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WHEAT SECTOR DEVELOPMENT PROGRAMME OF AFGHANISTAN

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Foreword

Wheat is the staple food of Afghan people and crucial for the nation's food and nutrition security. Domestic production of wheat was more than capable of meeting demand in the 1960s and 1970s. During the years of internal turmoil and destruction, wheat production drastically contracted, and Afghanistan became dependent on large-scale commercial imports and food assistance to meet the demand for wheat grain and flour. Since 2002, wheat production has rebounded thanks to well-orchestrated international assistance in rebuilding the irrigation infrastructure, restoring agricultural research, renewing input supply systems and revitalizing the seed sector, which was spearheaded by the European Union and the Food and Agriculture Organization of the United Nations (FAO). But growth in domestic production still lags behind the increasing demand for wheat, and dependence on imports still persists. Clearly, this situation is not helpful for strengthening Afghanistan's food and nutrition security, particularly for enabling the country to reach the Millennium Development Goal targets for eradicating poverty and hunger.

The Ministry of Agriculture, Irrigation, and Livestock (MAIL), with FAO technical assistance, undertook an initiative to develop a long-term perspective on the development of the wheat sector by commissioning several subsector studies on the wheat value chain and developing a National Wheat Policy of Afghanistan. This report, *Wheat Sector Development Programme of Afghanistan*, presents the analysis of demand and supply scenarios of wheat over the next 16 years (2014–2030) as well as strategies for accelerating wheat production with a focus on achieving self-sufficiency in the supply of wheat by 2025 or sooner. Included is an overview of the programme interventions and resource implications for implementing the strategies, which were designed to reflect the National Wheat Policy's strategic directions.

I commend the MAIL officials and scientists for this work and thank FAO and other international agencies cooperating with FAO for producing a roadmap for the comprehensive development of Afghanistan's wheat economy. This document will serve as a blueprint for the Government for mobilizing the needed resources and making investment in the targeted areas.

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Technical Assistance

This document has been prepared by the Ministry of Agriculture, Irrigation and Livestock (MAIL), the Islamic Republic of Afghanistan with technical and financial assistance from Food and Agriculture Organization of the United Nations (FAO) under project entitled “ Formulation of a Comprehensive Wheat Sector Development Programme (TCP/AFG/3302)”.

Study Team

The FAO Team consisted of International Experts: Indrajit Roy, (Wheat Sector Development Programme), K. C. Roy (Irrigation and Mechanization), S.S. Singh(Wheat Research), Ram C. Chowdhury (Inputs requirement and Supply), Mubarik Ahmed (Strategic Grain Reserve), Rajendra P Singh (Wheat Trade), Ernesto L. Aragon (Farming Systems), Matiar Rahman (Extension), and Subash Dasgupta (Wheat Policy Development) and international and national experts: Indrajit Rou, A.R Manan & N. Wassami (Wheat Training Manual development), and M. Akbarzad (Information Collection) . This Study Team has been conducted under technical supervision of Subash Dasgupta, Senior Plant Production Officer, FAO Regional Office for Asia and the Pacific Regions, Bangkok, Thailand.

Methodology of the Study

The team started work on 08th May 2012 with the arrangement of Project Inception workshop. A combination of analytic, investigative, participatory and inclusive approaches to problem diagnosis and solution articulation characterizes the overall methodology adopted in preparing the policy briefs contained in this report.

First, Inception workshop set the stage of whole study which was largely attended by various stakeholders working in the field of wheat sector development. The workshop was inaugurated by the Deputy Minister. The LTO presented a conceptual framework putting the longer-term prospect of wheat development and structural change within the context of regional development with neighbouring countries and globalization. The recommendations of the workshops were used as guiding principles of sectoral studies. Outcomes of the Inception workshop and meetings held with key stakeholders including the Deputy Minister of Agriculture, donor agencies and others carefully reviewed and finalized the scope and direction and methodology of the study.

Second, FAO field team of reputed international and national consultants to conduct sectoral studies. All studies are completed by June 2013. During these period of time several field visits were arranged in major wheat growing areas to observe in person the state of wheat development and to meet with all stakeholders and learn firsthand their problems, what they see as major impediments to future development of wheat and what they feel should be done collectively by all concerned to overcome these constraints. Visits were made to local offices of the MAIL, training institutes, agricultural research stations, local markets at various levels, agricultural farms, seed stores, fertilizer distribution/sale points, irrigation pumps, agriculture machinery sale and repair stores, seed and grain storage facilities, and wheat mills.

Third, Several focus group discussions were held with MAIL officials at all levels, farmers, seed dealers, fertilizer dealers, seed associations, NGOs and agricultural traders. These discussions were invaluable for the Team to understand key issues as perceived by participants. These meetings were also used as sounding board for various policy options recommended and their likely impact, positive or negative. Field visits and focus group discussions were used to collect spot data on recent price movements and supply situation of major inputs, output and agricultural wages and rent as well as costs and returns from wheat production at farmers level.

Fourth, A two day National Consultative Meeting on Wheat Policy was conveyed at FAO’s Conference Hall, MAIL, Kabul, Afghanistan on 11-12th December 2012. The purpose of the meeting was to convene a diverse group of stakeholders, working in the field of wheat sector development in Afghanistan whose wide-ranging expertise and perspectives were used to critically examine the current status of wheat sector development in the country, in the context wheat policy development. The recommendations of this workshop are the major objectives of the wheat policy.

Fifth, the vast array of available literature on wheat sector development was carefully reviewed to come to grips with the current wisdom on the problems and prospects of the sector and the general perception as to its current direction. Available secondary data supplemented by some firsthand data collected quickly from the relevant sources were used in developing these important documents.

Limitations

The field visit was inevitably short limiting the possibility of in-depth investigation on ground to bring out more of inter and intra-regional variations. Due to that, it was possible to collect only limited amount of relevant data from the field. It was not possible to cross check all information in the field. The focused group discussions were only meant to be snapshot of rapid rural appraisal in improvised environment.

