started with the rising oil prices in the 1970s when the major oil exporting countries of the league of Arab States saw growing external reserves well beyond their own immediate needs and
started to offer official economic assistance to other developing parts of the world. Over time, bilateral arrangements gave way for multilateral strategies in rendering assistance.

In the past few years, Arab region’s private sector has also begun to invest in emerging economies as a means to develop business opportunities. Thus, along with increases in bilateral and regional institution financed projects, corporate/equity investment from Arab countries in Sub Saharan Africa is growing as well, which is aiding the growth of the region. A number of land investments by Arab countries in Sub-Saharan Africa, enacted as government- to-government deals to secure food supplies, have been reported from 2006 to 2009. Sudan has had the most number of deals signed (Figure 14).

Figure 14: Reported land investments by Arab countries in Sub-Saharan Africa to secure food supplies: government to government agreements from 2006 to 2009 (Source: IFPRI)

<table>
<thead>
<tr>
<th>Target Country</th>
<th>Investor country</th>
<th>Nature of investment</th>
<th>Status of agreement</th>
<th>Date announced or signed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenya</td>
<td>Qatar</td>
<td>40,000 ha leased for fruit and vegetable cultivation in exchange for funding US $2.3 billion port</td>
<td>Signed</td>
<td>Nov-08</td>
</tr>
<tr>
<td>Malawi</td>
<td>Djibouti</td>
<td>Unknown area of farmland leased</td>
<td>Signed</td>
<td>Apr-09</td>
</tr>
<tr>
<td>Mali</td>
<td>Libya</td>
<td>100,000 ha secured for rice</td>
<td>Signed</td>
<td>n.a.</td>
</tr>
<tr>
<td>Sudan</td>
<td>Egypt</td>
<td>Land secured to grow 2 million tons of wheat annually</td>
<td>Signed</td>
<td>n.a.</td>
</tr>
<tr>
<td>Sudan</td>
<td>Jordan</td>
<td>25,000 ha secured for livestock &amp; crops</td>
<td>Signed</td>
<td>n.a.</td>
</tr>
<tr>
<td>Sudan</td>
<td>Kuwait</td>
<td>&quot;Giant&quot; strategic partnership; further information not available</td>
<td>Signed</td>
<td>Sep-08</td>
</tr>
<tr>
<td>Sudan</td>
<td>Qatar</td>
<td>Joint holding company set up to invest in agriculture</td>
<td>Signed</td>
<td>Jul-08</td>
</tr>
<tr>
<td>Sudan</td>
<td>Saudi Arabia</td>
<td>9,200-10,117 ha leased for wheat, vegetables, and animal feed</td>
<td>Signed</td>
<td>Feb-09</td>
</tr>
<tr>
<td>Sudan</td>
<td>United Arab Emirates (UAE)</td>
<td>378,000 ha total invested in by UAE</td>
<td>Under implementation</td>
<td>n.a.</td>
</tr>
<tr>
<td>Sudan</td>
<td>UAE (Abu Dhabi Fund for Development)</td>
<td>30,000 ha secured for corn, alfalfa, and possibly wheat, potatoes, and beans</td>
<td>Signed</td>
<td>n.a.</td>
</tr>
<tr>
<td>Tanzania</td>
<td>Saudi Arabia</td>
<td>500,000 ha requested for lease</td>
<td>Requested</td>
<td>n.a.</td>
</tr>
</tbody>
</table>
Figure 15: The magnitude of land deals as a percentage of total land area, agricultural area and agricultural plus forest covered areas in respective countries

