

Improving Food Security in Arab Countries



Enabling poor rural people
to overcome poverty

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Contents

1. What Factors Underlie The Recent Shock In Agricultural Commodity Prices?	1
Why are Arab countries concerned about the recent price shock?	1
What factors are increasing food security risks?	2
Will food-price shocks continue to be a problem for Arab countries?	7
2. What Is The Impact Of The Recent Price Shock On Arab Economies?	9
What impact will the recent food-price shock have on inflation?	9
What is the impact of the food-price shock on government budgets?	10
What impact can food-price shocks have on poverty?	12
What are the food security implications for Arab countries with different resource endowments and fiscal balances?	14
3. Food Security In The Future: Import Dependency Is Projected To Increase	17
What do forward-looking models tell us about food security in Arab countries?	17
4. Improving Food Security With Safety Nets, Family Planning Services, and Education	23
What long-run consequences can food-price shocks have on education, health, and nutrition?	23
What measures are Arab governments employing to respond to the recent price shock, and what are the limitations of these measures?	25
How can Arab countries manage demand to mitigate the consequences of price shocks?	27
5. Optimizing Investments To Increase Productivity And Profitability	31
What role will productivity play in addressing increasing demand for food in Arab countries?	31
Can Arab countries expand cultivated area in order to meet their food demand?	32
What are the obstacles to and opportunities for increasing productivity?	32
How can Arab countries make the most of scarce water resources?	35

Why is investing more in rain-fed agriculture critical to Arab countries?	37
How can Arab countries increase productivity?	37
What can be done to improve dissemination of knowledge to farmers?	41
6. Reducing Exposure To Market Volatility	43
How can Arab countries ensure a steady supply of reasonably priced cereal imports?	43
What are alternative stockpiling strategies?	45
Is land acquisition a viable strategy?	48
What alternative strategies can Arab countries employ?	49
Next Steps	51
References	53

List of Boxes

Box 1.1: Food Security Has Multiple Dimensions	3
Box 1.2: Why Retail Food Prices Have Not Fallen with Commodity Prices	6
Box 6.1: Egypt Could Mitigate the Risk of High Wheat Prices with Financial Instruments	47

List of Figures

Figure 1.1: Arab Countries Are the Largest Net Importers of Cereal in the World	2
Figure 1.2: Global Growth Rates of Yields for Major Cereals Are Slowing	4
Figure 1.3: Biofuel Policies in the United States May Contribute to a Substitution of Wheat with Maize	5
Figure 2.1: The Food CPI Drove the Overall CPI in 2007	10
Figure 2.2: Oil-poor Countries Have Fiscal Deficits While Oil-rich Countries Have Fiscal Surpluses	11
Figure 2.3: Food Subsidies Are a High Share of GDP in Some Countries	12
Figure 2.4: Arab Countries with High Cereal Import Dependency and Large Fiscal Deficits are Most Vulnerable at the Macro Level	15
Figure 3.1: Cereal Demand Far Outpaces Domestic Production in Arab Countries	18
Figure 3.2: Sudan's Potential as the Breadbasket for Arab Countries Is Uncertain	20
Figure 3.3: Demand Management and Production Enhancement Both Reduce the Import Burden and Vulnerability	22
Figure 5.1: Historically, the Price of Wheat Has Gone Down	32
Figure 5.2: Expansion of Arable Land in Arab Countries Far Outpaced the World Until the 1990s	33
Figure 5.3: Arab Countries' Cereal Productivity Lags Behind World Averages	33
Figure 5.4: Arab Countries Are Quickly Proceeding from Water Stress to Absolute Water Scarcity	34
Figure 5.5: The Cost of Self-Sufficiency Grows as Population and Incomes Grow	37

List of Tables

Table 2.1: The Poor Are Concentrated in Rural Areas	13
Table 3.1: Arab Countries Will Increase Their Cereal Imports by Varying Degrees	19
Table 4.1: Arab Countries Have Used Various Economy-wide Policies and	25
Existing Social Protection Programs to Address the Recent Price Shock	
Table 5.1: Irrigation Use Varies Greatly by Sub-region and Country	35
Table 5.2: Agriculture Research and Funding in National Agricultural	39
Research Institutions	
Table 6.1: Logistics Performance Index: World Rankings	44
Table 6.2: Egypt Would Have Saved On Imports by Using Hedging Instruments	47



Abbreviations

AAID	Arab Authority for Agricultural Investment and Development	IFAD	International Fund for Agricultural Development
AOAD	Arab Organization for Agricultural Development	IMF	International Monetary Fund
AgGDP	Agricultural gross domestic product	IFPRI	International Food Policy Research Institute
CPI	Consumer price index	NARIs	National Agricultural Research Institutes
FAO	Food and Agriculture Organization of the United Nations	NGO	Non-governmental organization
GCC	The Cooperation Council for the Arab States of the Gulf	OECD	Organisation for Economic Co-operation and Development
GDP	Gross domestic product	USAID	United States Agency for International Development
ICARDA	International Center for Agricultural Research in Dry Areas	USDA	United States Department of Agriculture
		WFP	World Food Program
		WHO	World Health Organization

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Executive Summary

This joint working paper lays out a rationale and strategic framework for improving food security and managing food-price shocks in the Arab countries. The paper does not provide country specific policy and project recommendations. Such recommendations will follow from the country by country application of the framework, taking into account each country's political and cultural preferences, resource endowments, and risk tolerance.

In 2007 and the first half of 2008, a sharp rise in agricultural commodity and food prices triggered grave concerns about food security, malnutrition and increased poverty throughout the world. While the threat of a prolonged food-price shock receded with falling energy and commodity prices and a weakening global economy in the second half of 2008, many factors underlying the volatility in food prices appear here to stay and will require careful management if the world is to avoid future food-price shocks.

Arab countries import at least 50 percent of the food calories they consume. As the largest net importers of cereal, Arab countries are more exposed than other countries to severe swings in agricultural commodity prices, and their vulnerability will probably be exacerbated in

coming years by strong population growth, low agricultural productivity, and their dependence on global commodities markets.

Arab countries need to act urgently to improve food security. Projections of the region's food balance indicate that dependence on imports will increase by almost 64 percent over the next twenty years.

This paper suggests three critical strategies that, together, can serve as pillars to help offset future vulnerability to price shocks:

1. Strengthen safety nets, provide people with better access to family planning services, and promote education.
2. Enhance the food supply provided by domestic agriculture and improve rural livelihoods by addressing lagging productivity growth through increased investment in research and development.
3. Reduce exposure to market volatility by improving supply chain efficiency and by more effectively using financial instruments to hedge risk.

Education is the first pillar to increased food security in Arab countries. Arab governments can

reduce demand for cereal by educating families about nutrition, while providing people with access to family planning services. The recent food shock is associated with an additional four million undernourished people in Arab countries. As much as 35 percent of daily calories consumed in Arab countries come from wheat alone, driving the region's heavy dependence on cereal imports. Health education programs would encourage families to choose a more balanced diet that is less dependent on cereal.

In addition to education, well-targeted and scalable safety nets soften the impacts of price shocks by ensuring that poor families do not compromise their health or children's education to meet food costs. The poor in the region are most vulnerable to food-price shocks, spending anywhere from 35 to 65 percent of their income on food. Most countries in the region have one or more cash-transfer programs that could be reformed or broadened to fulfill this need.

Arab countries can take steps to increase food production at home, even with the constraints imposed by the limited availability of water and land. Projections suggest that by 2050 renewable water will fall below 500 cubic meters per capita and arable land to 0.12 hectares per capita. This second pillar would improve agricultural productivity through investments in research and development. Improved technology will boost cereal yields, which are currently only half of the average yield worldwide—a gap that is growing.

Better water management will be critical in raising agricultural productivity. Equally important is investment in agricultural research and devel-

opment, which despite average rates of return of 36 percent in Arab countries, receives less funding than in the rest of the world. Climate change is likely to have a significant impact on domestic production, and research and development initiatives are urgently required to drive the next green revolution.

Since Arab countries are likely to remain net cereal importers even with the successful implementation of these measures, financial instruments such as options and futures provide an attractive means for reducing exposure to market volatility by hedging risk. Arab countries could also make legislative and organizational changes in national procurement procedures to get better prices and to lower costs.

Arab countries could also manage their import exposure more actively by investing in infrastructure to produce, store, and transport food. Approximately 75 percent of the retail price of food is attributable to production, transportation, and marketing. This kind of investment could also allow some food-importing countries with access to inexpensive petroleum to better arbitrage fuel and food prices. Potential investments could be in land, infrastructure, or technology, and might even extend to support of research and development in those countries with the potential to boost agricultural exports to Arab countries.

A repeat of the sort of severe price shocks seen in 2007/2008 will inevitably force families across Arab countries to weigh the cost of educating their children or seeking medical care against the need to put food on the table. To avoid such a calamity, all Arab countries need to reexamine

their food security positions and their exposure to future swings in supplies and prices.

An approach that relies on the three pillars outlined in this paper (strengthening safety nets, providing people with access to family planning services, and promoting education; enhancing domestic food sources; and reducing exposure

to market volatility) offers an integrated and comprehensive framework to enhance food security. This global challenge requires a global response led by governments, international and regional funding and lending institutions, United Nations agencies, non-governmental organizations, civil society, and the private sector working in unison.



Résumé analytique

Ce document de travail conjoint examine les raisons d'intervenir et propose un cadre stratégique permettant de renforcer la sécurité alimentaire et de gérer les chocs des prix des denrées alimentaires dans les pays arabes. Il ne propose pas de politiques ou de recommandations de projet destinées à un pays en particulier. De telles recommandations découleront de l'application par chaque pays des principes formulés par ce cadre stratégique général en prenant en compte les préférences politiques et culturelles, les dotations en ressources et la tolérance aux risques particulières de chacun d'entre eux.

La forte hausse des prix des produits de base agricoles (les «produits de base») et des denrées alimentaires de 2007 et du premier semestre 2008 a suscité dans le monde entier de graves interrogations en matière de sécurité alimentaire, malnutrition et progression de la pauvreté. Alors que la menace d'un choc prolongé sur les prix alimentaires s'éloigne avec la chute des prix de l'énergie et des produits de base et l'affaiblissement de l'économie mondiale au cours du second semestre 2008, bien des facteurs sous-jacents de volatilité des prix alimentaires semblent devoir perdurer et vont requérir des soins vigilants pour que la planète ne revive pas à l'avenir de nouvelles flambées des prix alimentaires.

Les États arabes importent au moins 50 % des calories qu'ils consomment. Premiers importateurs de céréales, les États arabes se retrouvent plus exposés que d'autres pays aux dangereuses fluctuations des prix des produits de base agricoles. Leur vulnérabilité risque probablement de s'aggraver dans les prochaines années en réponse à leur forte croissance démographique, à la faiblesse de leur productivité agricole et à leur dépendance à l'égard des marchés mondiaux des produits de base.

Les États arabes doivent donc se mobiliser sans attendre pour renforcer la sécurité alimentaire. Les projections de leur balance alimentaire démontrent que la dépendance à l'égard des importations va progresser de près de 64 % au cours des vingt prochaines années.

Le présent document suggère trois stratégies déterminantes — trois piliers — qui peuvent, ensemble, étayer les politiques de résistance à la vulnérabilité future aux chocs liés aux prix :

1. Renforcer les filets de protection sociale, améliorer l'accès aux services de planning familial et promouvoir l'éducation.
2. Promouvoir l'approvisionnement en denrées alimentaires produites par les agricultures

nationales et améliorer les conditions de vie en milieu rural en s'attaquant au retard de la croissance de la productivité par des investissements accrus en recherche-développement.

3. Réduire l'exposition à la volatilité du marché par l'amélioration de l'efficacité de la chaîne d'approvisionnement et par une utilisation plus efficace des instruments financiers de couverture des risques.

Le renforcement de la sécurité alimentaire dans les pays arabes repose prioritairement sur l'éducation — le premier pilier. Les gouvernements arabes peuvent réduire la demande de céréales en formant les familles aux questions de nutrition, tout en facilitant l'accès aux services de planning familial. Le récent choc alimentaire se traduit par quatre millions supplémentaires de personnes sous-alimentées dans les pays arabes. Le blé représente à lui seul près de 35 % des calories consommées quotidiennement dans les pays arabes, renforçant la forte dépendance de la région à l'égard des importations de céréales. Des programmes d'éducation axés sur la santé pourront encourager les familles à choisir un régime alimentaire plus équilibré, moins fortement tributaire des céréales.

Outre l'éducation, des filets de protection sociale bien ciblés et ajustables atténuent les impacts des chocs des prix en veillant à ce que les prix alimentaires ne conduisent pas les familles pauvres à compromettre la santé ou l'éducation de leurs enfants. Les pauvres de la région sont particulièrement vulnérables aux chocs des prix des denrées alimentaires, ils y consacrent de 35 % à 65 % de leur revenu. La plupart des pays de la région disposent d'un ou de plusieurs pro-

grammes de transfert d'espèces qui pourraient être modifiés ou étendus de manière à répondre à ce besoin.

Les pays arabes peuvent prendre des mesures pour accroître la production alimentaire intérieure, même s'il existe des contraintes liées à la disponibilité limitée en eau et terres. Les projections indiquent que d'ici 2050, l'eau renouvelable disponible passera à moins de 500 mètres cubes par habitant et les terres arables à 0,12 hectares par habitant. Ce deuxième pilier permettrait d'améliorer la productivité agricole par le biais d'investissements en recherche-développement. L'amélioration des technologies va stimuler les rendements des cultures de céréales. Ils se situent actuellement à la moitié de la moyenne des rendements mondiaux, et l'écart ne cesse de croître.

Une meilleure gestion de l'eau sera déterminante pour accroître la productivité agricole. L'investissement dans la recherche-développement agricole est tout aussi important car, malgré des taux de rentabilité moyens de 36 % dans les pays arabes, elle y est moins bien financée que dans le reste du monde. Le changement climatique risque d'avoir un impact significatif sur les productions nationales et les initiatives de recherche-développement doivent être engagées rapidement pour faire avancer la prochaine révolution verte.

Comme les pays arabes risquent de rester importateurs nets de céréales, même en cas de mise en œuvre réussie de ces mesures, des instruments financiers tels que les options et contrats à terme constituent des moyens attractifs de réduction de l'exposition à la volatilité des marchés par la cou-

verture des risques. Les pays arabes pourraient également faire évoluer les bases législatives et organisationnelles des procédures de passation des marchés pour obtenir de meilleurs prix et réduire les coûts.

Les pays arabes pourraient également gérer plus activement leur vulnérabilité en matière d'importations en investissant dans des infrastructures permettant de produire, de stocker et de transporter les denrées alimentaires. Environ 75 % du prix de détail des denrées alimentaires sont imputables à la production, au transport et à la commercialisation. Ce type d'investissement pourrait également permettre à certains pays importateurs de denrées alimentaires ayant accès à du pétrole bon marché de procéder à un meilleur arbitrage entre les prix du carburant et ceux des denrées alimentaires. Les investissements potentiels pourraient porter sur des terres, des infrastructures ou de la technologie, et pourraient éventuellement venir à l'appui de la recherche-développement dans les pays disposant d'un potentiel de croissance des exportations agricoles vers les pays arabes.

Un retour de chocs sur les prix comme ceux de 2007/2008 contraindra inévitablement les familles des différents pays arabes à mettre en balance le coût de l'éducation de leurs enfants ou des soins médicaux pour pouvoir assurer leur subsistance. Pour éviter une telle catastrophe, il convient que tous les pays arabes réexaminent la situation de leur sécurité alimentaire et leur exposition aux fluctuations futures des approvisionnements et des prix.

Une approche s'appuyant sur les trois piliers décrits dans le présent document (renforcement des filets de protection sociale, de l'accès aux services de planning familial et promotion de l'éducation ; promotion des sources nationales de denrées alimentaires ; et, réduction de l'exposition à la volatilité des marchés) offre un cadre stratégique global et intégré pour l'amélioration de la sécurité alimentaire. Ce défi mondial requiert une réponse mondiale, pilotée par les gouvernements, les institutions de prêt et de financement internationales et régionales, les organismes des Nations Unies, les organisations non gouvernementales, la société civile et le secteur privé, tous agissant de concert.



ملخص تنفيذي

1. دعم شبكات السلامة والأمان وتمكين الأفراد من الحصول بصورة أفضل على خدمات تنظيم الأسرة وتعزيز التعليم.
2. دعم الموارد الغذائية التي توفرها الزراعة المحلية من خلال مواجهة النمو المتباطئ في الإنتاجية عن طريق زيادة الاستثمار في مجالي البحوث والتنمية.
3. الحد من التعرض لتقلبات السوق من خلال تحسين فاعلية سلسلة الموارد الغذائية والاستخدام الفعال للأدوات المالية من أجل التحوط للمخاطر.

يعد التعليم بمثابة الركيزة الأولى لتحقيق الأمن الغذائي في البلدان العربية. وتستطيع الحكومات العربية الحد من حجم الطلب على الحبوب من خلال توعية الأسر بشئون التغذية وتمكينها من الحصول على خدمات تنظيم الأسرة. وترتبط الزيادة الأخيرة المفاجئة في أسعار الأغذية بزيادة أعداد من يعانون من سوء التغذية في البلدان العربية بنحو 4 مليون شخص. ويأتي نحو 35 بالمائة من السعرات الحرارية اليومية المستهلكة في البلدان العربية من القمح وحده، مما يدفع الإقليم إلى الاعتماد بشدة على واردات الحبوب. وتشجع برامج التوعية الصحية الأسر على اختيار أنظمة غذائية أكثر توازناً وأقل اعتماداً على الحبوب.

وبالإضافة إلى التعليم، تخفف شبكات السلامة والأمان ذات الأهداف الجيدة والقابلة للقياس من تأثير الزيادة المفاجئة في الأسعار بأن تضمن عدم تعرض صحة تلك الأسر أو تعليم أبنائها للمخاطر من أجل سداد تكاليف الغذاء. ويعتبر الفقراء في هذا الإقليم بمثابة الفئة الأكثر تعرضاً لمخاطر الزيادة المفاجئة في أسعار الأغذية، حيث ينفقون ما بين 35 إلى 65 بالمائة من دخلهم على الغذاء. ويوجد لدى معظم البلدان في الإقليم برنامج أو أكثر من برامج التحويل النقدي التي يمكن إصلاحها أو توسيع نطاقها من أجل الوفاء بهذه الاحتياجات.

تستعرض ورقة العمل المشتركة هذه الأساس المنطقي والإطار الاستراتيجي لتحسين الأمن الغذائي وإدارة الزيادة المفاجئة في أسعار الغذاء في البلدان العربية. ولا تتناول ورقة العمل سياسة محددة لدولة ما أو توصيات خاصة بأحد المشروعات. وسوف تنتج تلك التوصيات عن تطبيق ذلك الإطار من قبل كل دولة على حدة، مع وضع الأولويات السياسية والثقافية والموارد الطبيعية ودرجة تحمل المخاطر لدى كل دولة في الحسبان.

أثار الارتفاع الأخير الحاد (عام 2007 والنصف الأول من عام 2008) في أسعار السلع الزراعية والأغذية مخاوف شديدة بشأن الأمن الغذائي وسوء التغذية وتفاقم حدة الفقر في مختلف أنحاء العالم. ورغم تراجع الزيادة الهائلة في أسعار الأغذية مع انخفاض أسعار الطاقة والسلع وتدهور الاقتصاد العالمي خلال النصف الثاني من عام 2008، يبدو أن العديد من العوامل الكامنة وراء تقلبات أسعار الأغذية لا تزال قائمة وسوف تتطلب إدارة متأنية كي يتجنب العالم أي زيادة مستقبلية في أسعار الأغذية.

تستورد البلدان العربية 50 بالمائة على الأقل من السعرات الحرارية الغذائية التي تستهلكها. ونظراً لكونها أكبر مستورد للحبوب، فإن البلدان العربية تكون أكثر عرضة من الدول الأخرى لتقلبات حادة في أسعار المواد الزراعية وربما سوف تزداد حدة تعرضها لنقص الأغذية خلال السنوات القادمة نتيجة للنمو الكبير في تعداد السكان وانخفاض الإنتاجية الزراعية والاعتماد على أسواق السلع العالمية.