Acknowledgement

The Study team would like to express their sincere gratitude to the MAIL for their kind support in the whole process of developing of National Wheat Policy and Wheat Sector Development Programme (WSDP). In particular supports from Mr. Shakir Majeedi, Strategic Planning Advisor, GDDPC, MAIL and Mr. Noor Ahmad Popal, Senior Food Security & Livelihood Officer- Focal point of the project were extremely valuable in improving the quality of the study. Special Thanks goes to FAO-Afghanistan office for their whole hearted support in various ways which were very helpful. Sincere thanks are due to Mr. Ousmane Guindo, Ex-FAOR, Afghanistan and Mr. Mohammad AQA, AFAOR (P) for their continuous support and advise to make this study most successful. Finally, we would like to thank Mr. Tomio Shichiri, FAOR-Afghanistan for his kind guidance and advise to finalize this study.

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1. Executive summary

This Wheat Sector Development Programme (WSDP) was prepared in a participatory manner, using available information, field visits and consultation with all stakeholders. Its preparation was coordinated with the ongoing Governments' evolving strategy to make the country self-sufficient in wheat production. Wheat is the major cereal grain grown in the Islamic Republic of Afghanistan and is crucial for its food and nutrition security. It accounts for 76 percent of the annual production of cereals and 57 percent of the total production of food crops in the country. The demand for wheat is steadily increasing, and current per capita consumption is at about 180 kg per year, one of the highest rates in the region. But the country struggles with its domestic production of wheat. Since 2002, Afghanistan has significantly increased its wheat production, thanks to assistance from development partners in rebuilding the war-ravaged irrigation infrastructure, restoring agricultural research and extension systems and revitalizing the seed sector. However, the growth in production still lags behind the growth in demand, and the shortfall is filled by commercial imports and international food assistance. The deficit is so large that imports are still needed even in good harvest years.

Concern over the country's dependence on external sources for large-scale supplies of wheat is reflected in the Afghanistan National Development Strategy, the National Agricultural Development Framework and the Agriculture Production and Productivity Programme. The Government intends to re-establish self-sufficiency in the domestic supply of wheat through greater efficiency in production, which entails greater mechanization of processes and improved techniques at all stages, from planting to harvesting.

This report, Wheat Sector Development Programme of Afghanistan, prepared with technical assistance from the Food and Agriculture Organization of the United Nations, outlines the planned interventions to achieve self-sufficiency by 2025. These interventions are based on technical input and recommendations from six subsector studies encompassing Afghanistan's current wheat value chain and strategic directions specified in the National Wheat Policy.

The first half of this report reflects analysis of supply and demand scenarios for wheat production in Afghanistan over the next 16 years (2014–2030). The projections are broken down into four-year intervals: 2013–2016, 2017–2020, 2021–2025 and 2026–2030. The demand projections were made using scenarios that reflect trends in the consumption of wheat, population growth rates, gross domestic product per capita growth rates and elasticity of demand. The demand is projected in the range of 7.51–8.03 million tonnes by 2016, 8.69–9.56 million tonnes by 2020, 9.34–10.42 million tonnes by 2025 and 10.73–12.04 million tonnes by 2030. For the analysis, the potential for boosting domestic production to meet the anticipated

demand was examined, taking into account two scenarios that use different rates of increase in cultivated areas under wheat: (i) the proportion of irrigated area in total wheat cropped area and (ii) the potential yields under irrigated and rainfed conditions. A comparison of the projections for demand and production showed that elevating domestic wheat production to the level of zero imports is an achievable goal by 2025, or possibly sooner.

The Wheat Sector Development Programme (WSDP) was designed to help Afghanistan reach self-sufficiency in the domestic supply of wheat by 2025. The projection analysis was used to derive strategies to accelerate the increases in wheat production and quantitative targets for measuring the progress. Based on the goal of self-sufficiency, the proportion of irrigated area in total area under wheat cultivation needs to increase to at least 54 percent by 2016, 58 percent by 2020, 63 percent by 2025 and 68 percent by 2030. Likewise, the aggregate wheat area needs to reach not less than 2.73 million ha by 2016, 2.95 million ha by 2020, 3.23 million ha by 2025 and 3.5 million ha by 2030. The minimum national average yields of irrigated wheat needed to be 3.17 tonnes per ha by 2016, 3.45 tonnes per ha by 2020, 3.79 tonnes per ha by 2025 and 4.14 tonnes per ha by 2030. Average rainfed wheat yields should stabilize at levels of not less than 1.41 tonnes per ha by 2016, 1.64 tonnes per ha by 2020, 1.92 tonnes per ha by 2025 and 2 tonne per ha by 2030. Irrigation water-use efficiency needs to increase from the current 25 percent to at least 40 percent by 2030, which would then multiply the gains from the horizontal expansion of irrigated cropping.

The second half of the report describes in detail each of the seven components of the WSDP and the planned activities that should help the Government and farmers achieve the quantitative targets. The programme aims to improve farmers' access to inputs, technology and knowhow to thus eliminate existing weaknesses in the production of wheat. This includes adopting new approaches for the efficient delivery of extension support services and training. To significantly increase farm-level efficiency of input use – seed, fertilizer and labour – the WSDP intends to step up mechanization processes and introduce improved production practices. With these strategies combined, post-harvest losses, currently estimated at 15–20 percent, should steadily decline.

The strategy for strengthening the wheat value chain focuses largely on improving the quality of domestically produced flour by introducing new wheat varieties that are superior for making flatbreads and by modernizing the wheat milling industry. Another important element is the upgrading of wheat marketing practices: better market price information collection and dissemination, improvement of the market infrastructure, transportation and storage and the elimination of weak links in the supply chain. Other elements emphasize training various agency staff to work towards improving the governance of the wheat sector.

The seven components of the WSDP encompass the following interventions:

Component 1: Closing the gaps in wheat yields

This programme component intends to reach the yield targets by closing the yield gaps – by at least 30 percent for irrigated wheat and 20 percent for rainfed wheat – within five years, using existing technology. It is a multi-component programme consisting of applied and adaptive research, front-line demonstrations, farmers’ training and field visits, delineation of wheat-growing zones, packaging of production technologies tailored to specific wheat-growing zones and the improved supply and quality of inputs. The programme draws on attempts to maximize the use of what is best currently available in terms of knowledge, technology and physical infrastructure while providing guidance on making new investments in emerging frontiers of knowledge and technology to improve Afghanistan’s wheat sector development. It is essentially a platform for amassing critical strength in the drive to scale up rapid progress towards self-sufficiency.