<table>
<thead>
<tr>
<th>Recipient country</th>
<th>FAO land resource data (1,000ha)</th>
<th>Land deals as percentage of:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Land area</td>
<td>Agricultural area</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>106,000</td>
<td>35,077</td>
</tr>
<tr>
<td>Madagascar</td>
<td>54,154</td>
<td>39,443</td>
</tr>
<tr>
<td>Sudan</td>
<td>237,600</td>
<td>138,773</td>
</tr>
<tr>
<td>Tanzania</td>
<td>88,580</td>
<td>34,200</td>
</tr>
<tr>
<td>Mali</td>
<td>122,019</td>
<td>39,619</td>
</tr>
<tr>
<td>Mozambique</td>
<td>78,638</td>
<td>48,400</td>
</tr>
<tr>
<td>Uganda</td>
<td>19,710</td>
<td>12,812</td>
</tr>
<tr>
<td>DR Congo</td>
<td>226,705</td>
<td>22,650</td>
</tr>
<tr>
<td>Nigeria</td>
<td>91,077</td>
<td>78,500</td>
</tr>
<tr>
<td>Zambia</td>
<td>74,339</td>
<td>25,589</td>
</tr>
<tr>
<td>Ghana</td>
<td>22,754</td>
<td>14,850</td>
</tr>
<tr>
<td>Malawi</td>
<td>9,408</td>
<td>4,970</td>
</tr>
<tr>
<td>Senegal</td>
<td>19,253</td>
<td>8,637</td>
</tr>
</tbody>
</table>

Note: Green color signifies countries with most number of deal, yellow color with medium number of deals and orange color with the least number of deals

In general, substantial investment opportunities still exist in the Sub-Saharan African countries as only a small percentage of the agricultural area has been signed off for investments – as is the case with even those countries with the most number of deals – Ethiopia, Madagascar and Sudan (Figure 15 on previous page). It is to be noted though a majority of the land deals made in Ethiopia and Madagascar were for the purpose of biofuels, unlike in Sudan, where 11 deals were for food and only 2 for biofuels.

8. Opportunities in Cereal Production for Food Security in Arab and Sub-Saharan African Countries

Several countries have exhibited higher agricultural growth rates per capita over the last 10 years, attributed to a better policy environment, increased usage of technology, and higher commodity prices. As a good example, Ghana nearly halved its poverty rate from over 51% to 28% between 1991–92 and 2006. It is the only African country to reduce its global hunger index by more than 50%.

Keeping in mind the gaps in production and consumption of major cereals in Arab and Sub-Saharan African countries (Figure 16), efforts on cereal production along the following pathways offer significant opportunities for consideration.

Bridging yield gap in wheat

As the largest consumed and imported cereal commodity in both Arab and Sub-Saharan African countries, wheat offers the biggest potential for contributing to food security. With several successful programs tested across varying agro-ecologies and the availability of a wealth of high-yielding technologies, prioritizing increasing productivity of wheat cropping systems will deliver the highest returns in a short period of time for both regions.

Sub-Saharan Africa’s opportunity to be self-sufficient in maize

Figure 16: Gap between production and consumption of major cereals (2009)

<table>
<thead>
<tr>
<th>In million tonnes</th>
<th>Sub-Saharan Africa</th>
<th>Arab Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>17.5</td>
<td>65</td>
</tr>
<tr>
<td>Rice</td>
<td>9.6</td>
<td>5</td>
</tr>
<tr>
<td>Maize</td>
<td>1.7</td>
<td>18</td>
</tr>
<tr>
<td>Barley</td>
<td>0.15</td>
<td>8.5</td>
</tr>
</tbody>
</table>
While Arab countries have sizeable deficit in maize, the gap has been minor in Africa and has maintained roughly the same between production and consumption of maize since 2000. In 2000, Africa produced 42 million tons of maize but consumed 53 million tons filling the gap with imports. In 2010, the production increased to 64 million tons, which is annual growth rate of 4%, but consumption increased at the same rate reaching 76 million tones filling the gap with import of 14 million tons. The potential for expanding maize production in Sub-Saharan Africa is significant as an estimated 88 M ha of land not yet plant is suitable to growing maize, not including the protected and forested areas. However, this potential is largely cut off from population centers with the markets and financial services that are conducive to technical change. Physical access to markets is far more restricted for farmers in Sub-Saharan Africa than for farmers in other regions of the developing rural world.

9. Recommendations for Cooperation between Arab and Sub-Saharan African Countries to Enhance Food Security

Cooperation between Arab and African countries to enhance food security should be based on complementarities and comparative advantages that exist between them in the availability of natural resources and arable land; challenges from climate change and global trends; and mutual interest in financial investment.

In summary, the following recommendations are observed to be of mutual interest for both the regions and sound grounds for cooperation between Arab and Sub-Saharan Africa:

- **Political will and policy reforms:** African and Arab countries must put agriculture and food security among their top priorities and take advantage of the opportunity in their current framework – the Kuwait Declaration of the Arab Summit and Comprehensive Africa Agriculture Development Program (CAADP) of the New Partnership for African Development (NEPAD) adopted by the African Summit.