يتعين على البلدان العربية أن يتخذ إجراءات على وجه السرعة من أجل تحسين الأمن الغذائي. وتشير التوقعات الخاصة بالتوازن الغذائي في الإقليم إلى زيادة الاعتماد على الواردات بنحو 64 بالمائة خلال السنوات العشرين القادمة.

ويقترح هذا التقرير ثلاثة استراتيجيات هامة يمكنها أن تكون مجتمعة بمثابة ركائز تساعد على مواجهة الزيادة المفاجئة في الأسعار في المستقبل.

الأغذية. ويرجع 57 بالمائة من أسعار بيع الأغذية بالتجزئة إلى الإنتاج والنقل والتسويق. ويمكن أن يسمح هذا النوع من الاستثمار أيضا لبعض البلدان المستوردة للأغذية بالحصول على البترول بأسعار زهيدة من أجل المراجعة بصورة أفضل بين أسعار الوقود والغذاء. ويمكن أن تتمثل الاستثمارات المحتملة في الأراضي أو البنية الأساسية أو التكنولوجيا؛ بل ويمكن أن تمتد إلى دعم البحوث والتنمية في تلك البلدان، مع إمكانية دعم الصادرات الزراعية إلى البلدان العربية.

وسوف يؤدي تكرار الزيادة المفاجئة والحادة في الأسعار، والتي شهدناها عامي 2007/2008، إلى أن تضطر الأسر بمختلف البلدان العربية، وبصورة حتمية، إلى المراجعة بين تكلفة تعليم أبنائهم أو الحصول على الرعاية الطبية وبين الحاجة إلى توفير الغذاء اللازم. ولتجنب مثل هذه الكارثة، يتعين على جميع البلدان العربية إعادة دراسة موقفها فيما يتعلق بالأمن الغذائي ومدى إمكانية تعرضها للتقلبات المستقبلية في الإمدادات والأسعار.

يعد هذا التوجه الذي يعتمد على الركائز الثلاث المحددة في هذا التقرير (دعم شبكات السلامة والأمان وتوفير خدمات تنظيم الأسرة للأفراد، وتعزيز مصادر الغذاء المحلية، والحد من إمكانية التعرض لتقلبات السوق) بمثابة إطار عمل متكامل وشامل لدعم الأمن الغذائي. ويتطلب هذا التحدي العالمي استجابة عالمية من خلال التعاون بين الحكومات ومؤسسات التمويل والإقراض الدولية والإقليمية وهيئات الأمم المتحدة والمنظمات غير الحكومية والمجتمع المدني والقطاع الخاص.

يمكن أن تتخذ البلدان العربية خطوات لزيادة إنتاج الأغذية بالمنزل، رغم القيود التي تفرضها قلة المياه والأراضي. وتوحي التوقعات بانخفاض نصيب الفرد من المياه المتجددة إلى أقل من 500 متر مكعب ومن الأراضي الصالحة للزراعة إلى 0.12 هكتار بحلول عام 2050. وتؤدي هذه الركيزة الثانية إلى تحسين الإنتاجية الزراعية من خلال الاستثمارات في البحوث والتنمية. وسوف تحسن التكنولوجيا المتطورة من إنتاجية الحبوب، التي تمثل حاليا نصف المتوسط العالمي للإنتاجية - وتعد هذه الفجوة في تزايد مستمر.

سوف يمثل تحسين إدارة المياه عنصرا هاما من عناصر زيادة الإنتاجية الزراعية. وتحظى الاستثمارات في البحوث الزراعية والتنمية بذات الأهمية؛ ورغم متوسط معدلات العائد التي تبلغ 36 بالمائة في البلدان العربية، فإنها تتلقى تمويلا أقل مقارنة بالأقاليم الأخرى. ومن الأرجح أن يؤثر تغير المناخ تأثيرا كبيرا على الإنتاج المحلي؛ وهناك حاجة ماسة إلى أن تتولى مبادرات البحوث والتنمية دفع عجلة الثورة الخضراء القادمة.

نظرا لإمكانية أن تظل البلدان العربية بلدانا مستوردة للحبوب رغم تنفيذ جميع هذه التدابير بنجاح، فإن الأدوات المالية مثل عقود الخيار والعقود المستقبلية الآجلة تعد بمثابة وسيلة جذابة للحد من إمكانية التعرض لمخاطر تقلبات الأسعار من خلال التحوط لتلك المخاطر. ويمكن أن تجري البلدان العربية أيضا تعديلات تشريعية وتنظيمية ضمن إجراءات المشتريات القطرية من أجل الحصول على أسعار أفضل وتخفيض التكاليف.

يمكن أن تتولى البلدان العربية أيضا إدارة حجم وارداتها بصورة أكثر فاعلية من خلال الاستثمار في البنية الأساسية لإنتاج وتخزين ونقل



What Factors Underlie The Recent Shock in Agricultural Commodity Prices?

Very high agricultural commodity prices in the first six months of 2008 raised concerns worldwide about increased poverty and malnutrition. However, since June 2008, prices have retreated approximately 50 percent, driven down in part by strong production gains in developed countries (FAO 2008a). Other important factors contributing to the fall in prices include the world financial crisis, the precipitous decline of world oil prices, and the appreciation of the US dollar.

In spite of recent food price drops, many of the underlying factors behind high and volatile prices appear to be here to stay. Structural factors, such as population and income growth and biofuel demand, may prevent real prices from sliding back to the historic lows witnessed earlier this decade. Thinness of markets amplifies how price reacts to small, transitory changes in supply and demand.¹ Sustained high prices and increased volatility create a danger for Arab countries because they are highly dependent on international commodity markets for food.² The key messages of this chapter are:

- » Arab countries are highly exposed to international food commodity price shocks.
- » International agricultural commodities may be entering a period of sustained price

volatility due to thinness of markets and limited stocks.

- » Investments in agricultural productivity are critical to keeping long-term commodity prices stable and affordable.

Why are Arab countries concerned about the recent price shock?

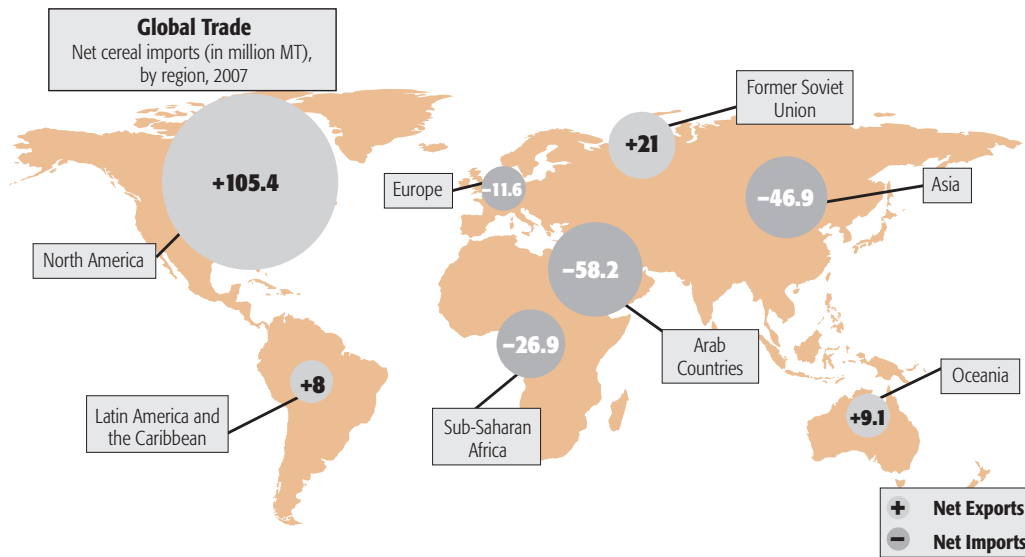
Arab countries are very vulnerable to fluctuations in international commodity markets because they are heavily dependent on imported food. Arab countries are the largest importers of cereal in the world (Figure 1.1). Most import at least 50 percent of the food calories they consume (FAO, 2008b).

Heavy dependence on food imports raises concerns about food security. Reliance on interna-

¹ Thinness of markets means a small proportion of world production enters international markets through trade.

² Arab countries include all members of the League of Arab States (LAS): Algeria, Bahrain, Comoros, Djibouti, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Palestine, Qatar, Saudi Arabia, Somalia, Sudan, Syria, Tunisia, UAE, and Yemen. Comoros is omitted from analysis because of its unique geography.

Figure 1.1: Arab Countries Are the Largest Net Importers of Cereal in the World (million metric tons, 2007)



Sources: Authors. Adapted from (FAO, 2008e).

tional commodity markets raises both price and supply concerns. In terms of price, high food prices put enormous pressure on household and national budgets. In terms of supply, five exporters (Argentina, Australia, Canada, the EU, and the United States) supply 73 percent of the world's traded cereals (FAO, 2008b) making access to imported cereal heavily dependent on events in these countries and on Arab countries' relationships with them.

What factors are increasing food security risks?

Supply and demand factors contributing to the recent price shock are best understood in structural and cyclical terms. The recent food-price shock is widely acknowledged to be a result of

the untimely convergence of multiple structural and cyclical factors.³ Recent commodity market projections by the OECD, FAO, and the World Bank (OECD and FAO, 2008) (World Bank, 2008b) suggest a structural shift may prevent prices from returning to pre-crisis levels. While this may or may not be true, of greater concern for Arab countries is that structural and cyclical forces are creating a system that is very sensitive to supply shortfalls and ever-increasing demand, making future price shocks very probable. The unexpected speed at which food prices can increase is especially problematic because of the inelasticity of both supply and demand.

³ Structural factors are long-term factors that cause a permanent shift in demand or supply. Cyclical factors are short-term factors that induce a temporary shift in supply or demand.

Box 1.1: Food Security Has Multiple Dimensions

"Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe, and nutritious food which meets their dietary needs and food preferences for an active and healthy life" (World Food Summit, Rome, 1996).

To achieve food security, the following four dimensions must be considered:

Food availability: The availability of sufficient quantities of food of appropriate quality, supplied through domestic production or imports (including food aid).

Food access: Access by individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet. Entitlements are defined as the set of all commodity bundles over which a person can establish command given the legal, political, economic and social arrangements of the community in which they live (including traditional rights such as access to common resources).

Utilization: Utilization of food through adequate diet, clean water, sanitation and health care to reach a state of nutritional well-being where all physiological needs are met. This brings out the importance of non-food inputs in food security.

Stability: To be food secure, a population, household or individual must have access to adequate food at all times. They should not risk losing access to food as a consequence of sudden shocks (e.g. an economic or climatic crisis) or cyclical events (e.g. seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security.

At a national level, food security exists when all of a country's citizens are individually food secure.

Source: FAO, 2006a

Households, especially poor ones, cannot quickly alter and reduce their food consumption in response to high prices. Instead, they must make sacrifices in other areas of their budgets. Agricultural producers cannot quickly ramp up production in response to high prices due to the seasonal time-cycle of agricultural production and the slow development of agricultural technologies.

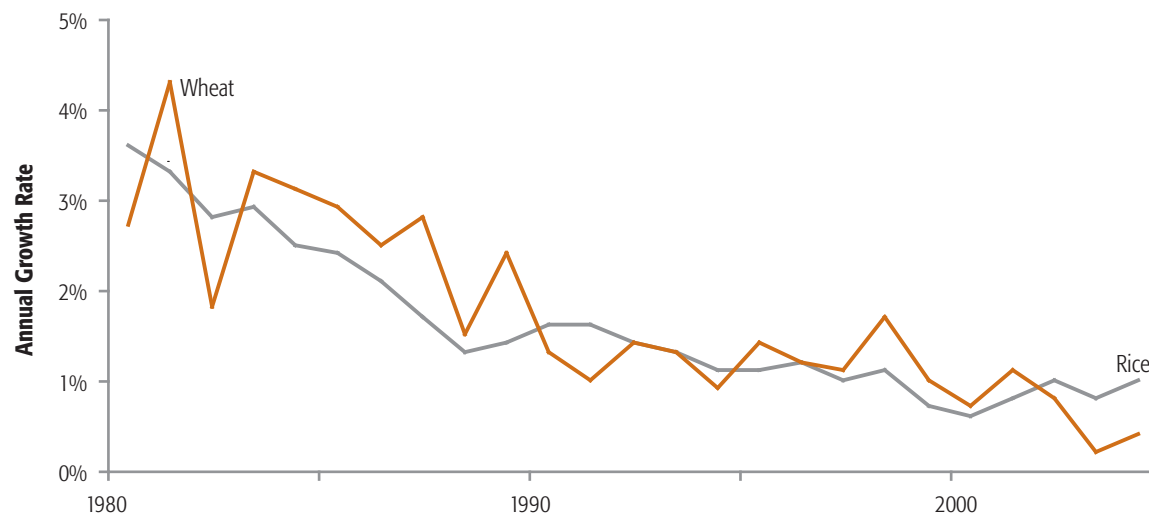
Declining growth in global agricultural productivity will cause shrinking surpluses in supply. In order to keep up with food demand, global agricultural-productivity growth needs to stay ahead of population growth. If not, demand will outpace supply and food prices will rise. Global productivity growth rates for major cereals are slowing (Figure 1.2).⁴ This is partly because public support for agricultural research has decreased since 1990 (Ruttan, 2002). Unless this trend is reversed, commodity markets will

remain thin and the likelihood of food-price shocks will increase.

Thin international cereal markets imply that relatively small shifts in supply or demand will lead to large shifts in prices. Only 18 percent of world wheat production and 6 percent of world rice production is exported; the rest is consumed domestically (FAO, 2008e). At the height of the recent shock some major wheat- and rice-exporting countries banned exports for fear of not being able to feed their people. These bans contributed to the rapid escalation of global market prices. The thinner the market, the sharper the fluctuation in international prices and the higher the likelihood of future price shocks.

⁴ Productivity growth refers to percent change in growth of yields.

Figure 1.2: Global Growth Rates of Yields for Major Cereals Are Slowing
(percent change in growth of yields, 1980–2005)



Source: FAO, 2008b

Note: Yield growth rates reported as seven-year moving averages.

Low stock levels increase price sensitivity to disturbances in demand and supply. Policy reform in recent years, such as replacing price supports with direct farmer payments, has brought down stocks in OECD countries from their high levels in the 1980s and 1990s (Gardner and Sumner, 2007; World Bank, 2008a). Low stock levels, combined with thin cereal markets and ever-increasing demand, contribute to a just-in-time commodity market that is more vulnerable to disruptions. FAO forecasts world end-of-season cereal stocks for crop years closing in 2008/2009 at 474 million metric tons, up 9 percent from their exceptionally low opening level and the highest volume since 2002/03 (FAO, 2008a). As a result, the cereal stock-to-use ratio is forecasted to rise two percentage points from a low of 20 percent in 2007/08. Although stocks are increasing, the probability of price shocks re-

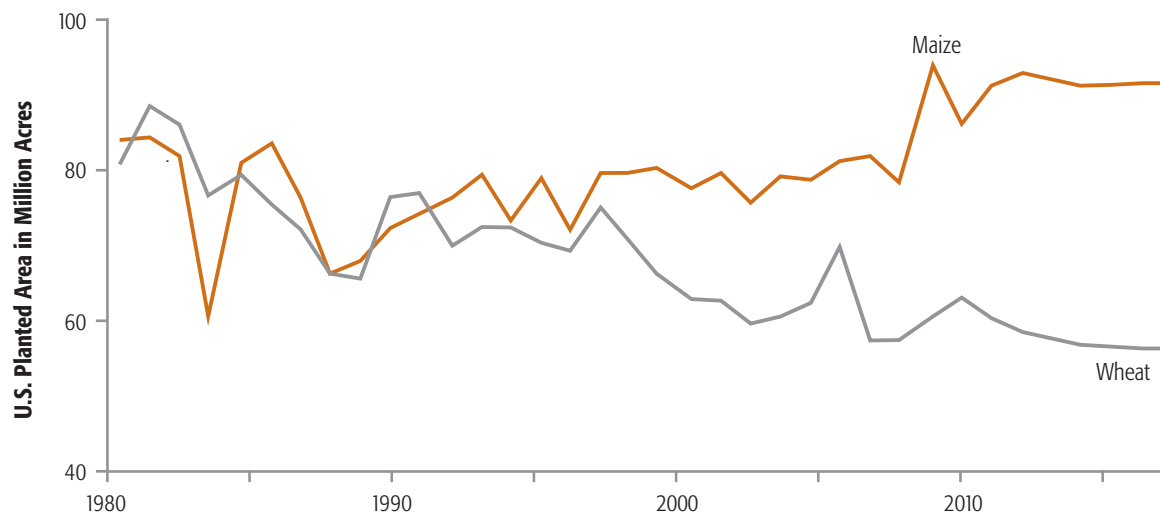
mains high when the pipeline stocks dip below the 25 to 30 percent range.

Climate change will contribute to market thinness and instability by increasing cereal yield volatility and possibly decreasing global cereal production. Global climate change models project an increasing probability of droughts and floods worldwide (Cline, 2007). A critical concern for Arab countries is how often droughts and floods occur in key cereal exporting regions. Research on the impact of global warming on average cereal production is not conclusive, but there are indications that average production will decrease. Rosenzweig and Parry (1996) estimate that global cereal production could decrease by 5 percent from 1996 to 2060, even with moderate investment in climate change adaptation.

Biofuel subsidies are shifting land away from production of food. Policies that promote biofuels such as ethanol and biodiesel, coupled with high domestic tariffs that discourage biofuel imports, shift land away from production of food and pasture (FAO, 2008g). There is evidence that this is occurring in the United States, a country that accounts for 28 percent of world cereal exports (Figure 1.3). Fabiosa et al. (2008) suggest that such policies in the United States will probably transmit directly to higher world-market prices for wheat and oilseeds. Sustaining such policies in the future would contribute to thinner wheat markets and an upward structural adjustment in world wheat prices. Similar biofuel policies in the European Union, Canada, and elsewhere could exacerbate anticipated structural changes in the production of wheat, coarse grains, oilseeds, sugar, and other crops.

Food commodity prices historically have moved with petroleum price. Petroleum is the primary ingredient of diesel and fertilizer, which are two key components of agricultural inputs. The cost of transporting food also increases with the price of fuel. A recent study indicates that when oil prices are above \$50 a barrel, oil and food commodity prices move together, but when the price of oil falls below \$50 a barrel, oil and food prices decouple (World Bank, 2009). Under most circumstances, oil-producers will be insulated from increases in food commodity prices. However, if petroleum prices decrease and food commodity prices increase, such as when oil prices are low and there is a major drought, oil-producing countries will be less able to finance imports during future price shocks. Rising petroleum prices can also impact commodity prices by increasing the demand for

Figure 1.3: Biofuel Policies in the United States May Contribute to a Substitution of Wheat with Maize
(1980–2017 area planted, million acres)



Source: USDA, 2008b.

biofuels, which diverts cereal and sugar from food to fuel (FAO, 2008c).

Monetary policies, currency fluctuation, and financial speculation may have also contributed to the recent shock. Low interest rates reduce the price of storage and encourage the buying and holding of real commodities (Frankel, 2008). The recent decline of the U.S. dollar against other hard currencies increased the demand for these goods, since commodities priced in dollars became cheaper in real terms. Financial speculation may also have contributed to the price shock. In periods of uncertainty and/or recession, investors shift to real assets including commodities. This leads to large increases in non-traditional investments in commodity markets as fund investors bet on continued price increases. However, recent research suggests that speculation may be a symptom of the food-price shock and not a cause (Carter, Rausser, and Smith, 2008).