Component 2: Strengthening the institutional capacity for wheat research and seed production

The programme activities focus on improving national capacity in terms of organizational, technical and human resource efficiency in developing new varieties of wheat that are of good quality, have higher yield potential and can easily adapt to local growing conditions. This includes introducing new crop management technology, improving institutional capacity for the rapid multiplication of all categories of wheat seed (foundation, registered and certified), improving the quality of on-farm seed production and increasing the farm-level supply of quality seeds, all of which should enable the faster penetration of improved varieties and increase the seed replacement rate. The programme aims to foster average yields that are at par or exceed the wheat production target for 2025.

Component 3: Support for the enhanced utilization of inputs for accelerating wheat production

The programme activities involve upgrading the institutional capacity for delivering inputs (fertilizers, pesticides, farm machinery, institutional credit and land) and associated public and private sector support services to farmers through infrastructure development, institution building and improved inter-institution links. It also includes improving the training of extension service providers and the public sector’s quality control of imported fertilizers and agro-chemicals. The programme emphasizes systematic soil test-crop response studies in all regional stations to develop appropriate recommendations for the rate and timing of applying fertilizers and agro-chemicals and balancing the use of mineral fertilizer with organic manure. There is as well considerable increase in the demonstrations of modern agricultural machinery, such as

four-wheel and two-wheel tractors and their attachments, including wheat seeders, bed planters, zero-till drills, reapers and combine harvesters.

Component 4: Intensification of irrigated wheat and improving the productivity of rainfed wheat through supplemental irrigation

This programme concentrates on strengthening the knowledge and technology base as well as the physical infrastructure for extending the coverage of irrigation at an accelerated pace to achieve the targets. This includes expanding the facilities for supplemental irrigation in rainfed areas. With the expansion of irrigation coverage, wheat yields and production are expected to increase at – or exceed – the rates needed to achieve self-sufficiency by 2025.

Component 5: Crop diversification for improving productivity and the sustainability of wheat cultivation

This component introduces greater crop diversity in wheat-based farming systems as an option for sustaining wheat production and enhancing soil fertility while boosting total household income through the cultivation of more remunerative crops and broadening the base of household food and nutrition security. The component also creates additional employment opportunities in the rural economy through downstream linkages in processing and marketing. The expansion of diversified cropping in suboptimal environments, such as rainfed areas, are expected to contribute towards improving the sustainability of rainfed wheat cultivation as well as yields.

Component 6: Strengthening the domestic supply of wheat through post-harvest loss reduction, improvement of on-farm storage and expanding the Strategic Grain Reserve

This programme is designed to reduce post-harvest losses in the wheat supply chain by training farmers in harvesting and grain storage, demonstrating improved methods of on-farm storage, conducting field demonstrations of machinery for harvesting and expanding the use of farm machinery by providing incentives and institutional support based on public–private sector collaboration. Another major focus of the programme is developing institutional capacity – technical, administrative and human resources – to efficiently run the Strategic Grain Reserve Directorate so that it contributes to minimizing post-harvest losses in the wheat supply chain.

Component 7: Commercialization of wheat production through wheat value chain and capacity-building in marketing *This programme is designed to accelerate the commercialization of wheat production in Afghanistan and thus create market-based incentives for increasing wheat production and value-added processing. This includes improving facilities for wheat marketing in terms of storage and marketing infrastructure and upgrading market information systems that benefit farmers and traders. The programme emphasizes the introduction of modern wheat processing technology (for post-harvest handling and storage, grain milling, baking,*

packing and packaging) and facilitating private sector enterprise development (through community enterprises, enterprise groups and small and medium-sized enterprises) along the wheat value chain to improve efficiency and value addition. It also involves establishing modern industrial wheat flour mills in the country as a major step towards the commercialization of wheat production.

The total investment cost of the WSDP over the initial five-year period (2014–2018) is estimated at \$910 million. Much of the proposed investment is not new and overlaps with ongoing and approved projects under the Ministry of Agriculture, Irrigation and Livestock (MAIL) and other ministries. Some of the financing can be mobilized by seeking convergence and complementarities with ongoing programmes and projects through improved planning. Development partners, such as the United States Agency for International Development, the United States Department of Agriculture, the World Bank, the European Union, the Japan International Cooperation Agency, the Australian Agency for International Development and the Food and Agriculture Organization of the United Nations, will be approached to review their lending portfolios and reconsider their priorities in both committed and new investment, in light of the proposed WSDP interventions. Additionally, the WSDP proposes inclusion of a new investment model – public–private partnerships – to tap into private sector resources for financing. This model is particularly suitable for mobilizing resources for modernizing Afghanistan’s wheat processing sector and the rapid mechanization of wheat cultivation.

The General Directorate Policy and Planning unit of MAIL has responsibility for implementing the WSDP. The Wheat Coordination Committee, also within MAIL and chaired by the Technical Deputy Minister, is responsible for administrative oversight and monitoring of the programme.

The primary risks identified in implementing the WSDP relate to the capabilities of MAIL, particularly at the provincial and local levels; in coordinating the participation of different stakeholders in programme activities; in securing adequate funding from donors; and coping with the country’s security situation. To mitigate the risks, the WSDP includes development of institutional capacity for improving interagency coordination and promoting good governance, including the devolution of greater administrative and financial controls to provincial authorities and contingency planning. Additionally, social and environmental impact analysis will be done for the major interventions to devise suitable adaptation and mitigation measures.

Abbreviations

ACIAR	Australian Centre for International Agricultural Research
ALA	Afghanistan Land Authority (Arazi)
ARIA	Agricultural Research Institute of Afghanistan
ANSOR	Afghanistan National Seed Organization
AusAID	Australian Agency for International Development
CIMMYT	International Centre for Improvement of Maize and Wheat
DAIL	Directorate of Agriculture, Irrigation and Livestock
DAP	diammonium phosphate
EMD	Enterprise and Market Development
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
GDP	gross domestic product
ICARDA	International Centre for Research in Dry Areas
IMF	International Monetary Fund
JICA	Japan International Cooperation Agency
MAIL	Ministry of Agriculture, Irrigation and Livestock
MEW	Ministry of Energy and Water
NASGRA	National Strategic Grain Reserve Authority
NPP	National Priority Programme
SMIO	Statistics and Marketing Information Office
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
WFP	World Food Programme
WSDP	Wheat Sector Development Programme

1. Introduction

Wheat is central to the agricultural economy of the Islamic Republic of Afghanistan. It accounts for 76 percent of the annual harvest of cereal grain and 57 percent of the total production of food crops in the country. The wheat sector contributed 49 percent to agriculture's share of gross domestic product (GDP) and 13.6 percent to total GDP in 2010/2011.¹ Trade in wheat and wheat flour, mainly imports from neighbouring countries through official channels, was estimated at \$229.6 million² and constituted 4.4 percent of the total import trade of \$5.15 billion in 2010.³ Unofficial cross-border trade has an equally important role in the importing of wheat flour and wheat, mainly from Pakistan.