- **Bridge cereal yield gaps, a potent source of increase in food production:** Technically, food security can be enhanced through the more robust approach of vertical improvement in productivity by closing the yield gap between the low actual and potential productivity levels – a path that holds high potential in both Arab and Sub-Saharan African countries, though far more in the latter. Sub-Saharan countries with an abundance of natural resources have significant can increase their food production and productivity with relatively less investment. Arab countries, with limited land and water, will require greater investments to help bridge the yield gap but gains can be substantial and some of them could possibly even achieve food security (e.g., Iraq, Syria, Morocco, Algeria and Sudan). Bottom line, the opportunity in bridging the yield gap, given the range of proven technologies available for both marginal and high-potential agro-ecosystems, is sizeable and a low hanging fruit for food security in both the regions.

- **Joint sustainable agriculture projects through Arab investments in Sub-Saharan Countries:** Land investments by economically strong Arab countries for sustainable agriculture projects in Sub-Saharan Africa offers a path for horizontal expansion in food production. Countries like Mozambique and D.R. of Congo with huge amounts of arable land available are well-suited for planning large-scale sustainable agriculture projects. Such cooperation will lead to win-win outcomes with mutual gains in food security and reduction in the food imports bills for both the regions. The keyword in the strategy, however, is sustainable to avert further land degradation and damage to Africa’s fragile eco-systems.

- **Promote and encourage large scale investment in sustainable agriculture development projects:** Adequate policies and assurances are essential to encourage foreign investment in
large sustainable development projects which can enhance food security in both Arab and Sub-Saharan African countries.

- **Focus on small-scale farmers:** An African agricultural revolution is within reach provided the continent can focus on supporting small-scale farmers to help meet national and regional demand for food, rather than rely on expansion of export crops. For Arab countries, bridging the yield gap for smallholder farmers offers a potent opportunity to reduce dependence on imports and even aim for exports as Syria was able to accomplish with wheat.

- **Support entrepreneurial leadership in agriculture:** There is growing evidence that supports the importance of entrepreneurial leadership in promoting agricultural innovation as a matter of urgency and must be encouraged even as the requisite institutions are awaited to be in place.

- **Adopt agricultural innovation systems:** Investments in agricultural research are critical to enable development and adoption of innovation systems that use multi-stakeholders approaches in identifying priorities, developing technologies and effectively transfer technologies to farmers, producers and other players along the value chain from production to consumption.

- **Investment in water management:** Implementing methods for sustainable use of water is a crucial element of successful agricultural development and embodies two principal components: policy and institutional reforms on the one hand and investment, technology, and management practices on the other. Cost-efficient technical solutions are available for even some of Africa’s most difficult and arid regions but not adopted due to lack of finance, slow dissemination, as well as the weak role of government subsidies and regulations.

- **Increase access to improved seeds:** Availability of quality seeds could both be a bane and blessing for smallholder farmers. The ongoing efforts to develop regional trading blocs in the seed industry, for example, across the 14 Southern Africa Development Community (SADC) countries, is aiming to enable companies to move seed and breeding material across national borders, register varieties more easily, and market their products regionally. Partnering of seed industry stakeholders across the regions has a valuable role in increasing yields, higher profits for farmers and stronger food security for the nation.

- **Financing infrastructure investment:** One of the most challenging aspects of investing in infrastructure is the high upfront costs. Making large investments creates a wide range of management and political risks. It is estimated that Africa will need nearly US$500 billion over the next decade to finance infrastructure projects. But such investments can have huge impact on costs of inputs and can transform African agricultural markets, speed up innovation generation and uptake with significant impact on food security and poverty reduction.

- **Support adaptation to climate change:** Climate-resilient agricultural practices should be developed and promoted through research and development. Basic inputs such as provision of
meteorological data could help farmers to adapt to climate change by choosing optimal planting dates.

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i Arab Millennium Development Goal Report 2013 report, United Nations Economic and Social Commission for Western Asia
ii Support for Agriculture Research and Development for Strategic Crops funded by African Development Bank