The impact of the financial crisis on food production is difficult to predict. The complex demand and supply forces in agricultural markets could create a number of different scenarios. The financial crisis may dampen demand for commodities, putting further downward pressure on agricultural prices through slower rates of GDP growth, negative market expectations, and falling oil prices. Falling oil prices will reduce demand for commodities used in biofuel production (e.g. maize and sugarcane). On the supply side, the financial crisis could depress production incentives through lower crop prices and reduced producer access to credit. Falling petroleum prices, however, will lower the costs of agricultural production and transport. In the end, the net effect on production depends on the relative speed of adjustment of farm-gate crop and input prices (FAO, 2008a). If input prices fall more slowly than producer prices, farmer margins will decrease, encouraging producers to cut production. However, if

Box 1.2: Why Retail Food Prices Have Not Fallen with Commodity Prices

"Like the hare in Aesop's famous fable, commodity prices tend to take a quick, early lead [over retail prices] in inflation cycles, but ultimately lose the race, falling in real terms" (Blomberg and Harris, 1995)

Globally, consumers are finding that retail food prices remain high, even after commodity prices for cereals have fallen 50 percent since their July 2008 peak. Although this may seem counterintuitive, there is substantial disconnect between commodity prices and retail prices.

The relationship between commodity prices and retail prices is complicated. Commodity prices are determined by much more than current supply and consumer demand. Commodities are traded on global auction-based markets, where prices can quickly adjust to actual or expected future demand. Retail goods, however, are traded on many disjointed markets that are subject to preexisting contracts and other frictions (Blomberg and Harris, 1995). Likewise, prices for retail goods, including food, are determined by much more than the price of the commodities used to produce them. In the United States, 25 percent of retail food price comes from food commodities and gets passed through to the farmer. The other 75 percent goes into production, transport, and marketing, and gets passed through to manufacturers, wholesalers, and retailers. Farm level production costs hinge mostly on oil prices, whereas production and transport costs of retail food depend on international wages, energy (oil and non-oil) prices, interest rates, and taxes (Urbanchuck, 1997). In the end, high commodity prices can serve as a warning of overall inflation, but when commodity prices eventually fall, consumer inflation often remains.

Source: Blomberg and Harris, 1995; Urbanchuck, 1997

input prices fall in line with producer prices, farmers may be encouraged to maintain production.

The financial crisis may also restrict some countries' access to credit, limiting their ability to import food. Whether or not the financial crisis decreases food production, it will slow down food trade, particularly for developing countries. As international food companies and food-exporting countries tighten credit, some Arab countries with limited financial resources will have difficulty financing cereal imports through debt. This is a serious concern since Arab countries are expected to depend increasingly on imports in the future.

Will food-price shocks continue to be a problem for Arab countries?

Demand and supply factors are increasing food security risks for Arab countries. Population growth, urbanization, and income growth are relatively strong in Arab countries and will increase the demand for food. Supply-side constraints are also more binding in most Arab countries than elsewhere due to acute competition for limited amounts of arable land and water, constraining these countries' ability to increase cereal production. Thin cereal markets and climate change will increase price sensitivity to disturbances in these demand and supply factors. The potential decoupling of petroleum and food commodity prices may cause deterioration in the fiscal balances of oil-producing countries, reducing their ability to cope with future shocks. It is unknown if world food prices will be high or low, but it is certain that Arab countries will

remain vulnerable to food price and quantity shocks in the future.

The structural factors driving food demand are increasing faster in Arab countries than worldwide. The combined population growth rate of all Arab countries is projected to be 1.7 percent, which is much higher than the world rate of 1.1 percent (World Bank, 2008b).⁵ Not only is the number of people increasing faster in Arab countries than elsewhere, but so is their purchasing power. The current income growth rate of Arab countries outpaces the global average, at 3.4 percent to 3 percent (World Bank, 2008b).⁶ Urbanization is also on the rise in Arab countries, with urban population growing by 3 percent during the 1990–2006 period, surpassing the global average of 2.2 percent (FAO, 2008b).

Water and land constraints are particularly challenging for agriculture in Arab countries. Approximately 75 percent of exploitable renewable water resources are taken out of the natural system and put to use compared to between 1 percent and 30 percent in other regions (World Bank, 2007a). In some areas, non-renewable sources such as fossil groundwater are being exploited. Consequently, there is little to no potential for sustainable increase in water use in most Arab countries. The expansion of arable land is also much slower in Arab countries than globally. Excluding Sudan, the amount of arable and permanent cropland increased

⁵ World Bank population data is for the World Bank's Middle East and North Africa region (MENA).

⁶ Income as measured by annual percent change in GDP per capita PPP at constant 2005 international dollars from 2001–2007.

at an annual growth rate of 1.7 percent from 1995–2005 (6.7 percent with Sudan). Worldwide, arable and permanent cropland increased 2.3 percent (FAO, 2008b). In addition to water and land constraints, cereal-yield growth has

been slower in Arab countries than the rest of the world. From 1990 to 2007 average cereal yields increased 14.5 percent in the Arab region, compared to 21.5 percent worldwide.



What is the Impact of the Recent Price Shock on Arab Economies?

The recent price shock provides important lessons about the potential macro and microeconomic effects of high food prices, and about the results of government responses to these trends. At the macro level, inflation in Arab countries is a challenge, increasing at more than twice the speed of world inflation in recent years (IMF, 2008). High energy and food prices are driving factors, outpacing overall inflation by several percentage points. High food prices also deteriorate the trade balances of all Arab countries. Most countries employ subsidies to address high food prices, but these subsidies can strain a country's fiscal balance. Although food commodity prices have fallen in recent months, they remain higher than when the price shock began; inflation remains a concern. The global financial crisis and declining oil prices will have a significant impact on the fiscal balances of the wealthier oil-exporting Arab countries, dampening their ability to absorb food-price shocks.

At the micro level, the recent shock probably made poverty both more widespread and more severe, although it is too early to determine the exact damage. The poor are certainly most vulnerable to food-price shocks, because they spend the largest share of their budget on food. Food-price shocks can push people above the poverty

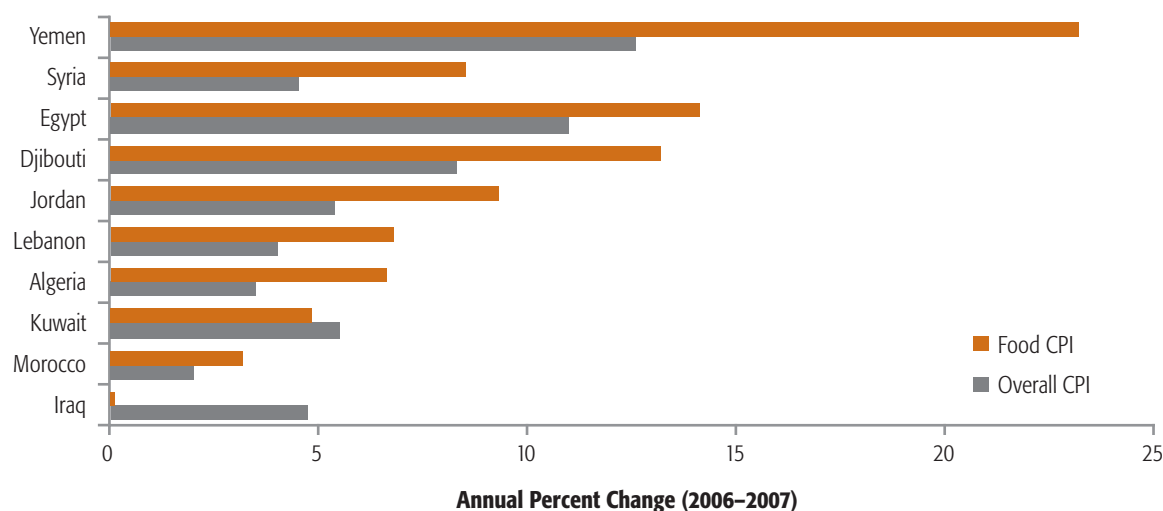
line into poverty, and worsen the condition of those who are already poor. Key messages of this chapter are:

- » Food-price shocks threaten macroeconomic stability in resource-poor countries.
- » Falling petroleum prices make oil-rich countries more vulnerable to shocks.
- » Food-price shocks increase the depth and incidence of poverty.
- » Different countries face different food security concerns depending on their resource endowment and fiscal balance.

What impact will the recent food-price shock have on inflation?

The food-price shock will have a major impact on inflation. The rise in food prices threatens macroeconomic stability primarily through inflation. Until recently, rising commodity prices were contributing to inflation throughout the world, and by some five percentage points in developing countries (World Bank, 2008c). Figure 2.1 indicates that in 2007 the annual percent change in food inflation in several Arab countries outpaced the change in overall inflation. Kuwait and Iraq, where the overall Consumer Price Index (CPI)

Figure 2.1: The Food CPI Drove the Overall CPI (2007)



Source: World Bank, 2008b.

outpaced the Food CPI, are notable exceptions to this trend.⁷ Despite falling commodity prices, inflation is projected to remain high in the future (IMF, 2008).

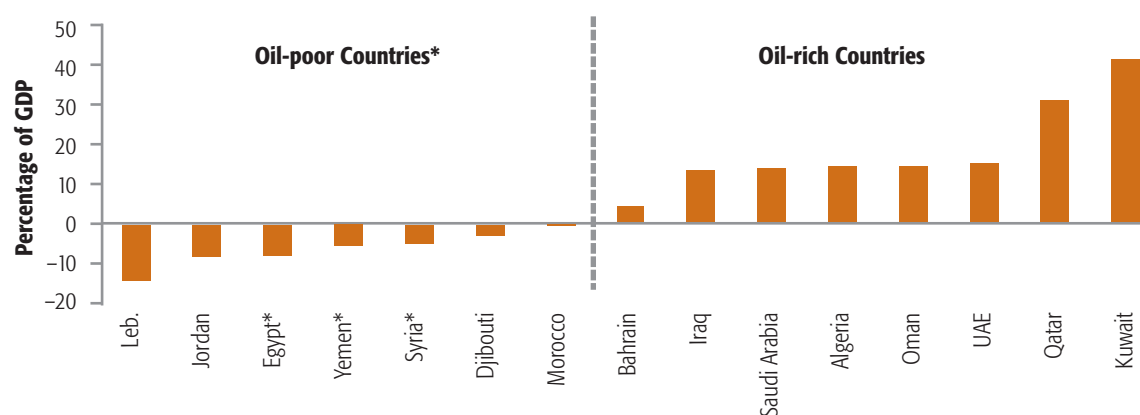
What is the impact of the food-price shock on government budgets?

Non-oil-exporting countries face increasing fiscal pressure due to the recent shock. In addition to inflation, food-price shocks directly affect trade and fiscal balances. Many Arab countries (e.g. Egypt, Jordan, Syria, and Yemen) have increased wages for public sector employees and have tried to support the poor by increasing bread subsidies, implementing direct cash transfers, and lifting tariffs on basic food commodities. However, these measures are not sustainable without concurrent increases in

revenues. In order to finance the additional expenditures, oil-poor countries may be forced to reduce other essential expenditures or increase borrowing, which has a negative long-term effect on their economies. Non-oil-exporting countries that rely significantly on cereal imports such as Jordan, Lebanon, Morocco, and Djibouti all have fiscal and trade deficits, contributing to their economic hardship. However, rising revenues from other commodity exports have eased some of the burden in oil-poor countries that are rich in other natural resources. For example, Morocco's phosphate exports tripled in value in 2008 and covered the oil deficit, while Jordan's export of potash helped cushion its food-import bills.

⁷ In addition to the food-price shock, other inflationary factors included GCC currencies pegged to a declining dollar, housing value increases, and oil related liquidity.

Figure 2.2: Oil-poor Countries Have Fiscal Deficits While Oil-rich Countries Have Fiscal Surpluses (2007 balances)



Source: World Bank, 2008b.

* Syria, Yemen and Egypt are oil-exporting countries, but their production and net exports are small when compared to the oil-rich countries.

Oil-rich countries have been able to absorb high food prices thanks to high oil revenues. Governments of oil-rich countries have been able to raise public sector wages and implement large food subsidy programs without incurring unbearable fiscal strain. However, the recent sharp decline in oil prices may deteriorate trade surpluses, which would reduce foreign exchange earnings, government revenues, and investment options. If oil prices continue to decline but food prices remain high, fiscal and trade surpluses could become chronic deficits. Syria, for instance, is currently an oil-exporter,⁸ but reserves are declining, and expensive food-subsidy programs are contributing to a deteriorating fiscal balance.

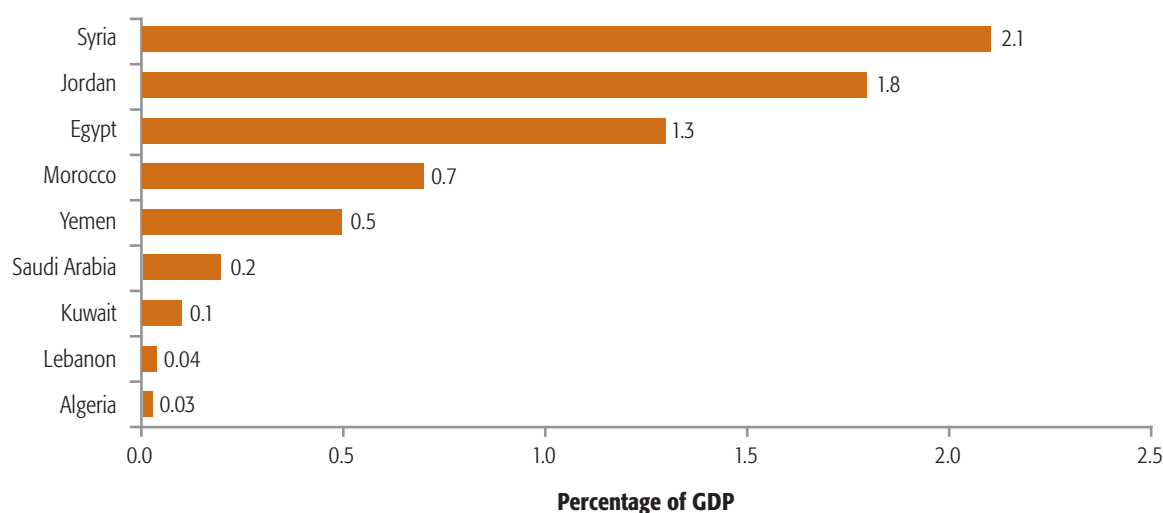
Across-the-board food-subsidy programs can create a substantial fiscal burden. Food-price shocks drive up the cost of government food

subsidies. At the same time, a common government response to shocks is to increase the coverage and size of these subsidies, driving up costs even further. In countries such as Syria and Egypt, which have across-the-board subsidies, the subsidies exceed 1 percent of GDP and could become a major fiscal problem if commodity prices stay high or in the event of future price shocks (Figure 2.3).⁹ While social and political considerations may make rationalizing food subsidies unpopular, Chapter 4 of this paper outlines potential strategies to improve their performance and reduce their fiscal burden.

⁸ Syria is expected to become a net oil importer by 2010.

⁹ This pales in comparison to energy subsidies, which average 7 percent of GDP across the region (World Bank 2008l).

Figure 2.3: Food Subsidies Are a High Share of GDP in Some Countries (2007)



Source: World Bank, 2008b.

What impact can food-price shocks have on poverty?

Rural poverty is at the core of Arab countries' food-security problems. About one quarter of the population of Arab countries is poor, and 76 percent of these poor people live in rural areas. Poverty rates in rural areas are also dropping more slowly than in urban areas (IFAD and FAO, 2007). Table 2.1 shows how the poor are distributed between rural and urban areas in Arab countries for which poverty data is available. With so many of the poor residing in rural areas, it is imperative that social safety nets are designed to reach these people, which programs based on proxy-means testing are not currently well equipped to do. Safety nets will be covered in greater detail in Chapter 4.

Higher food prices contribute to an increase in the incidence, depth, and severity of poverty.

The poor in the region are hit hardest by food-price shocks, spending anywhere from 35 to 65 percent of their income on food. Rough calculations suggest that, barring economic growth, a 30 percent increase in food prices in Egypt would have resulted in a 12 percentage point increase in poverty. (In fact poverty has fallen because there was economic growth). In Morocco a 14 percent increase in food prices would have resulted in a 4 percentage point increase in poverty. In Djibouti a 21 percent increase in the food CPI could have pushed extreme poverty up by 14 percentage points.¹⁰ These are relatively

¹⁰ These figures are the result of simulations and represent maximum possible effects. They refer to the changes in food prices (or food component of the CPI) approximately over the same time period—from the pre-crisis (2005) to early 2008, assuming no income growth and no substitution away from food. They also do not take into account possible positive effects of higher food prices on incomes of farmers.

Table 2.1: The Poor Are Concentrated in Rural Areas
(Various Years)

Country	Percent of urban who are poor	Percent of rural who are poor	Percent of poor in rural areas
Yemen ¹	21%	40%	84%
Djibouti ¹	39%	83%	31%
Egypt ¹	10%	27%	78%
Sudan ²	27%	85%	81%
West Bank and Gaza ¹	21%	55%	67%
Jordan ¹	12%	19%	29%
Syria ¹	8%	15%	62%
Algeria ¹	10%	15%	52%
Mauritania ³	30%	50%	78%
Morocco ¹	5%	15%	68%
Tunisia ¹	2%	8%	75%

Source: ¹ World Bank, 2008d; ² IFAD and FAO, 2007; ³ World Bank, 2008b

Note: Poverty as determined by national poverty line.

high magnitudes of impact, which reflects a characteristic feature of poverty in the region: a relatively high concentration of the population near the poverty line makes poverty numbers very sensitive to even small increases in the cost of living (World Bank, 2006). However, in Yemen the doubling of wheat prices in 2007 only resulted in an increase in the poverty headcount of six percentage points (World Bank, 2008m). This is because a relatively high percentage of the population lives below the poverty line.

Some groups of poor people stand to lose more than others from higher food prices. Those that stand to lose the most are the urban poor, the rural landless, and small and marginal farmers. Large farmers will be buffered from shocks since they are likely to benefit from higher agricultural produce prices (FAO, 2008f). In contrast,

a large proportion of small farmers in several Arab countries stand to lose from higher food prices because they are net consumers of food. Preliminary findings from Yemen are alarming. Between 2006 and 2008 the percentage of the surveyed population with inadequate food consumption grew a shocking 35 percentage points (from 24 percent to 59 percent) (World Food Program, 2008). In order to help marginal groups become food secure, employment opportunities need to be generated. Strategies to create economic activity in rural areas will be dealt with in Chapter 5.

Investing in smallholders is essential to eradicating rural poverty and increasing food security at the national level. There are many reasons policymakers would want to help smallholders. They usually make up the majority of the rural

population and of the rural poor. Enabling smallholders to become more productive contributes to household food security, which contributes in turn to national food security. Therefore the success of smallholders should also be recognized as a food security goal (IFAD and FAO, 2007; FAO 2008f). The need to invest in smallholders will be discussed further in Chapter 5.

The impact of the food-price shock on select groups may endure after prices drop. Households in extreme poverty may sacrifice productive inputs to purchase food, reducing their earning potential in the following year. For example, in Yemen 10 percent of surveyed farmers consumed seed stocks reserved for the following year (World Food Program, 2008). Some poor households are undoubtedly forgoing spending on health and education in order to feed themselves, ultimately sacrificing the productivity of future generations. The same study in Yemen revealed that 39 percent of surveyed households decreased expenditures on health (World Food Program, 2008).

What are the food security implications for Arab countries with different resource endowments and fiscal balances?