Wheat's added value to the economy is low due to the overwhelming subsistence nature of wheat production. Almost all of the wheat produced is consumed by households; a portion is sold when circumstances dictate, for example, to repay debt or meet emergency needs for cash. A seven-province farm-level survey (involving 6 020 households) conducted in 2012 by the Statistics and Marketing Information Office (SMIO) of the Ministry of Agriculture, Irrigation and Livestock (MAIL) found that households' own production accounts for 62 percent of the total consumption of wheat. The rest is purchased (Fakhrul, 2013). The wheat value chain is rudimentary and fragmented, and the wheat processing industry is underdeveloped. The quality of domestically produced flour is inadequate to satisfy consumer preferences for baked products.

Water mills in rural areas and small-scale diesel or electric-powered mills in urban centres form the backbone of the country's wheat processing industry. The processing capacities of these mills are 1–3 tonnes of wheat per day, and they process 90 percent of the domestic wheat. The milling industry comprises five public mills and 12 commercial mills located in Kabul, Mazar-e-Sharif, Jalalabad and Herat, with milling capacity ranging from 80 to 500 tonnes per day. These mills do not operate at full capacity due to competition from imported wheat flour and the unavailability of wheat grain, labour and electricity at cost-effective rates (Jalal and Albanese, 2013).

Wheat is the staple in the Afghan food basket, accounting for approximately 60 percent of total caloric intake (Government of Afghanistan, 2003). Domestic production was adequate to meet the demand for wheat in the 1960s and 1970s, but the country's subsequent descent into a prolonged period of political instability, foreign intervention and civil strife struck a heavy blow to the physical infrastructure and resources critical for sustaining growth in agricultural production.

¹ Estimates based on FAOSTAT production data and Central Statistics Organization, Afghanistan GDP data.

² All currencies are US dollar.

³ FAOSTAT data, available at www.faostat.fao.org.

Wheat production steadily declined and stagnated throughout the 1980s and 1990s. It eventually recovered and entered a growth path, beginning in 2002. Despite substantial progress towards increasing wheat production over the past decade, fostering a stable and sustainable upward production trend remains difficult due to the considerable sensitivity of the country's wheat production systems to annual fluctuations in the volume/duration and timing of rainfall, snowfall and drought.

In contrast, the growth in wheat consumption from 2000 to 2012 was dramatic and consistent, despite sharp increases in retail prices, particularly those of imported wheat flour. Consumption grew at 7.74 percent annually, from 2.04 million tonnes in 2000/2001 to 6.04 million tonnes in 2012/2013. Annual per capita consumption of wheat rose from 89.4 kg in 2000 to 181 kg in 2012. This was driven by rising per capita incomes, improved access to supplies in rural areas and targeted food assistance to vulnerable communities to stabilize per capita food consumption.⁴

Over the same period, domestic wheat production grew at a slightly higher rate than in the previous decade, at 8.34 percent per year. But this growth was not stable, characterized by high year-to-year fluctuation, and fell short of meeting the domestic wheat demand. Thus, the deficit in local production continues to be mitigated by commercial imports and international food assistance. Imports are needed even in good harvest years. The size of the import dependence to bring supplies of wheat grain and flour at par with demand varies from year to year, with an average of 38.3 percent between 2000 and 2012.

The perennial deficit in domestic production of such a staple food crop poses critical challenges to building sustainable food security, both at the household and national levels. The excessive dependence on imports for the supply of wheat flour and grain makes Afghanistan vulnerable to annual supply and demand scenarios in the exporting countries, and particularly to their grain trade policies that may be unfavourable and restrictive in the event of large-scale poor harvest or crop failure. Reverting back to self-sufficiency in the domestic supply of wheat is thus as much about bolstering national security as strengthening food security.

This concern is reflected in the Government's policy documents and agriculture sector plans, such as the Afghanistan National Development Strategy, the National Agricultural Development Framework and the Agriculture Production and Productivity Programme. To streamline ongoing efforts and undertake new initiatives within a coherent framework to boost national wheat production and strengthen household food security, the Food and Agriculture Organization of the

⁴ See *USDA Foreign Agricultural Service PDS database*, available at www.fas.usda.gov.

United Nations (FAO) provided technical assistance to MAIL to prepare the Wheat Sector Development Programme, or WSDP (FAO, 2013).

2. Objective of the Wheat Sector Development Programme

The WSDP will create a sturdy framework of interventions to increase wheat harvests, improve the efficiency of the wheat value chain and chart a roadmap for reaching self-sufficiency in the domestic supply of wheat, taking into consideration demand and supply scenarios up to 2030 and the Government's National Wheat Policy.

3. Wheat demand and supply projections to 2030

The strategies and elements of the WSDP highlighted in this report are based on the estimated demand for wheat and the country's capacity to provide for that demand up to 2030, as the following explains. The projection analysis essentially found that current levels of investment and production are inadequate to catch up with meeting the demand.

3.1 Demand

Given the limitations imposed by current data collection methods, the projection analysis used historical and per capita consumption data to estimate the future demand for wheat. A key assumption when calculating the projections was that the external environment affecting supplies and retail prices of wheat grain and flour in Afghanistan's wheat markets is likely to remain more or less the same – there will be no major disruption in access to supplies in rural areas and the Government's policies, rules and regulations will not be altered significantly to avoid stifling current consumption levels. Figure 1 depicts the pattern of domestic consumption of wheat in Afghanistan between 2000 and 2012 and the trend growth of consumption.