Exposure to food price and quantity risk is a function of dependence on cereal imports and fiscal balances. Arab countries are price takers and import dependent because they produce a relatively small share of world cereal, exposing them to substantial price and quantity risk. Price risk is the risk that cereal prices will be prohibitively high, making purchase difficult even though quantity is available on world markets. Quantity risk is the risk of food not being available, even

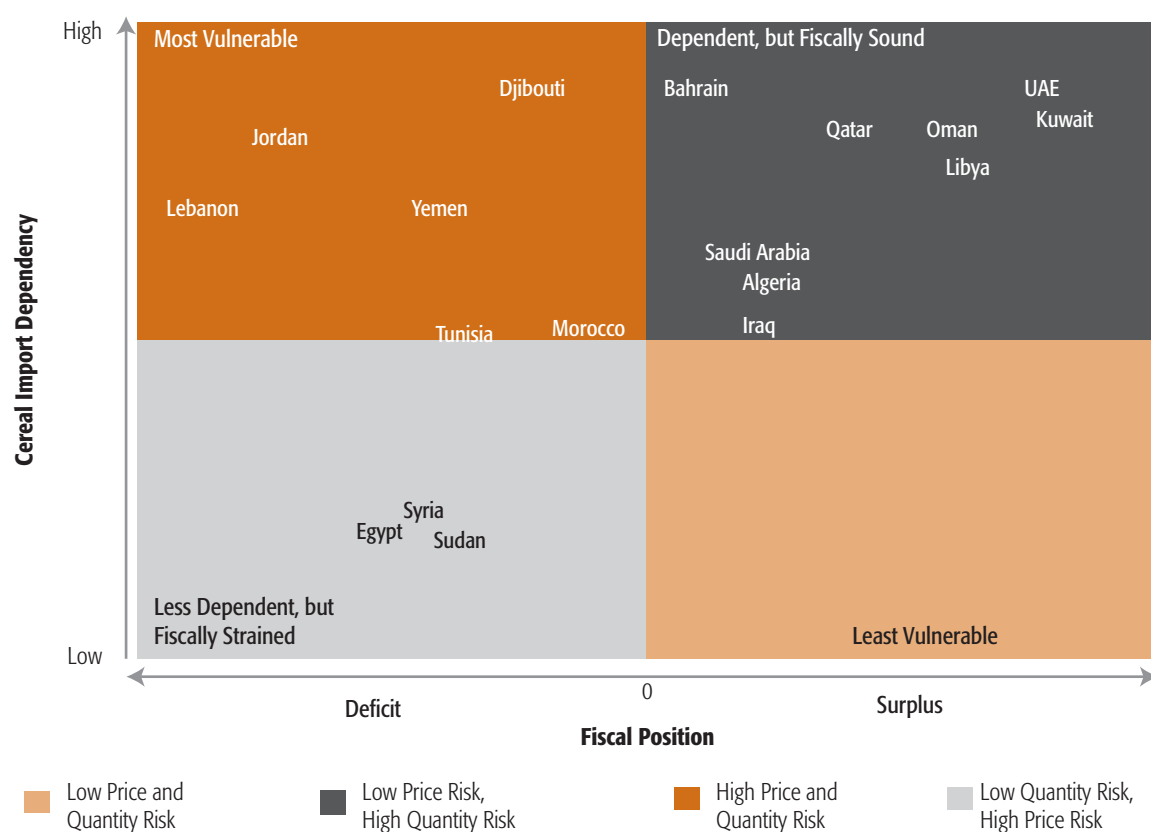
if there are sufficient funds for purchase. Figure 2.4 provides some possible combinations of dependence on imported cereals and fiscal balance to measure food price and quantity risk faced by Arab countries. GCC and other countries that are highly dependent on cereal imports but have strong fiscal balances are less vulnerable to price risk because of their strong resource base. However, since these countries depend entirely on food imports, they are concerned about quantity risk that could occur via export bans and other export restrictions like the ones witnessed at the height of the recent shock.

GCC countries are most vulnerable to food-price shocks when oil prices are low and food commodity prices are high. Low oil prices weaken fiscal balances of oil-rich nations, making it harder for them to handle high food commodity prices.¹¹ Cyclical factors (e.g., a decrease in demand due to the financial crisis and high oil prices) are contributing to the recent decline in oil prices, reducing income for the oil exporters. Structural factors driven by Western concerns about energy security and global warming may contribute to a longer-term slump in oil prices. These factors could decouple oil and food commodity prices, making it more difficult for oil-rich countries to offset terms of trade losses.¹²

¹¹ Depletion of oil reserves may also substantially reduce the extent to which current oil exporters are shielded from the negative fiscal impacts of high food prices.

¹² Terms of trade losses occur when a country's balance of trade deteriorates. This is a long-term risk for oil-rich countries since fossil fuel substitutes remain relatively expensive. The oil-rich countries can mitigate vulnerability by using current oil revenues to diversify their economies so that they are not so dependent on oil revenues in the future.

Figure 2.4: Arab Countries with High Cereal Import Dependency and Large Fiscal Deficits are Most Vulnerable at the Macro Level (2007 Fiscal Balances—percentage of GDP, 2005 Cereal Balances – metric tons)*



Source: Authors. Adapted from FAO, 2008b; IMF, 2008; World Bank, 2008b.

Note: Cereal import dependency is measured by net cereal imports/total cereal consumption.

* 2007 fiscal balances were drawn from the IMF. The most recent FAOSTAT data on cereal balances is for 2005.

Djibouti, Yemen, Morocco, Jordan, Tunisia, and Lebanon are most vulnerable to food-price shocks because they face both high quantity and high price risk.¹³ Price risk is a problem because weak fiscal balances constrain government financing options. Quantity risk is a problem because of high dependence on imports. These countries may need external support in addressing food security because they lack the fiscal resources to handle shocks.

¹³ In Tunisia, for example, it is estimated that food trade balance registered a surplus of 277 million dinars in 2006 and a deficit of 426.8 million in 2007 and the import coverage went down from 121 percent to 79 percent. In terms of quantities, the country imported 296,600 metric tons of wheat in January and February 2008, 11.8 percent less than in the same period of 2007, but the value was two times as much. Moreover, the disbursements of the Caisse de compensation reached 575 million dinars in 2007 against 321 million dinars in 2006, corresponding to 1.3 percent of GDP.

Sudan, Egypt, and Syria face low quantity risk and high price risk. Price risk is a problem because weak fiscal balances constrain government financing options. Quantity risk is not as much of a problem because these countries are less dependent on imports. Although these countries are less dependent on cereal imports, they all have food-subsidy programs that weaken their fiscal balances. Chapter 4 presents some strategies that can be used to bring down the cost and improve the effectiveness of these programs.

No Arab country is protected from future food-price shocks. Each country needs to assess how much price and quantity risk they can tolerate, and how much they can afford to mitigate, in order to devise a risk management strategy to mitigate the impact of future price shocks. Such a strategy will consist of a combination of addressing the growth in the demand for food, increasing production of food, and managing exposure to volatility in commodity prices. At the same time, countries can reduce fiscal pressure by designing more efficient safety nets.



Food Security in the Future: Import Dependency is Projected to Increase

While the future of world food prices is unknown, economic models show that food demand will outpace supply in Arab countries, leaving them much more vulnerable to food-price shocks than other regions. Policy-makers need to develop a comprehensive strategy that balances the risks associated with imports with the costs associated with increasing domestic production. Key messages of this chapter are:

- » Forward-looking global economic models project that consumption of cereals and meat in Arab countries will continue to outpace production, leading to increasing dependence on food imports.
- » Many factors contributing to the recent food-price shock appear to be more severe and enduring in Arab countries than elsewhere.
- » A three-pillar strategy to address food security in Arab countries includes strengthening safety-nets and education to cope with rising consumption, enhancing agricultural productivity and rural livelihoods through cost-effective investments, and reducing exposure to market volatility.

What do forward-looking models tell us about food security in Arab countries?

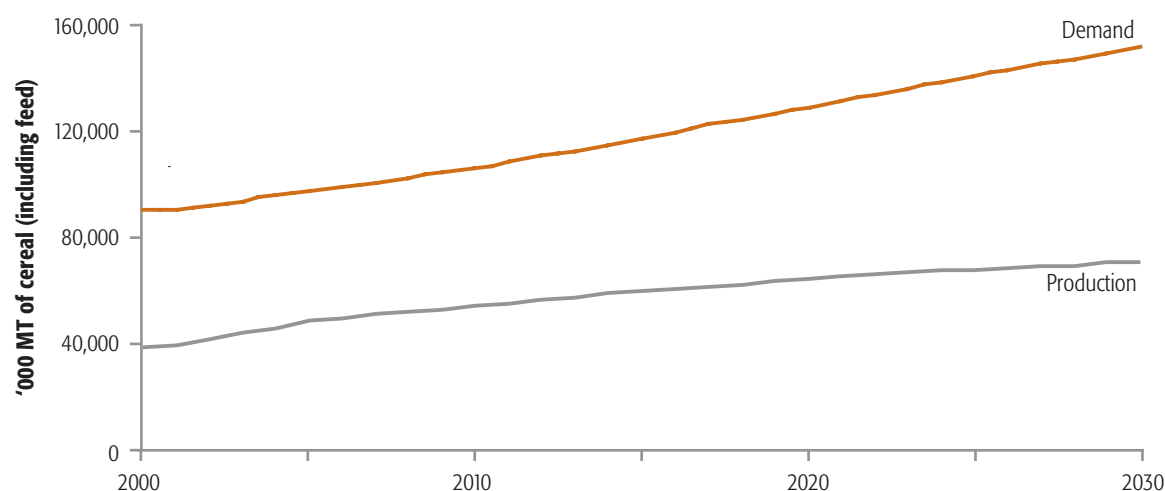
Two forward-looking economic models project that demand for food in Arab countries will grow substantially to the year 2030. The IMPACT¹⁴ model, created by IFPRI (2008a), and an FAO model (2006a; 2008d) are both food-balance models that project future food demand and supply throughout the world.¹⁵ The two models provide strikingly similar results for Arab countries except for Sudan despite using different methodologies.¹⁶ Both models project that demand for food in Arab countries will grow substantially to the year 2030 and beyond, and production will not be able to keep pace, resulting in increasing dependence on imported food.¹⁷ This suggests that, unless

¹⁴ International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT).

¹⁵ The projections presented in this paper are from the IMPACT model unless otherwise indicated.

¹⁶ The IFPRI and FAO models produce conflicting results for Sudan and whether it will be a net importer or net exporter of cereals. The IFPRI model results are used in all aggregate projections for the region, and both sets of projections are used when focusing on Sudan individually.

¹⁷ The IFPRI model goes to 2030 while the FAO model goes to 2050.

Figure 3.1: Cereal Demand Far Outpaces Domestic Production in Arab Countries

Source: Authors. Adapted from IFPRI, 2008.

Note: Includes Sudan; MT is metric tons

mitigating measures are adopted, Arab countries will become more and more vulnerable to global food-price shocks.

Dependence on cereal imports will increase by almost 64 percent, exacerbating food deficits in most Arab countries. Total cereal demand in Arab countries will increase from 2000 levels of about 84 million metric tons to nearly 142 million metric tons by 2030. With increased investment in agriculture and technological innovation, cereal production has the potential to increase from estimates of 37 to 69 million metric tons over the same time frame.¹⁸ The total amount of imported cereal required by the region is therefore expected to rise 55 percent from 47 to 73 million metric tons by 2030 (Figure 3.1).

Net cereal imports vary depending on population growth and availability of land and water resources. In some Arab countries cereal imports

will double, whereas in others they will remain constant or decrease. All, with the exception of Sudan, will remain net cereal importers through 2030 and beyond (Table 3.1). The primary driver of increasing net cereal imports in the model is population growth, with income growth playing a smaller role. Egypt will increase its cereal imports 138 percent from 2000 to 2030, far more than any other country in the region. Morocco is the only country that will decrease cereal imports (by 17 percent).¹⁹

¹⁸ Although land and water are very constrained, increases in agricultural productivity are the norm, even if they are slowing. Over time, new technologies are created and adopted by more farmers, increasing production. These increases, however, will not be able to keep up with projected demand.

¹⁹ Production data from the FAO (2008b) shows that Morocco made a leap in production from 2000–2003 then slowed. Most of the decrease in projected Moroccan cereal imports therefore has already taken place, and from now on their import requirements will increase.

Table 3.1: Arab Countries Will Increase Their Cereal Imports by Varying Degrees (IFPRI Baseline Assumptions)

Sub-region and country		Projected population growth, 2000–2030 (percent)	Projected income growth, 2000–2030 (percent)	Renewable water resources/capita, 2005 (cubic meters)	Projected increase in net cereal imports, 2000–2030 (percent)
Arabian Peninsula ¹		105	190	145	89
Northeast Africa	Djibouti	68	200	378	69
	Egypt	59	168	788	137
	Somalia	118	167	1,787	48
	Sudan	66	254	1,780	—
Mashreq	Iraq	95	24	3,688 ²	48
	Jordan	74	238	163	61
	Lebanon	30	186	1,259	52
	Syria	78	189	1,379	98
Maghreb	Algeria	47	210	355	18
	Libya	57	211	103	72
	Morocco	45	193	921	–17
	Tunisia	29	200	455	4

Source: IFPRI, 2008; FAO, 2008b

¹ Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, UAE and Yemen.

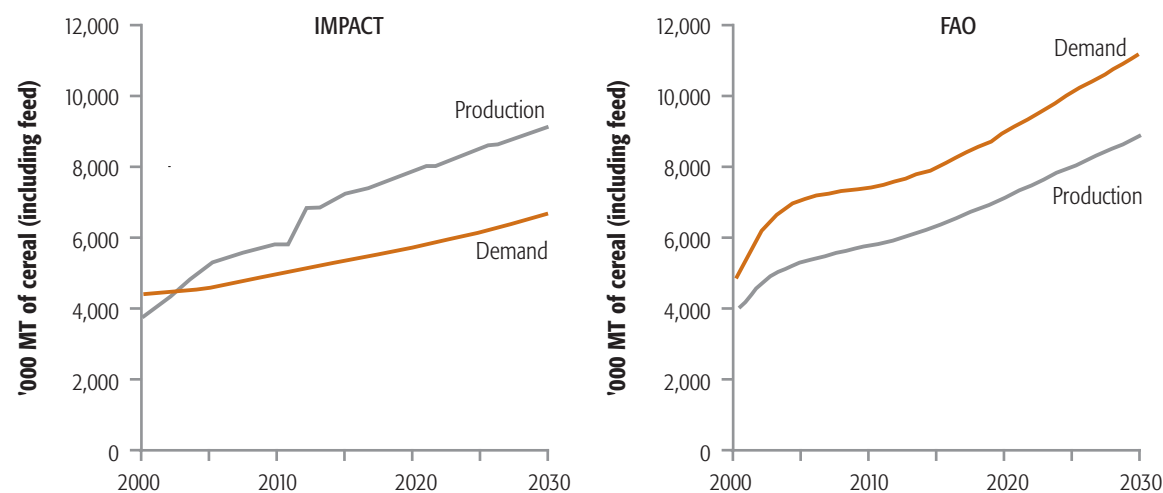
² 1995 data used.

— = Not available.

Meat and milk consumption will also rise. Meat consumption will increase by 104 percent and milk consumption will increase by 82 percent. Increases in consumption of animal products will be more pronounced in oil-rich countries—nearly doubling from 2000 to 2030—driven by surging income and population growth. This will lead to substantially greater dependence on imports of these products in the future. Non-oil-producing countries will also increase meat and milk consumption, but have the natural resource endowments necessary to

produce enough to keep imports near current levels.

Increasing demand for meat and milk further raises vulnerability to cereal price shocks. Consumption of meat and milk will rise faster than consumption of cereal, and this is reflected in the makeup of cereal demand. Cereal demand for human consumption is projected to increase by about 50 percent from 2000 to 2030 whereas for animal feed it will nearly double. This trend is consistent for oil-producing and non-oil-

Figure 3.2: Sudan's Potential as the Breadbasket for Arab Countries Is Uncertain

Source: Authors. Adapted from IFPRI, 2008; FAO, 2008d.

producing countries. Without appropriate investment in yield-increasing technology, rapid expansion in animal production may come at the expense of future crop production.²⁰

Sudan holds 30 percent of arable land in Arab countries, but is far from becoming a breadbasket for the region. The IMPACT and FAO models have similar production projections for Sudan, but the two models differ in terms of domestic consumption. IMPACT projects low domestic demand and net cereal exports. FAO projects higher domestic demand than IMPACT, which will keep Sudan a net cereal importer into the foreseeable future (Figure 3.2). In 2005, the last year for which data is available, Sudan was still a net importer, satisfying only 71 percent of its cereal consumption.

Sudan's potential as a breadbasket for the region depends on massive improvement in productiv-

ity and infrastructure. Currently, cereal yields in Sudan are very low (FAO, 2008b). This is partially due to the pervasiveness of rain-fed agriculture, and partially to low farm-level investment. If Sudan's underachievement in productivity is dramatically improved, the country could become a major source of cereals for other Arab countries (Dubai School of Government, 2008). Neither of these models factor in a potential large infusion of foreign capital into Sudanese agriculture and infrastructure (transport, irrigation canals, marketing infrastructure, etc.). While it is clear that Sudan will not be able to feed all Arab countries, there is potential for foreign investment to dramatically increase

²⁰ These consequences are not accounted for in the model but should be considered. Livestock integrated in cropping systems can damage soil through compaction and preclude the adoption of some forms of conservation agriculture.

production through vertical as well as horizontal expansion. This is discussed in greater detail in Chapter 5.

A global economic downturn will have little impact on the likely increase in food imports.²¹ Under a “low investment and growth” scenario,²² the IMPACT model projects that cereal demand (feed and food) in Arab countries in 2030 would be 7 percent lower than under the baseline scenario, meat demand 8 percent lower, and milk demand 15 percent lower. Cereal and milk production would also decrease, but not by as much as demand. As a result net cereal imports would be 7 percent lower and net milk imports 25 percent lower than under the baseline scenario. Meat production would fall more than meat demand under the low-growth scenario, leading to a 14 percent increase in net imports.

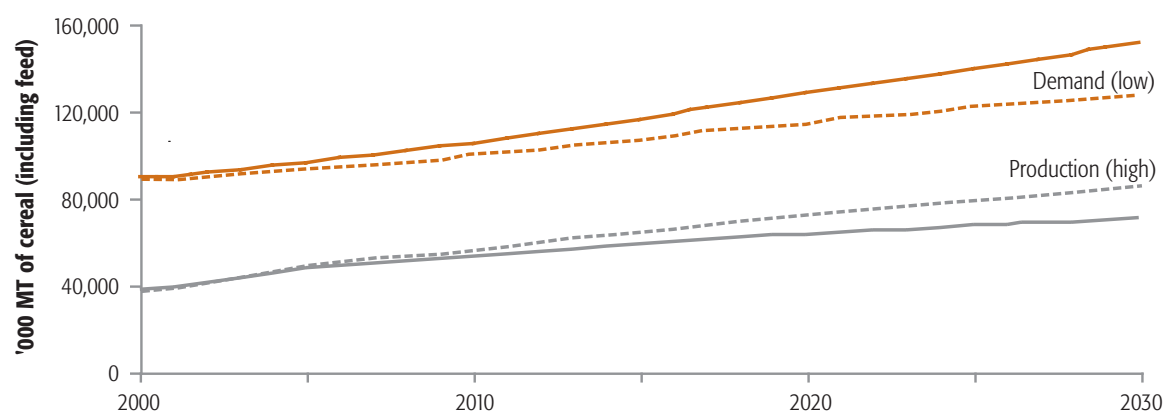
The challenge for the future is to find the best ways to improve food security, while recognizing that there will be a continued and increasing dependence on imports. The projections on the future of the food balances of Arab countries suggest three critical strategies or “pillars” that each country can use to develop a plan to decrease vulnerability to food-price shocks and enhance food security. The first pillar is coping with rising consumption by strengthening safety nets, providing better access to family planning services, and promoting education. This is the topic of Chapter 4. The second is making cost-effective investments in order to enhance agricultural productivity and rural livelihoods. This is the focus of Chapter 5. And the third is reducing exposure to market volatility, which

is explored in Chapter 6. Figure 3.3 illustrates how these three pillars work together to improve national food security: Managing overall consumption levels helps address long-term concerns that sufficient supplies may not always be available on world markets (quantity risk) and the potential burden of high food commodity prices (price risk). Increasing domestic production will reduce quantity risk but will not dampen price shocks because Arab countries account for only a small share of world cereal production. Smoothing exposure to market volatility by better management of imports, through the instruments described in Chapter 6, will improve price risk management but will not address quantity risk concerns. Together, these three pillars will create an overall strategy that will mitigate the effects of future food-price shocks.

²¹ This particular “low growth” scenario was created before the recent global financial slowdown. It is a broadly pessimistic long-term outlook, incorporating decreased overall economic growth and agricultural productivity growth due to climate change. In contrast, the recent global financial slowdown is expected to be a short-term period (1–2 years) of slow growth. Once more is known about the effects of the recent global slowdown on agricultural productivity, a more appropriate “low growth” scenario can be created. The analysis in this report therefore reports the model results under the baseline scenario.