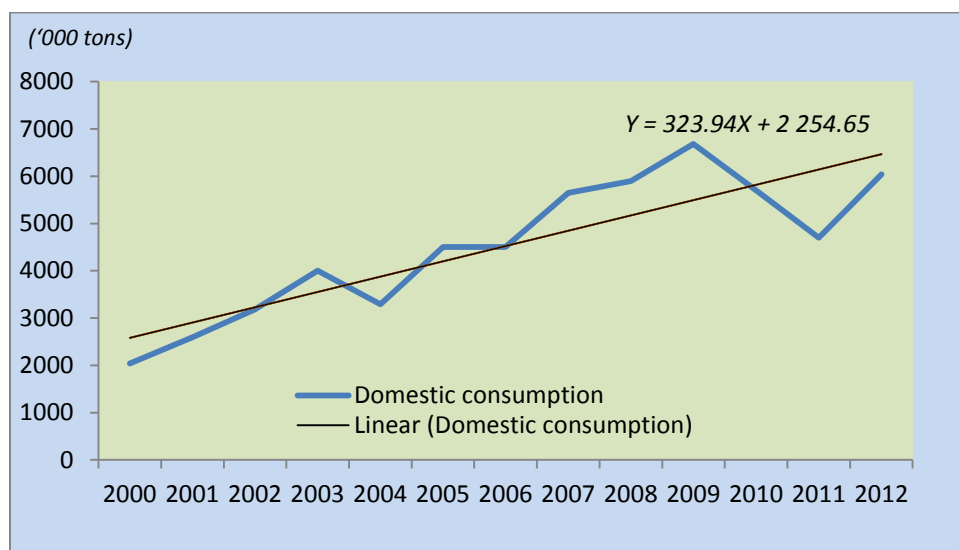
Projected demand based on household consumption was calculated using the following formula (Singh):

$$D_t = d_0 * N_t (1 + r * \eta)^t$$

where D_t is the household demand for wheat in year t ; d_0 is the per capita consumption of wheat during the base year 2012, N_t is the projected population during the year t , r is the per capita GDP growth between the 0 and t periods; and η is the expenditure elasticity of the demand for wheat. The demand projections up to 2030 were made for the periods: 2013–2016, 2017–2020, 2021–2025 and 2026–2030.

FAOSTAT data were used to estimate populations. Per capita annual consumption of wheat was estimated by dividing yearly consumption by the number of people. Household-level data were also used for cross-reference.

Figure 1. Domestic consumption of wheat in Afghanistan, 2000–2012



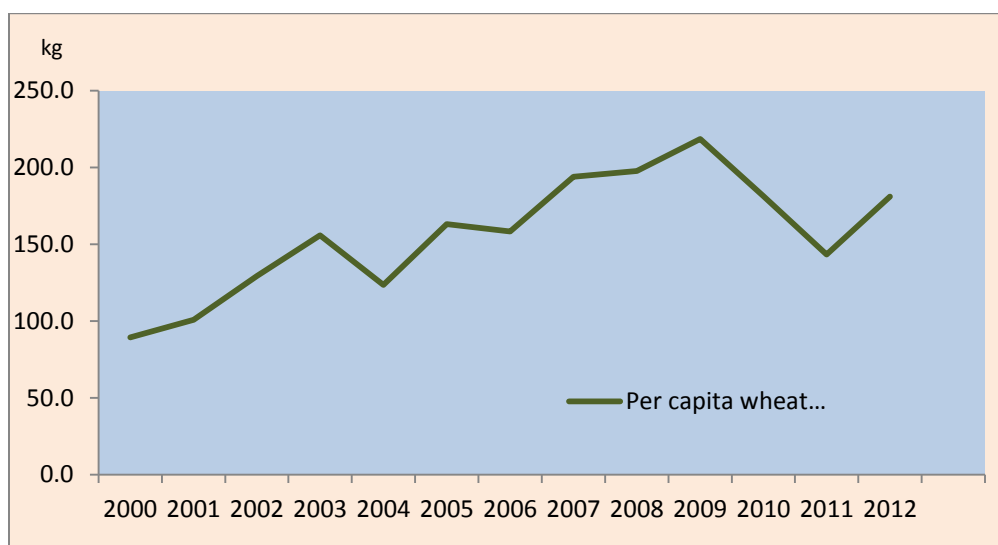
Source: USDA, Foreign Agricultural Service Production, Supply and Distribution (PSD) online database.

Household expenditure elasticity of demand was estimated using time-series retail price data of wheat grain and flour in eight major markets of Afghanistan collected and analysed by the World Food Programme (WFP). In estimating the growth of GDP per capita, the trend growth of GDP from 2006 to 2011 (at 15.8 percent per year) that were obtained from national accounts data, was moderated using International Monetary Fund (IMF) forecasts to account for the likelihood of slower growth due to a drawdown of the current level of international economic assistance to Afghanistan.

Two scenarios were envisaged to project the demand of wheat. In the first scenario, the per capita annual consumption of wheat, which grew at 5.1 percent per year (reaching 181 kg in 2012 from 89 kg in 2000), was allowed to rise at about the same pace (Figure 2). In the second scenario, the growth in per capita consumption was expected to increase at a much slower rate, taking into consideration the high levels already attained and the likelihood that it would remain at about the same level due to diversification of diets, a rise in per capita income and increased urbanization. These assumptions of growth of per capita wheat consumption were consistent with data gathered from a farm-level survey conducted in 2012 in seven provinces that showed households annually consumed an average of 170 kg per capita of wheat, ranging from 131 kg in Herat to 212 kg in Parwan (SMIO, 2012).

In both scenarios, the GDP growth rates and estimates of expenditure elasticity of demand were the same. The GDP per capita growth for 2013–2016 was projected at 4.8 percent per year and at 4.6 percent for 2017–2020. These projections factored in the IMF forecasts (2013) for real GDP growth, at 3.1 percent in 2013 and 4.8 percent, from 2014 through 2018.

Figure 2. Per capita per year wheat consumption in Afghanistan, 2000–2012



Source: Authors' projections.

Table 1 provides the results of the two scenarios for the wheat-demand projections.

Table 1. Demand projections of wheat, 2013–2030

Parameter	Base year 2012	2013–2016	2017–2020	2021–2025	2026–2030
Population ('000s)	33 397	37 827	42 141	47 602	53 266
Population growth (%)		3.1	2.7	2.4	2.3
Per capita consumption (kg)	181				
Scenario 1		193	209	217	224
Scenario 2		185	190	195	200
Per capita GDP growth (%)	10.2	4.8	4.6	4.2	4.5
Elasticity of demand	0.5	0.5	0.45	0.4	0.4
Demand ('000 tonnes)	6 040				
Scenario 1		8 027	9 560	10 417	12 039
Scenario 2		7 694	8 691	9 345	10 730
Based on consumption trend		7 506	8 717	10 232	11 743

Note: Except for the growth rates, the figures refer to the status in the terminal year of the time periods.

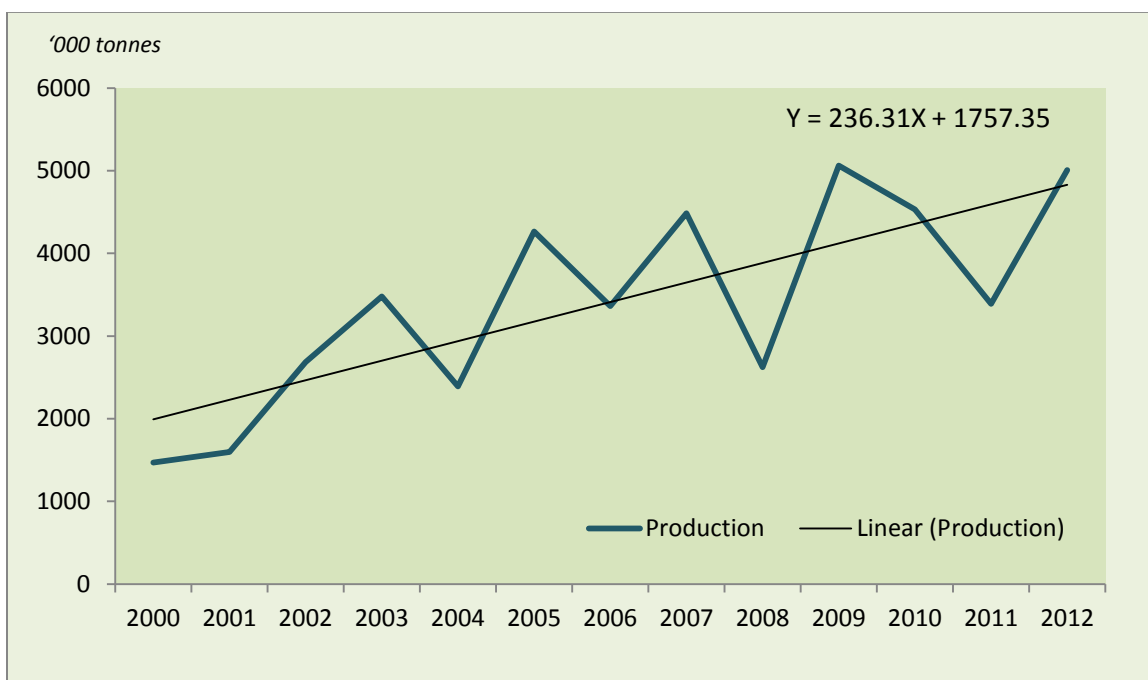
Sources: SMIO, 2012; authors' projections.

As shown in Table 1, the projected Afghanistan wheat demand will be in the range of 7.51–8.03 million tonnes in 2016, 8.69–9.56 million tonnes in 2020, 9.34–10.42 million tonnes by 2025 and 10.73–12.04 million tonnes in 2030.

3.2 Production

Wheat production in Afghanistan grew at 8.34 percent per year between 2000 and 2012. The potential of this production to meet the demand for consumption was examined by projecting the trend growth from 2013 to 2030 (Figure 3). Production was estimated at 5.77 million tonnes in 2016, 6.72 million tonnes in 2020, 7.90 million tonnes in 2025 and 9.08 million tonnes in 2030. Figure 4 displays the results from the comparison of the trend in domestic production of wheat with the trend in consumption demand.

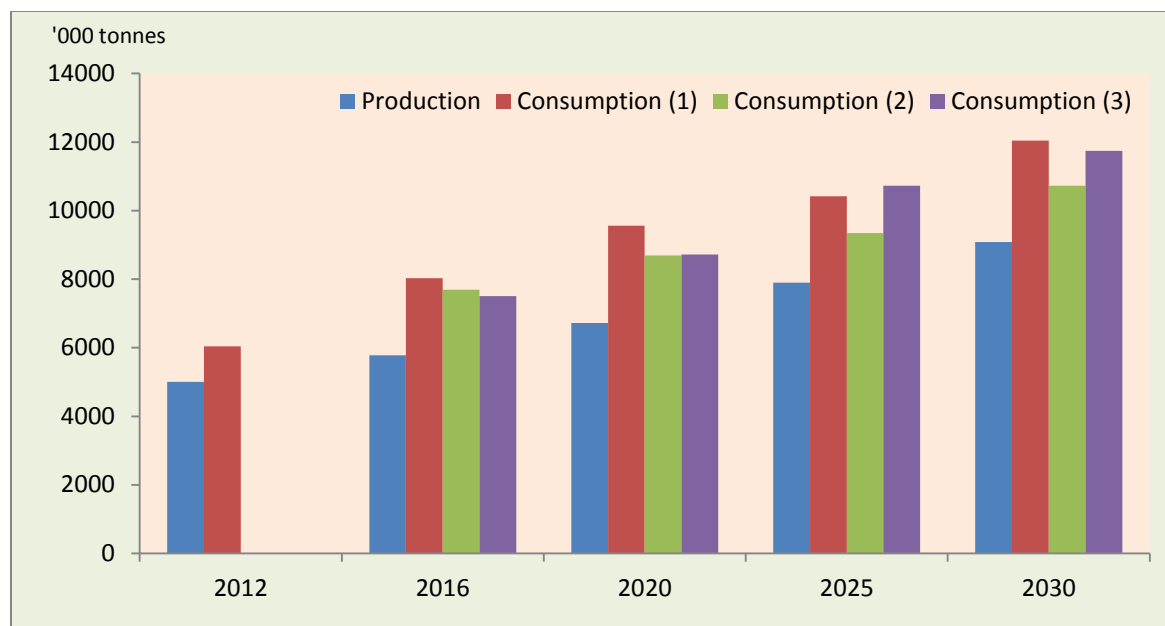
Figure 3. Growth of wheat production in Afghanistan, 2000–2012



Source: Authors' projections.

The gap between the trend in consumption demand of wheat and the trend in production over the period 2013–2030 ranges between 2 million tonnes and 2.4 million tonnes, indicating the widening of the shortfall that existed in the previous decade (Figure 4). In other words, the current levels of investment in the wheat sector, particularly in wheat research and extension, are inadequate to elevate wheat production and productivity to a level that would realistically allow catching up with demand, which is expanding faster as the country enters a new transformative stage of its development.