²² The implementation of the low agricultural growth scenario assumes that worldwide GDP growth is 0.3 percentage points lower than the baseline (3.06 percent p.a. as opposed to 2.86 percent p.a.). This scenario also assumes a reduction in worldwide numbers growth for livestock by 20 percent and a reduction in animal yield by 20 percent. Finally, the scenario assumes a reduction in worldwide crop yield growth by 40 percent as well as a reduction in worldwide oils- and meal-production by 20 percent (IFPRI, 2008a).

Figure 3.3: Demand Management and Production Enhancement Both Reduce the Import Burden and Vulnerability



Source: Authors. Adapted from IFPRI, 2008a.

Note: Dashed lines were generated by decreasing demand by an additional 0.5 percent each year and increasing production by one percent each year. These lines are purely demonstrative and do not come from the model.



Improving Food Security with Safety Nets, Family Planning Services, and Education

The first pillar of the food-security strategy addresses increasing domestic demand for food. Food-price shocks will be particularly catastrophic for the youngest generation in Arab countries if they lead to reduced household investment in health, nutrition, and education. High food prices may force poor households to reduce food consumption, leading to malnutrition, wasting, and stunting. Children may be forced to drop out of school because their families can no longer afford the cost of books or school fees. A burgeoning population could be one of the region's greatest assets, and every opportunity must be taken to ensure that it does not turn into a liability.

Effective safety nets are crucial to preventing a lost generation due to inadequate investments in health, nutrition, and education. But creating safety nets that provide the appropriate assistance to those who most need it in a financially sustainable manner requires improved targeting and flexibility, so that they can be scaled up when shocks strike and scaled down when they recede. Of course there are serious political risks involved with safety net reform, as illustrated by recent riots in Egypt in response to shortages in subsidized food. Another method of minimizing the damage of food-price shocks

involves providing people with better access to family planning services and educating them, particularly the women and children, about the consequences of an unhealthy diet. Key messages of this chapter are:

- » Strengthening safety nets is critical to protect those most in need.
- » Providing people with access to family planning services and educating them about the consequences of an unhealthy diet can provide sustainable benefits.
- » Adopting a multi-pronged strategy that includes measures such as food fortification can help reduce the prevalence of malnutrition.

What long-run consequences can food-price shocks have on education, health, and nutrition?

Shocks can lead the poor to reduce food consumption, which could increase the prevalence of malnutrition. The recent food-price shock is associated with an additional 4 million undernourished people in Arab countries (FAO, 2008f). Judging by both stunting and wasting indicators, Yemen is one of the ten countries in the world

most affected by this increase in malnutrition, and is the most affected Arab country. The most recent data from the World Health Organization indicate that 58 percent of Yemeni children under the age of five are stunted and 41 percent are underweight (WHO, 2008a). In Djibouti the problem is also grim: 39 percent of children under the age of five are stunted and 26 percent are underweight. Households that respond to price shocks by reducing calorie intake or by shifting consumption away from healthy foods to cheaper, less nutritious foods increase their exposure to health risks such as malnutrition (FAO, 2008f). Childhood malnutrition diminishes adult intellectual ability and work capacity, causing economic hardships for individuals and their families (Caulfield et al., 2006).

Shocks can also lead the poor to reduce investment in human capital. Lower-income household responses to sustained high prices may include disinvesting in the future of young people. For example, poor families may discontinue preventative health care, withdraw children from school to generate additional income or reduce costs, and replace well-balanced diets with less expensive, less healthy staples (Benson et al, 2008). Newspapers in Egypt have reported that the poor are beginning to shift consumption to cheaper food with lower nutritional content. Some families are also reducing expenditures on education and health services. In Yemen, there are informal reports that poor households are taking children out of school and putting them to work.

Certain kinds of general food subsidies may eventually raise long-term health costs. Subsidized foods that are made available to all

sectors of the population may encourage overconsumption by those above the poverty line. For example, subsidies on unhealthy foods such as sugar and cooking oil can make a balanced diet less attractive because unhealthier alternatives become more affordable (Alston, Sumner, and Vosti, 2006). Obesity, high intake of animal fat, and low intake of dietary fiber are risk factors for chronic non-communicable diseases such as coronary disease, diabetes mellitus, and colon and breast cancer (National Research Council, 1989). If across-the-board food subsidies do cause increasing rates of obesity in Arab countries, the costs of addressing this problem may eventually become a major concern.²³ To prevent this, Arab countries can start implementing nutrition interventions to prevent diet-related diseases. For example, obesity-related medical expenses accounted for 9 percent of total U.S. medical expenditures in 1998, and may have reached as high as \$93 billion (2002 dollars) (Finkelstein, Fiebelkorn, and Wang, 2003). Egypt, where approximately 45 percent of the population is considered obese, is the Arab country most at risk (WHO, 2008b). With obesity rates higher in Egypt than in the United States, where obesity is at 32 percent, Egypt's medical expenditures could soon skyrocket. While it is uncertain that Egypt's broad bread and sugar subsidies are contributing factors to its obesity rate, it is certainly a possibility that merits further exploration.

²³ It takes 15 to 20 years before the increase in body weight is followed by the onset of diabetes and another 5 to 15 years before diabetes causes more serious complications such as renal failure, blindness, and amputations.

Table 4.1: Arab Countries Have Used Various Economy-wide Policies and Existing Social Protection Programs to Address the Recent Price Shock.

Country	Economy-wide Policies				Existing Social Protection Programs			
	Reduce taxes on foodgrains	Increase supply using foodgrain stocks	Export restrictions	Price controls/ Consumer subsidies	Cash transfer	Food for work	Food ration/ stamp	School feeding
Egypt			✓	✓	✓		✓	
Morocco	✓	✓		✓				✓
Tunisia	✓	✓		✓	✓			
Yemen		✓	✓	✓	✓			
Lebanon	✓			✓				✓
Syria	✓	✓		✓	✓		✓	✓
Jordan	✓			✓	✓			✓
WBG	✓				✓		✓	✓
Iraq	✓	✓	✓	✓	✓		✓	
Djibouti	✓			✓		✓		✓

Source: World Bank, 2008b.

Note: WBG is West Bank and Gaza

What measures are Arab governments employing to respond to the recent price shock, and what are the limitations of these measures?

Arab governments are responding to the recent price shock with a combination of trade policies, wage increases, and safety-net programs that will be difficult to scale back. Trade- and tax-policy changes have been a common initial response, aimed at increasing food security and controlling consumer prices. Morocco recently reduced wheat tariffs substantially and provided subsidies to wheat importers. It also maintained price controls on wheat, flour, and bread and

reduced taxes on food grains. Egypt banned rice exports to try to shield domestic consumers from high world prices. Syria imposed export restrictions and reduced taxes on food grains. Djibouti eliminated consumption taxes on several food staples and is providing limited food assistance to rural families through donor support. Tunisia reduced taxes on wheat and is keeping price controls on strategic staples. Yemen is temporarily providing wheat subsidies, and Jordan is maintaining bread subsidies.²⁴

²⁴ Jordan eliminated other food and energy subsidies as part of a broader reform.

Public-sector wages have been increased in several countries, including Jordan, Egypt, Syria, Yemen, Saudi Arabia, and Oman, although these increases are largely intended as compensation for both higher energy and food prices. Some countries have used cash transfers to increase the purchasing power of the poor.²⁵ Egypt recently expanded its small cash-transfer program, and Yemen has created a workfare program building on an infrastructure-based social fund and is reforming and expanding its cash-transfer program. One consequence of some of the actions taken so far, however, is that they will be difficult to remove or scale back. Increasing public-sector wages is a permanent and untargeted response, fueling inflationary pressure. When recipients become accustomed to the benefits of maintaining or, as in the case of Egypt, expanding food subsidies or rations, it can be very difficult to remove them, even if market prices fall. In the wake of the recent global financial and economic crisis, Arab governments are expected to reduce food subsidies further in light of pressures to expand public expenditures to stimulate the economy.

Food subsidies are popular, but have substantial drawbacks. Many countries in the region rely heavily on food subsidies as the primary safety net, including Egypt, Jordan, Syria, and Morocco, among others. In-kind food subsidies are particularly popular and many countries have expanded these subsidies in response to the recent price shock. While energy subsidies constitute by far the largest safety-net component in most countries, food subsidies absorb up to 2 percent of GDP in some cases (Figure 2.3).²⁶ Subsidies have several disadvantages. First, they divert significant resources from alternative,

more productive uses. Second, when they are not targeted, they are unnecessarily expensive, because most benefits are captured by the non-poor.²⁷ And third, in-kind food distribution systems entail heavy administrative overhead and substantial wastes due to storage losses, and they encourage corruption, waste, and leakage of food to non-human uses.

Existing safety nets do not reach those most in need. Programs need to be targeted to the poor because they are most affected by price shocks, spending proportionately more on staple foods. Most cash-transfer programs in the region are small, amounting to less than 1 percent of GDP in most cases.²⁸ Most programs use categorical targeting approaches. Households and individuals are entitled to benefits if they fall into eligible categories, such as single mother, widow, unemployed, elderly, or disabled. These categories are not limited to the poor, and do not necessarily cover the poorest sectors of the population. For example, Egypt's social-

²⁵ Cash transfers can be unconditional, given to everyone who qualifies based on predetermined criteria, or conditional, where cash is given in exchange for behavior modification (e.g., sending children to school).

²⁶ In 2006–2007, energy subsidies were more than 11 percent in Syria and 7 percent in Egypt.

²⁷ Yemtsov (2008) estimates that in Egypt a person in the poorest quintile receives 3 times less in terms of subsidies than someone from the top 20 percent of the distribution and in Morocco the poor are receiving only 10 percent of what the government spends on universal price subsidies, while 90 percent goes to subsidized goods consumed by the non-poor.

²⁸ Less than 0.1 percent of GDP was spent on cash transfer assistance in Egypt in 2005; Morocco spends about 0.6 percent of GDP on cash transfers, The National Aid Fund in Jordan accounted for between 0.6 and 0.7 percent of GDP between 2002–2005.

assistance program covers less than 12 percent of the poor and has a benefit leakage rate to the non-poor estimated at between 48 and 60 percent in 2008 (World Bank, 2008n). In Yemen in 2005, the Social Welfare Fund cash-transfer program reached only 13 percent of the poor population. Of those who received transfers, 70 percent were not in the target group. The National Aid Fund in Jordan covered less than 20 percent of the eligible population in 2005, and of those who received aid, only 14 percent were actually eligible.

How can Arab countries manage demand to mitigate the consequences of price shocks?

Improve the design of safety nets to dampen the effects of food-price shocks and prevent them from doing permanent harm. Simulations indicate that a sharp drop in poverty headcount, depth, and severity would be possible in many countries of the region if the current system of categorical transfers is replaced with transfers targeted through a proxy-means test²⁹ coupled with geographic targeting (World Bank, 2009). Proxy-means testing typically does well in identifying the chronic long-term poor. By increasing the budget dedicated to such programs away from generalized subsidies, the impact on poverty reduction can be substantially increased. Most Arab countries have the household data sets required to establish the necessary targeting formula, and many are already adopting or considering this approach.

Employ cash transfers, because they may be more cost effective than in-kind subsidies. In

comparison to in-kind subsidies, cash transfers do not distort commodity markets, typically have lower administrative costs, are amenable to payment systems that limit fraud and diversion of benefits, and allow beneficiaries sovereignty over what is purchased.³⁰ Most countries in the region have at least one cash-transfer program that could be adapted and scaled up to become a significant safety net. Conditional cash transfers are a program option that could foster human capital development and help break the cycle of poverty.³¹ For example, transfers could be made conditional on a child attending school.³² Brazil's Bolsa Familia and Mexico's Progresa/Oportunidades are examples of successful large-scale conditional cash-transfer programs.

Strengthen program coordination and enhance payment mechanisms to improve resource efficiency. At the policy level, program coordination

²⁹ Proxy-means testing involves determining a set of observable characteristics that are correlated with poverty to identify the eligible population without relying on direct income measures.

³⁰ However, there are concerns that the shift from in-kind food subsidies to cash transfers could have negative gender implications given that the male head of household normally receives the transfers, and he may not necessarily give as much priority to food purchases and nutrition as women would do (FAO, 2006c).

³¹ Cash assistance is provided to poor families conditional on behavior, often including keeping children in school and maintaining health regimes. The cash helps reduce poverty in its own right and compensates families for the opportunity cost of changing behavior; the changed behavior is expected to contribute to long-term human capital development for the young.

³² The World Food Programme (WFP) in Yemen has introduced school-feeding programs targeting girls' schools, which had a significant impact in enticing parents in several rural communities to send their daughters to school (IRIN, 2005).

needs to be improved to reduce overlapping beneficiaries and mandates that waste resources. For example, safety nets in the West Bank and Gaza are provided through a complex web of programs supported by the government, international donors, NGOs, and charitable organizations, some of which have the same target populations. At the program level, improvements can be made in the payment mechanisms used to distribute benefits, and in administrative operations and staffing. Egypt is piloting an electronic “smart” card for its ration system that will eventually include cash transfers and other benefits such as health insurance. The smart card can be used to track and distribute benefits through banks. However, smart-card implementation may be more difficult to deploy in rural areas, where limited education and access to infrastructure may reduce usage rates.

Implement safety nets that are flexible enough to be scaled up when shocks strike and scaled down when they recede. This is important because scalability enables relief for the vulnerable when prices are high and a reduction in the fiscal burden when prices are low. If possible, existing targeted cash-transfer programs should be the prime candidates to be scaled up. These include poverty-focused social assistance, as well as social pensions, unemployment assistance, and disability pensions. Where public workfare is already part of the safety net, it may be useful to expand program reach. The next most desirable candidate would be food stamps or other near-cash assistance that could be targeted and scaled up or down. Direct subsidies and food distribution would be the least desirable option, only advisable when food markets are functioning poorly or when subsidies are the only available safety net.

Provide people with better access to family-planning services. Arab countries have among the highest population growth rates in the world. The combined population of Arab countries was 73 million in 1950 and, at 333 million, is over four times greater today. It will nearly double again by 2050, increasing to approximately 600 million. A growing young population requires access to sufficient resources to maximize its contribution to society. However, a rising population also adds to the growing need for food imports. It drives up public food-subsidy bills, which can be significant when they are for basic goods and services that everyone in the population uses. Higher incomes, urbanization, and education are often identified as key factors contributing to long-term reductions in birth rates. However, access to family planning services has proven to be very effective in speeding up long-term demographic trends. Demographic trends and widespread access to family planning are already having significant impacts on reducing population growth rates in several Arab countries such as Tunisia, Lebanon, Morocco, Algeria and Egypt. The widespread provision of family planning services in Arab countries that continue to have high population rates, such as Yemen, Jordan and Mauritania, could have significant long-term benefits for a range of socio-economic issues, including food security.³³

Educate families about the benefits of a well-balanced diet to sustain long-term health benefits. A well-balanced diet rich in vitamins and minerals and high in fiber can help reduce the

³³ With its current population growth rate of 3 percent per year, Yemen's population is projected to increase from 21 million today to 58 million by 2050.

risk of health problems such as malnutrition and non-communicable diseases. As incomes increase, diets will improve. Nonetheless, the trend towards diet diversification can be accelerated through education programs targeting children, who are the consumers of today and tomorrow, and women, who play a key role in determining the composition of household diet. A primary objective of such programs would be to inform families about the nutritional composition of staple foods. For example, estimates indicate that approximately 40 to 45 percent of the nutritious value of white flour products, from vitamins to fiber, is lost during bleaching and other processes (The North African Journal, 2008). Nutritional education programs could highlight the nutritional benefits of consuming whole wheat flour products over white flour products.

Adopt a multi-pronged strategy to help reduce the prevalence of micronutrient malnutrition. Iron, iodine, and vitamin A deficiencies are among the most important nutrition-related health concerns facing Arab countries today. Anemia, often caused by iron deficiency, reduces the learning capacity and compromises the immune system of children and lowers the productivity of adults. Many Arab countries have used dietary supplements and food fortification to address these micronutrient deficiencies. While the fortification of salt with iodine has been

successful in many countries, the fortification of flour with iron has not shown an impact in reducing anemia as indicated by the results of follow up studies in the region.³⁴ Such interventions have been criticized for being unsustainable and for not reaching those that need them most, especially resource-poor families in rural areas. In addition, anemia can be caused by multiple factors, and the contribution of iron deficiency to overall anemia figures in Arab countries has not been reported.³⁵ A multi-pronged strategy to reduce micronutrient malnutrition might include management of infectious disease, deworming, promotion of breastfeeding, nutrition education, and dietary diversification in addition to supplementation and fortification when evidence is supportive of such interventions. In recent years, there has been a growing interest in breeding bio-fortified varieties of staple crops as a primary tool to fight micronutrient malnutrition. Such an approach has not yet been taken up by Arab countries and might be an option for some to pursue for combating micronutrient malnutrition.

³⁴ See, for example, the studies in Bahrain (Ministry of Health Kingdom of Bahrain, 2003).

³⁵ Causes of anemia can include: blood loss, hookworms, low dietary intake of iron, high intake of iron absorption inhibitors, vitamin B12 deficiency, folic acid deficiency, sickle cell disease, thalassemia (most Arab countries lay on the thalassemia belt).



Optimizing Investments to Increase Productivity and Profitability

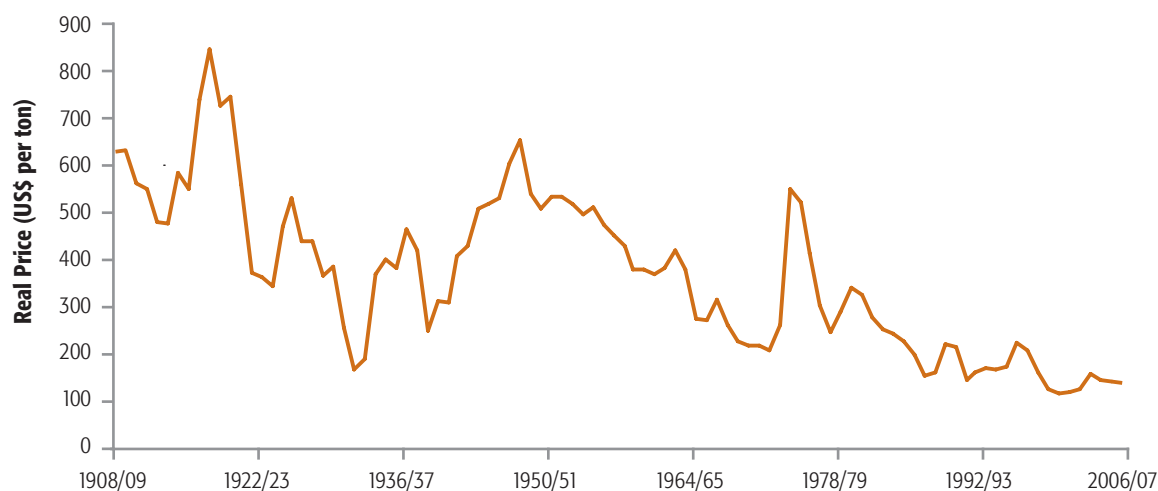
Increasing agricultural productivity is the second pillar of the food-security strategy. Higher productivity can increase the purchasing power of the rural poor, increase foreign-exchange earnings, and reduce import dependence.

Food production in Arab countries is limited by scarce land and water resources. There is little room for expansion of arable land or irrigation, so the emphasis must be put on increasing productivity in terms of yields and value per unit of land and water. Increasing productivity requires investment in research, extension, and technology transfer. Key messages of this chapter are:

- » Increasing productivity is the critical counterweight to increasing demand for food and production constraints.
- » Investment needs to be targeted to ensure that water is put to its highest-value use.
- » Research and development can lead to new technologies that will drive up productivity.
- » Investments in rural livelihoods will help rural communities make the most of their resources.

What role will productivity play in addressing increasing demand for food in Arab countries?