Figure 4. Comparison of trends in the domestic production of wheat with trends in consumption demand, current and projected



Source: Authors' projections.

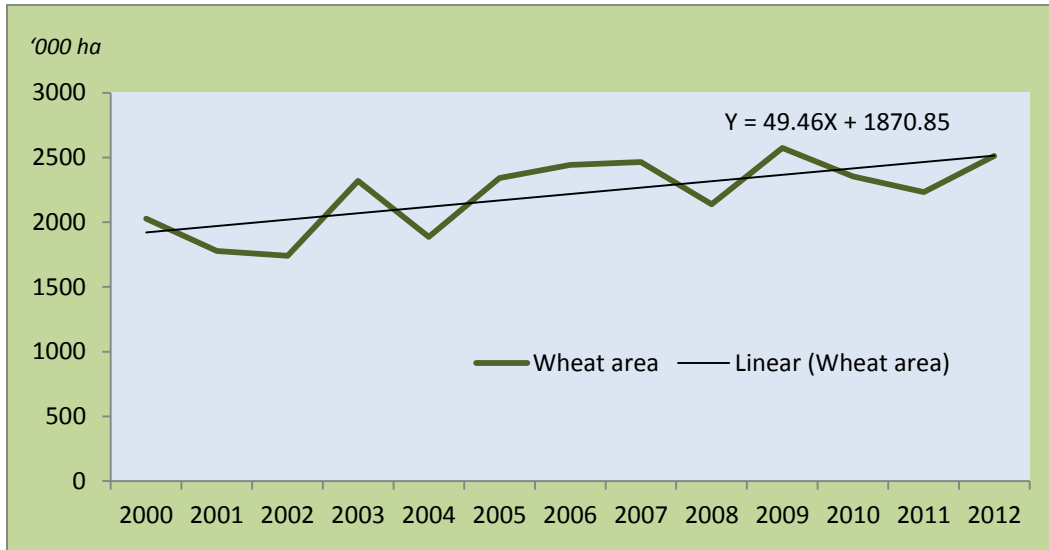
To suggest a sustainable level of increases in production and productivity of wheat, based on both vertical and horizontal expansion of wheat cropping, the analysis next looked at different options and pathways provided in the National Wheat Policy of Afghanistan. This exercise shed light on the magnitude of what needs to be done, the resources needed to adequately achieve the targets and the design of a roadmap for reaching self-sufficiency in the supply of wheat.

For this purpose, two scenarios of accelerating wheat production in Afghanistan were developed. The first scenario envisages maintaining a growth rate of wheat area of at least 2.35 percent per year from 2000 to 2012 (Figure 5) but steadily increasing the share of irrigated area in total wheat area. Accordingly, the needed trend for the wheat area was projected for the period 2013–2030, factoring in the continual increase in the share of irrigated area, from the current 45:55 ratio of irrigated to rainfed wheat. Beginning in 2013, the proportion of irrigated area was projected at 47 percent, with provision for an annual 1 percent increase in subsequent years. This would allow increasing the share of irrigated area to 50 percent by 2016, 54 percent by 2020, 59 percent by 2025 and 64 percent by 2030.

The second scenario envisages growth in the cultivated wheat area at a slightly higher rate (at 0.15 percent) and a faster conversion of rainfed wheat areas to irrigated areas than the first scenario. Accordingly, the share of irrigated area was projected at 48 percent beginning in 2013, 54 percent by 2016, 58 percent by 2020, 63 percent by 2025 and 68 percent by 2030. The impacts of climate change, likely to be mostly negative for wheat production, were not factored into these scenarios. The quantitative targets in both scenarios, however, reflect the strategic directions specified in the National Wheat Policy.

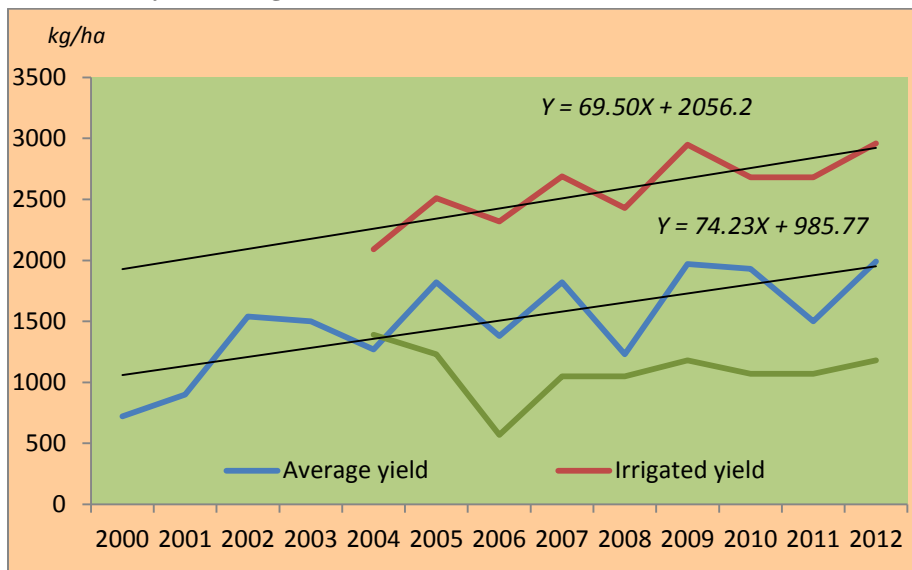
The yield of wheat, both irrigated and rainfed, was calculated on the basis of increasing at the trend rate of growth from 2000 to 2012 in both scenarios (Figure 6). It thus presupposes a mostly business-as-usual mode: largely a maintenance nature in development and application of technological solutions rather than breakthroughs in any area; it is not too interventionist, but at the same time, it continues to incrementally build on the successes achieved.

Figure 5. Growth of total wheat area in Afghanistan, 2000–2012



Source: Authors' projections.

Figure 6. Growth of wheat yield in Afghanistan, 2000–2012



Source: Authors' projections.

As Table 2 indicates, Afghanistan's average wheat yield increased from 0.72 tonnes per ha in 2000 to 1.99 tonnes per ha in 2012, at 5.8 percent per annum. Irrigated wheat yield also increased, from 2.29 tonnes per ha in 2004 to 2.96 tonnes per ha in 2012.