Productivity gains will remain the critical counterweight to increasing demand for food. The evidence presented in Chapter 1 suggests that there are a number of persistent structural factors that may keep agricultural commodity prices high in the future. However, it may be possible to gain more insight into what the future holds by looking back at the last 100 years of wheat prices (Figure 5.1). Since the early 1900s, real wheat prices in the United States have trended downward, driven by expansion and technological change. In the 19th and the first half of the 20th century, this increase in productivity was primarily due to an expansion of the area planted. In the second half of the 20th century, the increase came mostly from intensification arising from investment and ingenuity (Evans, 1998). While agricultural land continues to expand, the rate of expansion has been slowing. Similarly, decompositions of productivity gains point to research and development as major causes of growth since the 1960s. The green revolution provided productivity gains that eased high food prices after the 1970 oil shock.

Figure 5.1: Historically, the Price of Wheat Has Gone Down

Source: U.S. Department of Agriculture, 2008a.

However, as prices declined through the first half of this decade, so too did worldwide investment in agricultural research and development (World Bank, 2008e).

Can Arab countries expand cultivated area in order to meet their food demand?

Opportunity for expansion of arable land is limited. For most of the twentieth century, arable-land expansion in Arab countries outpaced the global average, but in the 1990s it slowed significantly (Figure 5.2). This slow down was mostly due to urbanization and stiff competition for scarce water resources. Limited land resources and a rapidly growing population may combine to create a troubling future: by 2050, arable land

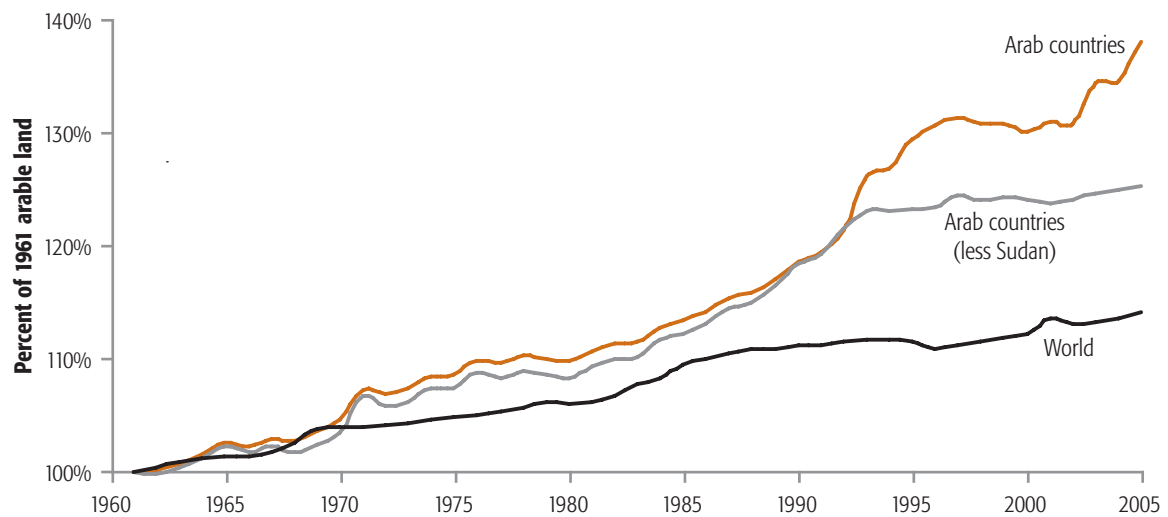
per capita is projected to reach 0.12 hectares per capita, a fall of 63 percent from its 1990s level (FAO, 2008b).

What are the obstacles to and opportunities for increasing productivity?

Productivity in Arab countries lags behind other food-importing developing countries and world averages. Cereal yields are currently at half the world average, and the gap is growing (Figure 5.3).³⁶ In the mid-1980s, productivity growth in Arab countries started catching up to

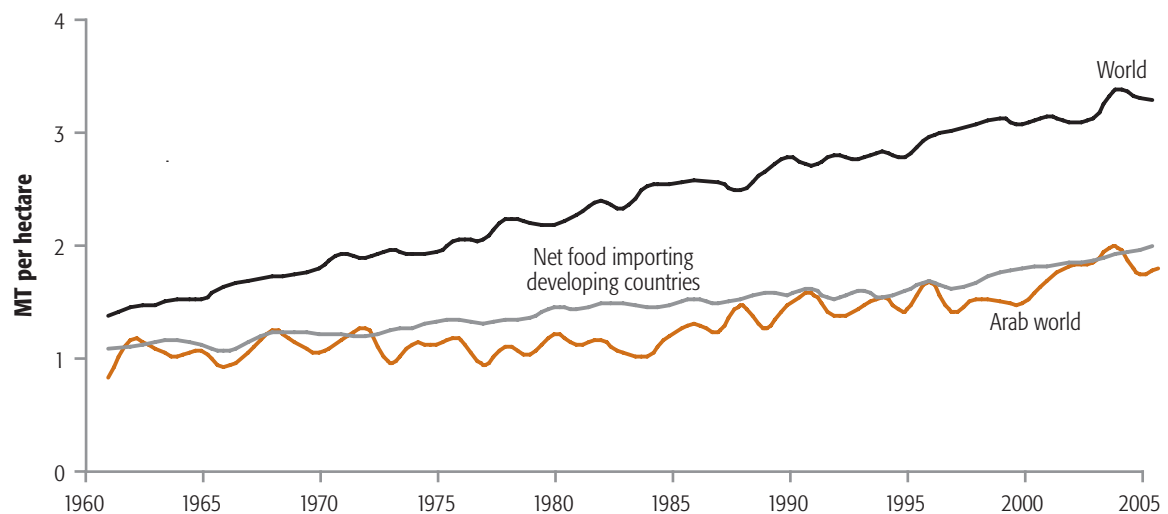
³⁶ Cereals include barley, maize, millet, oats, rice, rye, sorghum, triticale, wheat, and cereals not specified elsewhere.

Figure 5.2: Expansion of Arable Land in Arab Countries Far Outpaced the World Until the 1990s, When Expansion Became Limited to Sudan



Source: Authors. Adapted from FAO, 2008b.

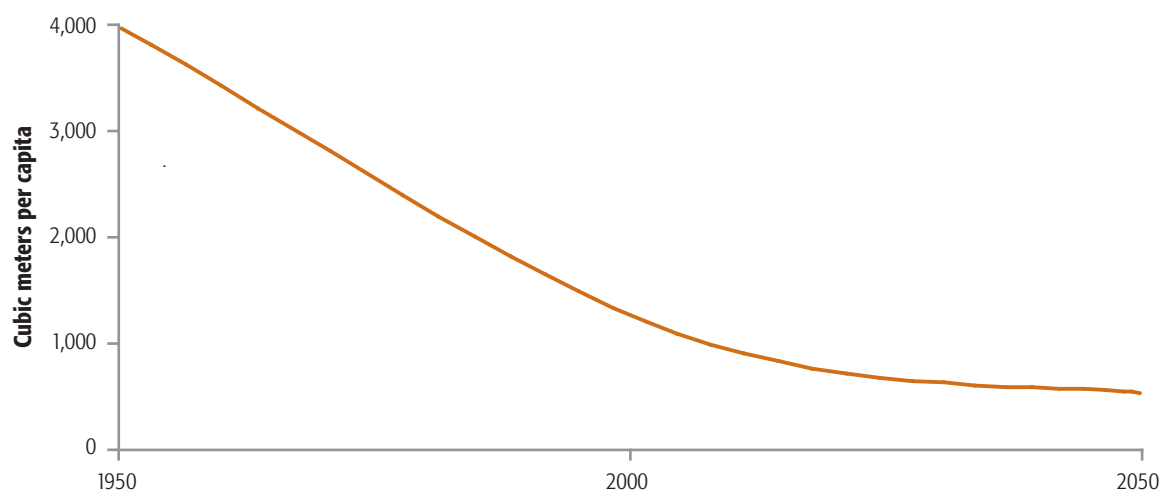
Figure 5.3: Arab Countries' Cereal Productivity Lags Behind World Averages



Source: Authors. Adapted from FAO, 2008b.

other net-food-importing developing countries (FAO, 2008b; Dyson, 1995). This was probably due to the widespread adoption of improved wheat and rice varieties in Syria and Egypt

(Baum, 2004). Recently, however, productivity growth in the region is again falling, while it is continuing to rise for net-food-importing developing countries. Productivity growth in

Figure 5.4: Arab Countries Are Quickly Proceeding from Water Stress to Absolute Water Scarcity

Source: Authors. Adapted from FAO, 2008b.

vegetables also lags behind the global average, but the gap is small, and productivity growth for fruits is above the global average. Low cereal-productivity growth, coupled with binding land and water constraints, causes greater dependence on imports. The main barrier to high productivity is scarce water, but lack of investment in research and in farmers also plays a role.

Water scarcity is becoming more acute and is a major obstacle to increasing agricultural productivity. Increased water use, coupled with growing populations, has made water increasingly scarce in Arab countries. From 1950 to the present, per-capita renewable water resources have fallen by approximately 75 percent. They are expected to decrease by an additional 40 percent from present levels by 2050. (Figure 5.4). This downward trend will probably be accelerated by climate change.

Countries need to take different approaches to address water scarcity depending on their access to and dependence on irrigation. The use of irrigation varies greatly by sub-region (Table 5.1). The GCC are totally dependent on irrigation due to extremely low levels of rainfall.³⁷ In the Mashreq countries (Iraq, Jordan, Lebanon, and Syria), the proportion of irrigated land ranges from 27 to 43 percent of total cropland. Maghreb countries (Algeria, Libya, Mauritania, Morocco, and Tunisia) are much less dependent on irrigation (7 to 18 percent), whereas Egypt and Djibouti are nearly 100 percent irrigated. Although water resources in Sudan are relatively less scarce, the proportion of irrigated land remains less than 10 percent (AOAD, 2007).

³⁷ The IMPACT model includes Yemen in the GCC. Yemen, however, is not totally dependent on irrigation, because rainfall is not as low there as in the GCC.

Table 5.1: Irrigation Use Varies Greatly by Sub-region and Country (2007, except where noted)

Country	Percent total land irrigated	Percent annual land irrigated	Percent perennial cropland irrigated
GCC	100	100	100
Yemen	47	42	65
Djibouti	100	100	100
Egypt	95	97	87
Somalia	—	14	—
Sudan	9	8	99
Iraq	32	27	91
Jordan	31	32	31
Lebanon	41	43	39
Syria	30	32	19
Algeria	17	10	90
Libya	14	11	17
Mauritania	7	6	9
Morocco	18	10	75
Tunisia	8	9	8

Source: AOAD, 2007

— = Not available.

How can Arab countries make the most of scarce water resources?

There is no new water for irrigation, so any agricultural expansion must come from water savings. Non-agricultural water demand is growing rapidly. Today approximately 85 percent of all abstracted surface water and groundwater in Arab countries is already used for irrigation, and this number must decrease.³⁸ Although advances have been made, creating new water for irrigation using desalinization and wastewater recycling is not economically viable for

most agricultural activities. The use of treated wastewater to irrigate food crops can also be problematic, because it often encounters public resistance, although this is changing (World Bank, 2007). Using wastewater for the irrigation of non-food crops should still be encouraged, because it frees up water for other uses. Water harvesting is another way to increase

³⁸ This figure is for the World Bank's Middle East and North Africa Region. It does not include the Arab countries Somalia and Sudan, and does include the non-Arab Iran and Israel.

water supply for irrigation.³⁹ It is important to recognize that desalinization, wastewater recycling, and water harvesting have their limits. Together they could amount to 20–25 percent of abstracted water, but they come at a high cost with limited use.

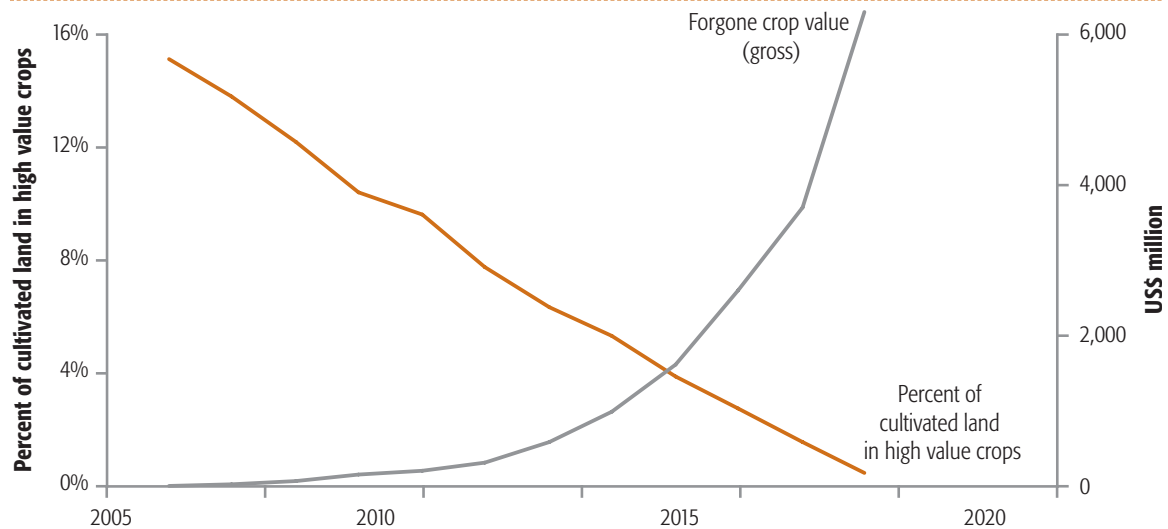
Policies that lower the cost of water to farmers encourage non-beneficial and low-value use. Water and energy subsidies that reduce the price of water encourage farmers not to maximize the value of water (World Bank, 2007). First, water is lost to non-beneficial use when flood irrigation is used instead of water-saving irrigation systems like sprinklers and drip. Second, farmers choose crops with low value added per drop of water. For example, vegetable production yields six times more value added per drop of water than wheat production, and ten times more value added per drop than beef production. In the Maghreb, 40 percent of irrigated land is dedicated to growing cereal; this is less than in the Mashreq (51 percent), Northeastern Africa (64 percent), and the GCC (73 percent) (FAO, 2008b). When farmers are encouraged to pay the full cost of water, they voluntarily switch their use of irrigated land from low-value crops such as wheat to higher-value crops such as fruits and vegetables. In addition, they have incentives to invest in water-saving irrigation technologies.

Encouraging farmers to replace cereals with high-value crops has mixed implications for food security. The World Bank's World Development Report (2008e) argues that the top agricultural priority for the majority of Arab countries is to diversify production out of staples and into high-value crops (like fruits and vegetables) for export. High-value crop production gives

landowners more entrepreneurial opportunities, creates more employment for women and landless workers, and raises agricultural wages. In countries that have a mix of rain-fed and irrigated agriculture, such as the Maghreb countries, the Mashreq, and Sudan, water pricing could create a natural split; cereal would be grown primarily under rain-fed conditions, and high-value crops under irrigation. This would increase dependence on imported cereals, but it would also generate more foreign exchange from high-value crop exports that would cover the cost of additional cereal imports. This would also be more profitable for farmers and leave them disposable income with which to buy staples. This is not to say that countries that depend entirely on irrigation should stop growing cereal where it is economically viable and sustainable, as in the Nile Basin of Egypt. In Gulf countries, where irrigation water is more limited, cereal production might be eliminated completely in favor of more efficient high-value crops. To supplement these changes, the strategies outlined in Chapter 6 can be developed to increase food security.

Arab countries will need to import much of their cereal, even in cases when they produce some domestically. There is a complex balance of advantages and sacrifices involved in either importing less cereal, or having more agricultural export earnings with which to import. The tradeoffs between these options need to be carefully evaluated when considering water policy that shapes production choice. This tradeoff is unique in each country, depending on its food needs and agri-

³⁹ Water harvesting refers to practices and structures for capturing storm water, including the construction of small dams.

Figure 5.5: The Cost of Self-Sufficiency Grows as Population and Incomes Grow

Source: World Bank, 2008f.

cultural potential. So long as the necessary time series data on planted areas and yield is available, an optimization model can be used to evaluate the tradeoff (World Bank, 2008f).

For Morocco, achieving cereal self-sufficiency is possible, but it will come at a high cost. Morocco is less dependent on cereal imports than most Arab countries. Projections show that Moroccan cereal demand for human consumption (mostly wheat) will increase from 73 million metric tons in 2003 to 103 million metric tons in 2030 (IFPRI, 2008). If Moroccan farmers make reasonable increases in cereal productivity and cultivated area,⁴⁰ then Morocco could achieve self-sufficiency in cereal production until 2017. However, converting land that could be used for growing high-value crops to grow cereals is very costly (Figure 5.5). As demand continues to grow, the cost of self-sufficiency would climb from \$21 million in 2007 to \$6 billion in 2017,

the last year self-sufficiency would be possible. The total value of income sacrificed in order to enforce national cereal self-sufficiency over an 11 year period would be a staggering \$16 billion. The trade-offs between high-value crops and cereals vary by country, but the underlying message is the same: the opportunity cost of moving towards cereal self-sufficiency increases exponentially as demand increases.

Why is investing more in rain-fed agriculture critical to Arab countries?

Despite predominately dry climates, many Arab countries depend mainly on rain-fed agricul-

⁴⁰ Productivity in each province would be brought to the level of the most productive province in that region of Morocco, and the amount of land in cereal production would be expanded to historical highs.

ture. In Algeria, Iraq, Jordan, Lebanon, Libya, Mauritania, Morocco, Sudan, Syria, Tunisia, and Yemen, rain-fed agriculture is practiced on more than half of all arable land (AOAD, 2007). In the Maghreb, Sudan, and Yemen, at least 80 percent of cereal production is rain-fed, and in the Mashreq, from one-half to two-thirds of cereal production is rain-fed (FAO, 2008b).

Rain-fed agriculture in Arab countries is in danger due to climate change. Climate change models indicate that average yearly rainfall could decrease by 10 percent in the next 50 years (World Bank, 2008g). Droughts and heat waves will become more frequent as weather cycles speed up. As a result, rain-fed yields will fluctuate increasingly over time, and average yields will begin to trend downward, decreasing by 20 percent in Arab countries overall and by almost 40 percent in Algeria and Morocco (World Bank, 2007a). It is usually the most marginalized farmers and herders who depend most on rain-fed agriculture, particularly in the drier areas. These groups will be further marginalized and impoverished by the negative effects of climate change.

Helping rain-fed farmers adapt to climate change requires investment in new technologies. Research into conventionally bred and genetically modified drought-resistant crops is essential for keeping rain-fed agriculture economically viable (El Obeidy, 2006). Conservation tillage has the potential to increase and stabilize yields in the face of frequent droughts (World Bank, 2008e).⁴¹ Trials on rain-fed wheat in Morocco have generated increased and more stable yields than conventional tillage systems (Mrabet, 2002; 2008). Some experts argue, however, that agri-

cultural research will not keep up with climate change, and that public resources may be best spent in other areas that offer people an alternative livelihood to agriculture.

How can Arab countries increase productivity?

Agricultural research and development (R&D) yields very high returns. Worldwide, returns to agricultural R&D are estimated at 45 percent. In Arab countries, the estimate is slightly lower, at 36 percent (Alston et al., 2000).⁴² With such high returns, it seems that there is gross underinvestment in agricultural R&D in Arab countries and globally. Following the recent food-price shock, there is a renewed interest in investing in productivity, but more R&D is required if Arab countries are to experience a green revolution. The returns in Arab countries include many social advantages, such as enhanced food security and rural livelihoods, and benefit a wide range of people, from farmers to food consumers. Given these broad social returns, the public sector must play the primary role in investing in agricultural R&D.

Increase public investment in agricultural research and development. Arab countries invest approximately \$1.4 billion annually in

⁴¹ Also referred to as reduced tillage, no-till, and conservation agriculture, conservation tillage can be used for both rain-fed and irrigated agriculture. One of its main benefits, soil-moisture retention, is particularly pertinent for rain-fed agriculture in Arab countries.

⁴² The estimate for the Arab region is much less precise, as there were only 11 studies to use, considerably fewer than in other regions.

Table 5.2: Agriculture Research and Funding in National Agricultural Research Institutions

	Potential researcher years (PRYs) ¹	Funding (millions of 2000 US\$)	PRYs/100,000 rural residents	Funding as percent AgGDP
Algeria	575	14	8	0.4
Bahrain	32	3	457	17.9
Egypt	6,710	68	27	0.5
Iraq	770	—	30	—
Jordan	198	6	35	1.2
Lebanon	83	4	66	0.4
Libya	261	13	83	1.6
Morocco	606	40	6	0.9
Sudan	595	3	3	0.1
Syria	1,058	15	22	0.4
Tunisia	368	15	16	0.6
UAE	73	—	46	—
Yemen	245	6	3	0.8
Arab world	11,574	187	14	0.5
Brazil	3,943	924	11	1.4
Argentina	1,858	270	45	1.0
Mexico	3,097	357	12	1.6

Sources: Casas et al. 1999; IFPRI 2008b.

¹ A potential researcher year is the equivalent of one year's worth of research. This unit is used since many researchers have a position that also consists of teaching, extension, and consulting, making them only part-time researchers.

— = Not available.

agricultural R&D (Pardey et al., 2006), or 0.66 percent of agricultural GDP (AgGDP) (Alston et al., 2000).⁴³ This is slightly higher than the developing-country average of 0.53 percent, but far below the recommended investment level of 2 percent of AgGDP (Gana et al., 2008), as well as the level of investment of developed countries, which averages 2.36 percent of AgGDP (Alston et al., 2000). Besides the atypical Bahrain, which invests 18 percent

of its small AgGDP in R&D, regional leaders are Libya, Jordan, and Morocco (Table 5.2). It is not only developed countries that invest highly in agricultural R&D; Brazil invests 1.7 percent of AgGDP, 1.4 percent of which is invested through government agencies (FAO, 2008b). Arab countries increased spending on

⁴³ Around 0.50 percent goes to national laboratories, the rest to other public sector research institutions.

agricultural R&D by only 0.05 percent of Ag-GDP from 1981 to 2000, whereas developed countries increased their spending by 0.95 percent (World Bank, 2008e).⁴⁴

Enhance incentives for agricultural researchers in Arab countries. The number of agricultural researchers in Arab countries is relatively high, but they are under-funded and ill-equipped. In 1999, there were 14 full-time agricultural researchers per 100,000 rural residents of Arab countries (Table 5.2). Leaders in this respect are atypical Bahrain, with 457 researchers per 100,000 rural residents, Libya, with 83, and Lebanon, with 66.⁴⁵ This compares well with countries that have high agricultural development, such as Argentina (with 45 researchers per 100,000 rural residents), Brazil (with 11), and Mexico (with 12) (Table 5.2). However, funding per researcher in Arab countries is much lower, so researchers tend to have lower salaries and fewer resources, making them less productive than researchers with better funding (Casas et al., 1999). For scholars with Ph.D.s, the financial incentives to enter public-sector research at National Agricultural Research Institutes (NARIs) are generally inferior to the incentives to enter academia and focus on teaching. Those who do enter NARIs are often ill-equipped to be efficient in their research because of low investment in information technology and support staff (Gana et al., 2008). Raising researcher salaries and increasing resources will attract the best and the brightest researchers to agriculture, and will drive the innovation that will increase Arab agricultural productivity.

Develop innovative strategies that encourage private-sector investment in agricultural R&D.

Since agricultural research produces mainly public goods, it is difficult to incite private-sector investment. Nevertheless, there are several steps that can be taken to strengthen the investment climate. Stronger intellectual property rights for improved varieties and other agricultural innovations would help businesses privatize the returns to their investments. In Latin America, competitive funding for R&D has become common. Private firms are allowed to compete for public funds, which they can use to conduct research with private co-financing. Another method that governments can use to encourage private investment is to offer rewards for certain innovations, such as drought-resistant wheat varieties, that are developed by the private sector. Yet another approach is to encourage innovation by letting farmers apply for grants to implement new technologies and techniques. This type of grass-roots, farmer-led R&D has spurred technology dissemination and increased incomes in several countries, including Albania (World Bank 2008k). In the end, a partnership between public, private, and farmer-led research will be required to enhance R&D in Arab countries (World Bank, 2008e).

Promote a multi-lateral research agenda to increase the number of beneficiaries from a common research agenda. The League of Arab States (LAS) and United Nations Development Program (UNDP) recommend a regional R&D fund with a committed long-term budget

⁴⁴ There are signs of improvement as recently Qatar, Tunisia, and UAE have made some progress in promoting public sector R&D (Gana et al., 2008).

⁴⁵ Bahrain's relatively small rural population inflates this figure.

(LAS-UNDP, 2008). The inability to capture returns to research from beneficial spillovers is a major consequence of underinvestment at the national level (Alston, 2002). Because many Arab countries share the same agricultural goals (primarily food security) and challenges (such as water scarcity and climate change), a multi-nation research agenda could increase the number of beneficiaries from a common research agenda. Such a program would be well situated to incorporate indigenous knowledge into its research agenda. Because indigenous technologies are developed from the ground up, they are well adapted to the needs of the end-user (Warren and Rajasekaran, 1993). The International Center for Agricultural Research in Dry Areas (ICARDA) has a mandate that covers most Arab countries. The Arab Center for the Studies of Arid Zones and Dry Lands (ACSAD), established by LAS in 1968, has a mandate similar to ICARDA and covers all Arab countries. An independent Arab agriculture fund could work with ICARDA, ACSAD, NARIs, and other research organizations to achieve the objectives of its contributors.

What can be done to improve dissemination of knowledge to farmers?

Couple investments in R&D with improvements in extension. Agricultural extension in Arab countries is underperforming. In the poorest Arab countries—Somalia, Sudan, and Yemen—extension is virtually non-existent. A successful extension agenda must reach large and small

farmers alike. Large farmers have the greatest productive potential per farmer, and will be able before others to afford innovative, but expensive, technologies. Smallholders may produce less food per hectare and per farmer, but they make up a large proportion of the target population; extension's biggest failure has been not providing them with basic information (Gana et al., 2008). Smallholders often struggle to stay competitive because they lack basic technical and marketing information. Extension is necessary to help them produce and market crops with more value added, which will generate more economic opportunity for both the farmers and their communities. As discussed in Chapter 2, ensuring the success of smallholders is an essential component of national food security.

Invest in rural livelihoods to enhance food security and improve farmer welfare. Household assets, such as land, physical capital, education, and health, are crucial factors in the ability of farmers to secure rural livelihoods and to participate and compete in agricultural markets (World Bank, 2008e). Enhancing access to these assets is critical to improving purchasing power and will require significant public investment. Making smallholder farming more productive and profitable will also go a long way towards improving the purchasing power of rural households. A broad array of tactics can be used to achieve this, including investing in rural infrastructure, making product markets work better, improving access to financial services, enhancing the performance of producer organizations, and arranging payments for environmental services.



Reducing Exposure to Market Volatility

Even if Arab countries can successfully address demand and increase productivity, they will remain net importers of cereal, and will therefore be exposed to the risks of thin markets and high prices. Reducing exposure to cereal-import volatility is the third pillar of the food-security strategy. A number of risk management strategies are at the disposal of Arab countries, each with advantages and disadvantages for reducing price and quantity risk. Each Arab country faces a different mix of quantity and price risk, depending on its ability to produce food domestically and its natural endowment of oil and other natural resources. Each country therefore needs its own tailor-made risk management strategy. Key messages of this chapter are:

- » Improving supply-chain efficiency can greatly reduce cost and improve distribution.
- » Developing virtual stockpiles is a more cost-effective and flexible strategy to address quantity risk than physical stockpiles
- » Investing in infrastructure used to produce, store, and transport food can reduce exposure to cereal-import volatility

How can Arab countries ensure a steady supply of reasonably priced cereal imports?

A comprehensive review of national cereal-procurement methods may reveal simple ways to generate substantial savings. One cost effective way to generate savings is to improve procurement. Countries that import large quantities of cereal should review national procurement legislation and methods to determine if they are inflexible, outdated, and costly. An example of archaic procurement among Arab countries is Yemen, which does not consider price or use sophisticated measures to determine import quantity when issuing tenders, instead simply scaling up from previous years (World Bank, 1995). Characteristics of modern food-procurement systems include electronic tendering, bidding, credit, and transaction-risk mitigation.

Legislative and organizational changes in national procurement rules can enable economies of scale and risk management in procurement. Arab countries represent the single largest group of importers. Thus, by relaxing national

legal constraints that prohibit multinational procurement, they could take advantage of economies of scale in food procurement and reduce cost. Arab countries can also take better advantage of economies of formal markets for risk. Another reason they do not always receive the best prices and definitive quantities of food imports is that they do not use formal risk markets to insure transactions as much as OECD countries, China, India, and other emerging economies. Large trade transactions present substantial risk, and in a world of limited supply and competitive procurement, Arab countries are at a considerable disadvantage in ensuring their food security compared to countries that hedge risk. It is possible to overcome this by partnering with multinational companies with extensive experience and a wide network of established trading partners, or by using financial markets to insure transactions (World Bank, 2008h).

Underperforming logistics are a problem throughout the region. Improving logistics in the supply chain is particularly important for countries that import large quantities of food, because it reduces costs and improves distribution. Ultimately, this enables more food to reach consumers at a lower price. The GCC countries place well in the World Bank's Logistics Performance Index (Table 6.1), but poorly compared to other high-income countries. A possible explanation for this is that because oil exports are so dominant in the economies of these countries, there has been relatively little pressure from the private sector for trade and transport reform. There is great variation in logistics performance in the Maghreb. Algeria is one of the bottom 10 countries ranked worldwide, whereas Mauritania is in the top half and is ranked sixth among low-income countries. Despite sharing similar good relations and close ties with the EU, Morocco vastly underperforms compared to

Table 6.1: Logistics Performance Index: World Rankings

Country	World rank (of 150)	Country	World rank (of 150)
UAE	20	Mauritania	67
Bahrain	36	Morocco	94
Saudi Arabia	41	Egypt	97
Kuwait	44	Lebanon	98
Qatar	46	Yemen	112
Oman	48	Somalia	127
Jordan	52	Syria	135
Tunisia	60	Algeria	140
Sudan	64	Djibouti	145

Source: World Bank 2007b

Tunisia. Both countries implemented exemplary customs and port reforms. Tunisia, however, was quicker to improve domestic logistics like trucking and warehousing, and also implemented an electronic data exchange to simplify customs clearance (World Bank, 2007b).

Improved monitoring of world and regional cereal supply and demand will help Arab nations foresee price shocks, allowing them to adjust imports accordingly. Although it was impossible to imagine the full magnitude of the recent food-price shocks on Arab countries, some of the factors that caused it would have been picked up by appropriate monitoring systems. Production and stock projections for the major wheat-producing countries are readily available. For instance, the United States Department of Agriculture publishes monthly wheat outlooks online that project production, stocks, and prices. Moving forward, policymakers would benefit from the introduction of systems to continuously collect and assimilate real-time information.

Monitoring domestic supply and demand within the region is challenging because rural people are widely dispersed. By the time it is known that local stocks or production are too low, it could be too late to avert a crisis. The League of Arab States proposes a regional food security monitoring and early warning system that will help to determine the quantity and location of assistance that will be needed in response to a food shortage (LAS-UNDP, 2008). Such a system could collaborate with global institutions that already monitor food supply.⁴⁶ The creation of weather stations will help predict where shortages may occur, as well as how much cereal these areas will need in order to stabilize prices

(World Bank, 2008c, 2008i). Local information can then be aggregated so that policy makers will know how much cereal will need to be imported, and where it will be most needed.

What are alternative stockpiling strategies?

Countries need to tailor their stockpiling strategies to their specific needs. Food stocks serve multiple purposes: as rapid emergency food aid in times of crisis, as working stocks for regular distribution, and as buffer stocks to stabilize domestic prices (Dorosh, 2008).⁴⁷ Each country must assess how useful each of these purposes is for their needs. Key factors in making this assessment are national consumption, variability of domestic production (increasing with climate change), storage costs, size of the country relative to the international market, risks of production shortfalls and high prices to the poor, and thinness of international markets. For example, Morocco and Syria would need to gauge domestic production based on rainfall at critical times during the growing season, and adjust their stockpiles accordingly. Since production varies by region within these countries, they would need to transport cereal stocks internally based on where production shortfalls were expected. In

⁴⁶ USAID (Famine Early Warning System), FAO, and WFP collaborate with local institutions worldwide to monitor potential food shortages.

⁴⁷ Every level of the supply chain uses stockpiling to improve food security. Farmers, whether net producers or net consumers, stockpile if they think prices will rise. Urban consumers stockpile in times of expected scarcity. Large corporations and governments stockpile to take advantage of high prices or depress prices on domestic markets (World Bank, 2008i).

contrast, UAE and Bahrain know the quantity they will have to import (100 percent) without considering domestic production. Their stockpiling strategy would focus on world production and on buying and stocking when quantities are high and prices are low. Since these countries are small, they could conceivably hold their stocks in a central location. Alternatively, they could arrange to access stocks held in a neighboring country, like Saudi Arabia, with more stockpiling infrastructure.

Countries can employ financial risk-hedging instruments as a cost-effective complement to physical stockpiling. Financial instruments can be used to create virtual stockpiles, ensuring cereals at a certain price without many of the costs associated with physical stockpiles. These methods avoid the high cost of physical stockpiles of perishable materials.⁴⁸ Financial instruments also improve budget planning by allowing importing countries to lock in prices ahead of time. The two primary financial instruments used to establish virtual stockpiles are futures contracts and options.⁴⁹ Some importing countries continue to use conventional contracts with established suppliers, while using futures and options as an added price-security measure.

Futures contracts are one way to manage food-commodity price risk. Futures contracts are financial instruments that require the purchaser to buy a fixed quantity of a commodity at a fixed price during a predetermined time period. They typically require some sort of credit or guarantee. Future contracts would be especially attractive to oil-rich Arab countries with ready access to credit. Box 6.1 illustrates how Egypt, a major

wheat importer, could have used options and futures to mitigate the impacts of the recent food-price shock.

Options contracts give the purchaser the right, but not the obligation, to purchase a fixed quantity of a commodity at a fixed price during a predetermined time period. Unlike futures, options are paid for up front in cash, making them easier to access when credit cannot easily be obtained. Malawi set up an options contract to protect itself against rising prices. The options were exercised over a two month span at the end of 2005, allowing Malawi to import 60,000 metric tons of maize at \$50–90 below the market price. The premium on the contract was \$1.5 million dollars, so Malawi saved between \$1.5 and \$4.8 million over this two month span with the option. As the size of an option increases, so do both the premium and the potential savings (World Bank, 2008i). Individual countries or a regional fund could negotiate much larger contracts to hedge against high cereal prices (Box 6.1).

Countries can hedge against commodity prices using financial instruments such as swaps and loans with the support of the World Bank. The International Bank for Reconstruction and Development (IBRD) arm of the World Bank offers

⁴⁸ Deterioration, handling, transport, rotation (constant procurement and off-take), and opportunity cost of capital all pose economic barriers to stockpiling. This means that bigger stocks lead to bigger distributions programs and a larger fiscal deficit (Dorosh, 2008).

⁴⁹ Options on a terminal market offer more flexibility than futures; they insure the buyer against higher prices, but if the material is not required, there is no obligation to take it. A futures contract on a well-regulated terminal market can act as an insurance policy.

Box 6.1: Egypt Could Mitigate the Risk of High Wheat Prices with Financial Instruments

Egypt imported an estimated 7,000,000 metric tons of wheat from November 2007 to October 2008, when wheat prices were soaring. Actual purchase prices for the period are not available but a simple simulation using the Chicago Board of Trade (CBOT) market prices as a benchmark for market trends during the period indicates that the CBOT futures price basis of these purchases would have been \$2.75 billion. A hedging strategy based on the use of futures or options during this period would have provided greater budget certainty and, since market prices were rising, some protection against the short-term price increases. This simulation shows how Egypt could have partially protected itself from higher wheat prices by using financial hedging instruments (futures and options).

In the simulation, Egypt can use either futures or options, and a discretionary or non-discretionary approach to hedging. Discretionary hedging means hedging when the price is thought to be favorable. Non-discretionary hedging means purchasing hedges at regular intervals irrespective of price. This yields four approaches. These approaches can be applied at any magnitude, covering up to and even beyond 100 percent of expected imports. Each approach involved hedging between May and September 2007, to protect wheat purchases that took place between November 2007 and October 2008. All four strategies would have resulted in a savings over CBOT cash prices cost of the purchase.

Futures yielded greater savings than options for the time period examined. Since the price of the futures contracts never fell below the price paid, Egypt would never have been forced to sell them at a loss. If the market prices had moved down, Egypt would have been exposed to potentially large and unpredictable liabilities. For this reason, hedging with futures is inherently more risky than hedging with options. Options would always have been exercised, because the market price was always above the strike price. Options did not perform as well as futures over the time period in the simulation because hedging with options, since they provide greater flexibility, require a premium payment, thus adding to the overall cost.

Discretionary hedging did not perform as well as non-discretionary hedging in the simulation. It would have been better for Egypt to purchase fixed amounts of hedges routinely at predetermined dates rather than try to pick advantageous moments to buy. Table 6.2 provides an illustrative example of how hedging with futures and options in 2007–2008 could have provided savings over the CBOT spot market prices during the period November 2007–October 2008.

Table 6.2: Egypt Could Mitigate the Risk of High Wheat Prices with Financial Instruments

Hedge size	Per Metric Ton	25% (millions of US\$)	50% (millions of US\$)	75% (millions of US\$)	100% (millions of US\$)
Futures Discretionary	\$85.11	\$151	\$302	\$453	\$604
Non-discretionary	\$91.35	\$162	\$324	\$486	\$649
Options Discretionary	\$81.18	\$144	\$288	\$432	\$576
Non-discretionary	\$85.93	\$153	\$305	\$458	\$610

Source: Authors.

Note: Percentages in column headings refer to quantity of imports hedged.

its clients commodity swaps, and could structure commodity-linked loans in which the currency of repayment would be transformed from U.S. dollars to a commodity index to help reduce food commodity price risk. When international cereal prices are high, the swap allows IBRD to lower the client country's interest payment obligation. Savings from the debt payments could

then be used to offset the cost of rising import food prices. The IBRD can assess a client's risk exposure to commodity-price movement and assist them in designing an appropriate risk-management framework. Once a framework is in place, the client will be able to choose from a menu of available products and services (World Bank, 2008j).

Is land acquisition a viable strategy?

Arab investors are increasingly buying or leasing land in poor but land-abundant countries to secure their food supply. This strategy is often described as a win-win. The investor country acquires land and guaranteed access to the food produced on it, while reaping high financial returns to its investment. At the same time, the recipient country gets an infusion of capital into its agricultural sector, leading to economic development. For this to truly be a win-win arrangement, however, it is imperative that the investor country protect the recipient country's citizens from nationalization or expropriation, labor abuses, and loss of their own food security.

Saudi Arabia and the UAE are worldwide leaders in buying land in third-party countries. These two oil-rich Arab countries hold more than 2.8 million hectares between the two of them, mostly in Indonesia, Pakistan, and Sudan. Several other countries have also either acquired or attempted to acquire foreign agricultural land: Egypt in Uganda and Sudan; Bahrain in the Philippines; Kuwait in Cambodia, Laos, and Myanmar; Libya in Ukraine and Zimbabwe; and Qatar in Cambodia (The Economist, 2008; Sudan Tribune, 2009). The other major investors in foreign land are China and Japan. Investment is done by governments (UAE), multi-national financial institutions (Arab Authority for Agricultural Investment and Development, or AAAID), and private companies (Saudi Arabia's Al-Qudra). Public-private partnerships have been suggested in which the public sector absorbs risk and the private sector maximizes profit (Dubai School of Government, 2008). However, such a strategy

might encourage reckless investing by the private sector if it does not internalize risk.

Investors should carefully separate development goals from their food security goals. Investors seek to match their abundant capital with host countries' abundant land and labor. From a development perspective, this makes perfect sense both for the investor and the host country. However, high returns inherently involve high risk, which is a major drawback when the goal is food security. Large-scale farming operations have a notable history of failure in Sudan, and despite its agricultural potential, the World Food Program currently feeds 5.6 million people there. Sudan cannot manage to produce enough food for its own population, let alone those of investor countries. In a country whose people are hungry, an attempt to take the harvest away from farmers and deliver it to a wealthier investor country could be met with grave political repercussions. Recently, Daewoo Logistics of South Korea's 99 year lease of 1.3 million hectares of agricultural land in Madagascar (over half of Madagascar's agricultural land) fell through because of political backlash in the host country over what was perceived as "neo-colonialism" (Ryall and Plfanz, 2009). Although such resistance may not arise in other host countries, it should serve as a warning of the potential political difficulties associated with acquiring agricultural land in other countries to achieve greater food security. Bureaucratic slowdowns in host countries also form a deterrent to this investment strategy; exporting a container of food requires 24 days from Pakistan, 35 days from the Sudan, and 89 days from Kazakhstan (Dubai School of Government, 2008). If food-security goals and development goals are both

to be met with investment in foreign land, it is essential that the political environment and the business environment are conducive to the certain and timely delivery of production.

Establishing farming operations in third-party countries may allow investors to shield themselves from market risk, but at a cost. Using the global market to secure large quantities of food can be fraught with uncertainty, as the recent food-price shocks proved. However, opting to invest in third-party countries instead of using the market requires the investor to take on all of the weather risk of the host country, rather than choose which country to secure food from. Idiosyncratic political risk in the host country may also be a major concern, especially in countries like Sudan which have experienced frequent conflict. The market allows for more flexibility than third-party investment. Capital locked up in land purchases and long-term leases cannot easily be freed up to buy food from other suppliers when there is bad weather or political disruptions in the host country.

What alternative strategies can Arab countries employ?

Countries can invest in the infrastructure used to produce, store, and transport food abroad. This could be permanent infrastructure, such as ports, silos, and roads; mobile infrastructure, such as boats, trucks, and inputs such as fertilizer; or intellectual infrastructure, such as patents to seed varieties and other technologies. Buying land may be unnecessary if an investor can supply and control the infrastructure and technology necessary to produce, transport,

and store the food. The recipient would still increase the productivity of its land and labor, and could potentially benefit from the arrangement without upsetting the local population by selling land, while the investor would have its capital less tied up, and would not incur the political risks associated with land purchasing. The Gulf countries would benefit from this strategy, because they would create supply-chain synergies if they both produced oil and controlled the primary production factors dependent on petroleum. If these assets are properly diversified, they also minimize the problems associated with weather and political risk mentioned in the previous paragraph. Bonded warehouses could be constructed in Arab countries, allowing the physical stores tied to international commodity markets to reside inside the region. This would reduce apprehension about purchasing hedges tied to physical wheat located at distant terminal markets and would encourage more trading of the commodity.

Countries can invest in agricultural R&D of foreign countries over the long term. Chapter 5 presented the evidence of high rates of return for R&D investment in agriculture. In Arab countries, particularly those where land and water are extremely scarce, productivity might be too low to merit limiting investment in research to within the region. Investments in foreign agriculture could increase food security by increasing the productivity of trading partners or potential trading partners. Furthermore, if intellectual property regimes are strong enough, investor countries could own the technologies that lead to increased productivity, allowing them essentially to trade the right to use the technology for a portion of the resulting production.

There is no single ideal method for reducing exposure to market volatility; the tools presented in this chapter can be used individually, or in combination, to minimize risk. Improving supply chains can reduce costs and improve distribution. Investing in foreign land and infrastructure can reduce the amount of cereal that Arab countries need to import at world prices. Using financial instruments to hedge world price risk can help stabilize the price of the cereal that they still need to import.

Appropriate risk management strategies need to be constructed on a country by country basis depending on risk tolerance and financial ability to manage risk through investment in supply chains, use of financial instruments, and

investment in foreign land and infrastructure. Some tools, like modernizing procurement and improving logistics, are basic remedies that should be achieved to some degree by all countries in the region. Using financial instruments is a newer technique, but as the World Bank's success in Malawi shows, even countries with small economies can use hedging instruments to shield themselves from market risks. Investing in foreign land, infrastructure, and R&D is more suited for Arab countries with larger economies. All Arab food-importing countries should be able to find ways to protect themselves from food-price shocks like the ones seen over the past year, and the World Bank and its partners can help them devise, finance, and implement appropriate strategies.



Next Steps

This joint working paper identifies the core issues associated with food security that are unique to Arab countries and proposes a framework to address them. The framework includes three pillars: (1) strengthening safety nets, promoting greater access to family planning services and to education, (2) enhancing domestic food supply and rural livelihoods through increased investment in research and development, and (3) reducing vulnerability by improving supply chain efficiency and by more effectively using financial instruments such as options and futures to hedge risk.

The next step is for individual countries to determine how best to combine the three pillars to create an integrated and comprehensive strategy that addresses short, medium, and long-term policies to improve food security. These strategies will be country specific as they depend on a host of factors including national, political, and cultural preferences, resource endowments, and tolerance for risk. However, the framework proposed in this paper provides the necessary guidance on the key types of country-specific analysis that need to be undertaken in order to develop a comprehensive and customized strategy.

The first step is to undertake a long-term national food-balance projection. This will allow national policy makers to determine how much food will be consumed, how much is being produced domestically, and how much needs to be imported. Several models are currently available that can be used for this projection, including the ones presented in this paper.

The second step is to explore the range of actions that can be undertaken to strengthen safety nets, provide people with access to family planning services, and promote education. Improving the performance of safety nets is one of the most important short-term actions that will soften the impact of food-price shocks on the poor. Evaluating the available options for strengthening safety nets requires access to reliable data on household income and expenditures, a consensus on the national definition of poverty, and reasonable data on the administrative costs of different programs. The potential returns to different levels of investment in nutrition, education, and family planning can be analyzed using the food-balance projection.

The third step is to identify potential investments that can increase domestic agricultural

productivity and profitability. This is more relevant for some countries than others and requires careful enumeration of the available land and water resources and an assessment of whether or not appropriate policies are in place to make the most of them. It also requires knowledge of the returns to alternative investments in agricultural research and development, and in some cases an analysis of the potential tradeoffs of pursuing self-sufficiency in key crops.

The fourth step is to determine how much and what kind of exposure to cereal market volatility is acceptable. Drawing on the results of the food-balance projection and the sensitivity of the projection to steps two and three above, it is possible to measure the national exposure to market volatility

and then model the costs and benefits of the alternative approaches described in Chapter 6.

The final step is to give careful consideration to the budgetary consequences of all alternative courses of action. No country can extensively engage in every option laid out in this framework so it is essential to assess the tradeoffs between different food security strategies and other national goals.

The World Bank, the Food and Agriculture Organization, and the International Fund for Agricultural Development all stand ready to play a role in this process through the provision of technical assistance and financing for investments.



References

- Alston, J. M. 2002. "Spillovers." *Australian Journal of Agricultural and Resource Economics* 46 (3): 315–346.
- Alston, J. M., C. Chan-Kang, M.C. Marra, P.G. Pardey, and T.J. Wyatt. 2000. "A Meta-analysis of Rates of Return to Agricultural R&D: Ex Pede Herculem?" Washington, DC: International Food Policy Research Institute.
- Alston, J. M., D. A. Sumner, and S. Vosti. 2006. "Are Agricultural Policies Making Us Fat? Likely Links between Agricultural Policies and Human Nutrition and Obesity, and Their Policy Implications." *Review of Agricultural Economics* 28 (3): 313–322.
- AOAD (Arab Organization for Agricultural Development). 2007. Arab Agricultural Statistical Yearbook. Khartoum, Sudan: Arab Organization for Agricultural Development.
- Baum, M. 2004. "Agriculture and biotechnology in MENA." Paper presented at the Regional Workshop on Biotechnology in the Middle East and North Africa. September 29–30. Cairo.
- Benson, T., N. Minot, J. Pender, M. Robles, J. von Braun. 2008. "Global Food Crises." Washington, DC: International Food Policy Research Institute.
- Blomberg, S. B. and E. S. Harris. 1995. "The Commodity-Consumer Price Connection: Fact or Fable?" *Economic Policy Review* 1 (3). Available at SSRN: <http://ssrn.com/abstract=1028825>.
- Bloomberg. 2008. Online database available at <http://www.bloomberg.com>.
- Carter, C., G. Rausser, and A. Smith. 2008. "Causes of the Food Price Boom. Giannini Symposium on the Causes and Consequences of the Global Food Crisis." Oct. 10. Berkeley, CA.
- Casas, J., M.B. Solh, H. Hafez. 1999. *The National Research Systems in West Asia and North Africa Region*. Aleppo, Syria: International Center for Agricultural Research in the Dry Areas (ICARDA).
- Caulfield, L. E., S. A. Richard, J.A Rivera, P. Musgrove, R.E. Black. 2006. "Stunting, wasting, and micronutrient deficiency disorders." In Jamison, D.T., J.G. Breman, A.R. Measham, G. Alleyne, and M. Claeson (eds). *Disease Control Priorities in Developing Countries*. Washington, DC: World Bank.
- Cline, W.R. 2007. *Global Warming and Agriculture: Impact Estimates by Country*. Washington DC: Peterson Institute.

- Dorosh, P. 2008. "Public Foodgrain Stocks and Price Stabilization in South Asia: Historical Experience and Policy Options." Washington DC: World Bank.
- Dubai School of Government. 2008. "Food Security in the United Arab Emirates." Policy Brief, October 9. Dubai: Dubai School of Government.
- Dyson, T. 1995. "Loaves, Fishes, and Cereal Yields." *Times Higher Education*. January 27. Available at <http://www.timeshigher-education.co.uk/story.asp?storyCode=97544§ioncode=26>.
- The Economist. 2008. "Buying the Farm" August 21, 2008. Available at http://www.economist.com/world/mideast-africa/displayStory.cfm?story_id=11975452.
- El Obeidy, A. A. 2006. Introducing New Crops with High Water-Use Efficiency in the Middle East and North Africa. In Lee, C. and T. Schaff (eds.) *The Future of Drylands*. Leiden, Netherlands: Springer.
- Evans, Lloyd T. 1998. *Feeding the Ten Billion: Plants and Population Growth*. New York: Cambridge University Press.
- Fabiosa, J. F., J. C. Beghin, F. Dong, A. El Obeid, S. Tokgoz E. T-H Yu. 2008. "Land Allocation Effects of the Global Ethanol Surge: Predictions from the International FAPRI Model." Ames, IA: Iowa State University Department of Economics. Available at http://www.econ.iastate.edu/research/webpapers/paper_12877_08005.pdf.
- FAO (Food and Agriculture Organization). 2006a. "Food Security." *Policy Brief*, no. 2 (June). Rome: Food and Agriculture Organization.
- . 2006b. "World agriculture: towards 2030/2050." Interim report. Rome. Available at <http://www.fao.org/es/esd/AT2050web.pdf>.
- . 2006c. "Food Security and Wheat Policy in Egypt." *Roles of Agriculture Project: Policy Brief*, no 2 (October). Rome: Food and Agriculture Organization.
- . 2008a. "Food Outlook: Global Market Analysis." Rome: Food and Agriculture Organization.
- . 2008b. "FAOSTAT." Online database available at <http://faostat.fao.org/>.
- . 2008c. "The Rise in Crude Oil Prices Stimulates Ethanol-related Demand for Agricultural Commodities." Available at http://www.fao.org/es/esc/en/15/106/highlight_107.html.
- . 2008d. "Near East Agriculture Towards 2050: Prospects and Challenges." Presented at the 29th FAO Regional Conference for the Near East, March 1–5. Cairo.
- . 2008e. "Food Outlook." November. Rome: Food and Agriculture Organization.
- . 2008f. "State of Food Insecurity." Rome: Food and Agriculture Organization.
- . 2008g. "The State of Food and Agriculture. Biofuels: prospects, risks, and opportunities." Rome: Food and Agriculture Organization.
- Finkelstein, E. A., I. C. Fiebelkorn, and G. Wang. 2003. "National medical spending attributable to overweight and obesity: how much, and who's paying." *Health Affairs* 3 (1): 219–226.
- Frankel, J. 2008. "An Explanation of Soaring Commodity Prices." VoxEU.org. (March 25).
- Gana, A., K. Latiri, A. Suleri, R. ben Zid. 2008. "Central and West Asia and North Africa Summary for Decision Makers."

- International Assessment of Agricultural Knowledge Science and Technology for Development (IAASTD). Available at http://www.agassessment.org/docs/Global_SDM_060608_English.pdf.
- Gardner, B. and D. A. Sumner. 2007. "US Agricultural Policy Reform in 2007 and Beyond." *Agricultural Policy for the 2007 Farm Bill and Beyond*. Washington, DC: American Enterprise Institute.
- IFAD (International Fund for Agricultural Development) and FAO (Food and Agriculture Organization). 2007. "The Status of Rural Poverty in the NENA." Rome: International Fund for Agricultural Development.
- IFPRI (International Food Policy Research Institute). 2008a. "International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT): Model Description." Washington DC: International Food Policy Research Institute.
- . 2008b. *Agricultural Science and Technology Indicators Database*. Washington DC: International Food Policy Research Institute. Available at <http://www.asti.cgiar.org>.
- IMF (International Monetary Fund). 2008. "World Economic and Financial Survey." Online database available at <http://www.imf.org/external/pubs/ft/weo/2008/02/weodata/index.aspx>.
- IRIN (Integrated Regional Information Networks). 2005. "YEMEN: Food incentives for girl education." September 11. Available at: <http://www.irinnews.org/report.aspx?reportid=25459>.
- LAS (League of Arab States) and UNDP (United Nations Development Program). 2008. "Food Security, Poverty, and Agriculture in Arab Countries: Facts, Challenges, and Policy Considerations." New York: United Nations Development Program Regional Bureau for Arab States.
- Ministry of Health, Kingdom of Bahrain. 2003. "Impact of the National Flour Fortification Program on the Prevalence of Iron Deficiency and Anemia among Women at Reproductive Age in the Kingdom of Bahrain (First Monitoring Study)." Bahrain: Ministry of Health. Available at: http://www.moh.gov.bh/PDF/monitoring_study.pdf.
- Mrabet, R. 2002. "Wheat Yield and Water Use Efficiency Under Contrasting Residue and Tillage Systems in a Semiarid Area of Morocco." *Experimental Agriculture* 38: 237–248.
- Mrabet, R. 2008. *No-tillage systems for sustainable dryland agriculture in Morocco*. Rabat, Morocco: Institut National de la Recherche Agricole. Available at <http://www.inra.org.ma/ist/publications/ouvrages/notillsyst.pdf>.
- National Research Council. 1989. "Report of the Committee on Life Sciences, Diet and Health." Food and Nutrition Board. Washington DC: National Academy Press.
- OECD and FAO. 2008. "The OECD-FAO Agricultural Outlook, 2008–2017." Online database available at: http://www.oecd.org/pages/0,3355,en_36774715_36775671_1_1_1_1_1,00.html.
- Pardey, P. G., N. Beintema, S. Dehmer, and S. Wood. 2006. "Agricultural Research: A Growing Global Divide?" Washington, DC: International Food Policy Research Institute (IFPRI).
- Rosenzweig, C. and M. L. Parry. 1996. "Potential impacts of climate change on world food

- supply: a summary of a recent international study." in S. Ramphal and S. Sinding (eds.) *Population Growth and Environmental Issues*. Westport, CN: Greenwood Publishing Group.
- Ruttan, V. W. 2002. "Productivity Growth in World Agriculture: Sources and Constraints." *Journal of Economic Perspectives* 16 (4): 161–184.
- Ryall, J. and M. Pflanz. 2009. "Land rental deal collapses after backlash against colonialism." *The Telegraph*, January 15. <http://www.telegraph.co.uk/news/worldnews/africaandindianocean/madagascar/4240955/Land-rental-deal-collapses-after-backlash-against-colonialism.html>
- Sadighi J, R. Sheikholeslam, K. Mohammad, H. Pouraram Z. Abdollahi, K. Samadpour, F. Kolahdooz and M. Naghavi. 2003. "Flour fortification with iron: a mid-term evaluation", *Public Health*, 122(3):313–21.
- Sudan Tribune. 2009. "Egypt to Grow Wheat in Sudan." January 7. <http://www.sudantribune.com/spip.php?article26655>.
- United States Department of Agriculture (USDA). 2008a. *Wheat Yearbook*. Online database <http://www.ers.usda.gov/Data/Wheat/WheatYearbook.aspx>
- . 2008b. "Agricultural Projections to 2017." February. Washington, DC: United States Department of Agriculture.
- Urbanichuk, J. M. 1997. "Commodity markets, farm-retail spreads, and macroeconomic condition assumptions in food price forecasting." *American Journal of Agricultural Economics* 79 (5): 1677–1680.
- Warren, D. M. and B. Rajasekaran. 1993. "Putting local knowledge to good use." *International Agricultural Development* 13 (4): 8–10.
- WHO (World Health Organization). 2008a. Online database available at <http://www.who.int/research/en/>.
- . 2008b. World Health Organization Body Mass Index database. Geneva: World Health Organization. Available at <http://www.who.int/bmi/index.jsp>.
- World Bank. 1995 "The Wheat Subsidy in Yemen." Washington, DC: World Bank.
- . 2005. "Egypt-Toward a More Effective Social Policy: Subsidies and Social Safety Net." Social and Economic Development Group, Middle East and North Africa. Washington, DC World Bank.
- . 2006. "Sustaining Gains in Poverty Reduction and Human Development in the Middle East and North Africa." Social and Economic Development Group, Middle East and North Africa. Washington, DC: World Bank.
- . 2007a. *Making the Most of Scarcity: Accountability for Better Water Management in the Middle East and North Africa*. Washington, DC: World Bank.
- . 2007b. *Connecting to Compete: Trade Logistics in the Global Economy*. Washington, DC: World Bank.
- . 2008a. "Framework Document, Global Food Crisis Response Program." Washington, DC: World Bank.
- . 2008b. World Bank Online Database available at www.worldbank.org/data.
- . 2008c. "Global Financial Crisis: Responding Today, Securing Tomorrow." Background paper prepared for the G20 Summit on Financial Markets and the World Economy. Washington, DC: World Bank.
- . 2008d. "MENA Poverty and Social Indicators in MENA." Washington, DC: World Bank.

- . 2008e. *World Development Report 2008: Agriculture for Development*. Washington, DC: World Bank.
- . 2008f. Assessing the Tradeoffs between Cereal and High Value Crop Production in Morocco. Background paper. Washington, DC: World Bank.
- . 2008g. “Changements Climatiques et Impacts sur l’Agriculture au Maroc.” Washington, DC: World Bank.
- . 2008h. “A First Assessment of Food Security Program Options Available to GCC Countries.” Washington, DC: World Bank.
- . 2008i. “Risk Management & the Global Food Crisis.” Agriculture & Rural Development Department Commodity Risk Management Group. Washington, DC: World Bank.
- . 2008j. “Mitigating Agriculture Commodity Price Risk.” Washington, DC: World Bank.
- . 2008k. “Implementation Completion and Success Report on a Credit to the Republic of Albania for an Agriculture Service Project.” Sustainable Development Department. Washington, DC: World Bank.
- . 2008l. “Energy Efficiency Summary.” Background paper. Washington, DC: World Bank.
- . 2008m. “Yemen Economic Monitoring Note.” Washington, DC: World Bank.
- . 2008n. “Economic Growth, Inequality and Poverty: Social Mobility in Egypt between 2005 and 2008.” Washington, D.C.: World Bank.
- . 2009. *Global Economic Prospects 2009*. Washington, DC: World Bank.
- WFP (World Food Program). 2008. Draft Presentation: “Rapid assessment on the effects of soaring food prices on the poor segments of the Yemeni population.” Draft Presentation. Rome: World Food Program.
- Yemtsov, Ruslan. 2008. “The Food Crisis: Global Perspectives and Impact on MENA, Fiscal and Poverty Impact.” Middle East and North Africa Poverty Reduction and Economic Management Department. Washington, DC: World Bank.



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