During that period, rainfed wheat yields were marked by wild fluctuations and declined, from 1.39 tonnes per ha in 2004 to 1.18 tonnes per ha in 2012. For the future, the trend average of wheat yield was projected at 2.25 tonnes per ha by 2016, 2.54 tonnes per ha by 2020, 2.92 tonnes per ha by 2025 and 3.29 tonnes per ha by 2030.

The trend in yields of irrigated wheat was then projected at 3.17 tonnes per ha by 2016, 3.45 tonnes per ha by 2020, 3.79 tonnes per ha by 2025 and 4.14 tonnes per ha by 2030. Production estimates were made by multiplying the trend area by the trend yield. Total wheat production was calculated as a sum of production under irrigated and rainfed conditions.

Table 2. Projections of wheat production in Afghanistan, 2013–2030

Parameter	Base year 2012	Time period			
		2013–2016	2017–2020	2021–2025	2026–2030
Scenario 1					
Area under wheat ('000 ha)	2 512	2 711	2 909	3 157	3 404
Irrigated area ('000 ha)	1 167	1 356	1 571	1 862	2 179
Share of irrigated area (%)	46	50	54	59	64
Rainfed area ('000 ha)	1 345	1 356	1 338	1 294	1 225
Yield: irrigated wheat (tonnes/ha)	2.96	3.17	3.45	3.79	4.14
Yield: rainfed wheat (tonnes/ha)	1.11	1.41	1.64	1.92	2.00
Production: irrigated ('000 tonnes)	3 460	4 296	5 414	7 066	9 022
Production: rainfed ('000 tonnes)	1 590	1 910	2 201	2 484	2 448
Total production ('000 tonnes)	5 050	6 206	7 615	9 550	11 470
Scenario 2					
Area under wheat ('000 ha)	2 512	2 732	2 952	3 227	3 502
Irrigated area ('000 ha)	1 167	1 475	1 712	2 033	2 381
Share of irrigated area (%)	46	54	58	63	68
Rainfed area ('000 ha)	1 345	1 257	1 240	1 194	1 121
Yield: irrigated wheat (tonnes/ha)	2.96	3.17	3.45	3.79	4.14
Yield: rainfed wheat (tonnes/ha)	1.11	1.41	1.64	1.92	2
Production: irrigated ('000 tonnes)	3 460	4 674	5 900	7 713	9 862
Production: rainfed ('000 tonnes)	1 590	1 770	2 039	2 291	2 239
Total production ('000 tonnes)	5 050	6 444	7 939	10 004	12 101

Note: The production projections refer to the terminal year of the time periods.

Source: SMIO, 2012; authors' projections.

3.3 Supply

The production projections were compared with the projected demand for wheat under all scenarios. The findings indicate that 2025 is the plausible point when steadily increasing levels of domestic production enter the range of projected demand for wheat and the goal of achieving

self-sufficiency in the domestic supply of wheat appears on the horizon. To further investigate, time-series trends in consumption data that represent demand in the median range were compared with annual anticipated levels of domestic production (Table 3). The analysis concluded that with levels steadily decreasing, imports will still have a role in closing the gap between demand and supply of wheat (Figure 7).

Table 3. Projected annual domestic production of wheat and demand, 2013–2030 ('000 tonnes)

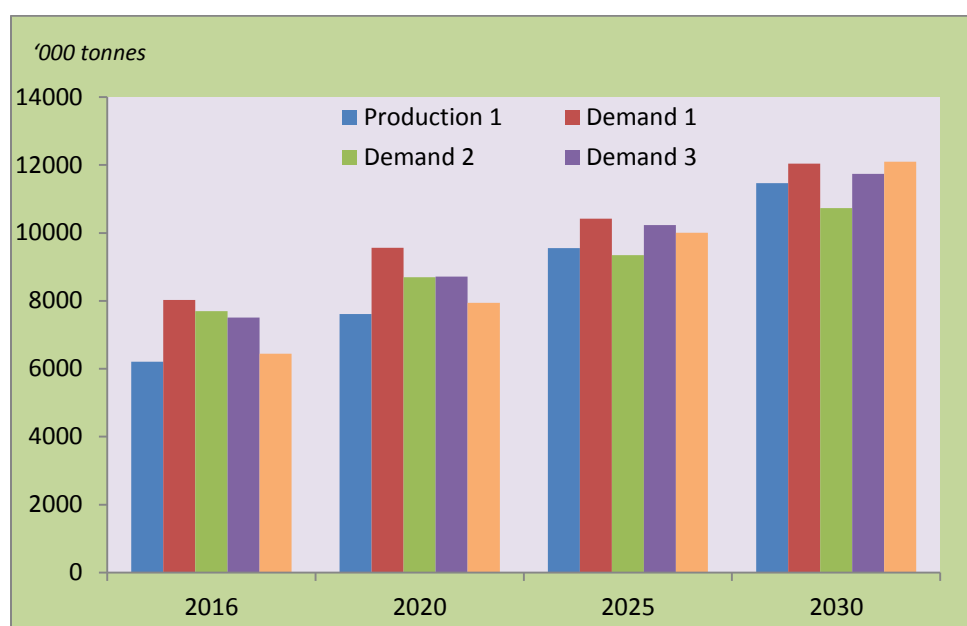
Year	Demand	Production (scenario 1)	Deficit/surplus	Production (scenario 2)	Deficit/surplus
2013	6 045	5 073	-972	5 128	-917
2014	6 901	5 570	-1 331	5 680	-1 221
2015	7 204	5 884	-1 320	6 057	-1 147
2016	7 506	6 205	-1 301	6 444	-1 062
2017	7 809	6 535	-1 274	6 794	-1 015
2018	8 112	6 872	-1 240	7 153	-959
2019	8 414	7 262	-1 152	7 562	-852
2020	8 717	7 615	-1 102	7 939	-778
2021	9 020	7 978	-1 042	8 327	-693
2022	9 322	8 394	-928	8 765	-557
2023	9 625	8 770	-855	9 168	-457
2024	9 927	9 156	-771	9 581	-346
2025	10 230	9 550	-680	10 004	-226
2026	10 533	9 952	-581	10 436	-97
2027	10 835	10 362	-473	10 877	42
2028	11 138	10 780	-358	11 328	190
2029	11 441	11 207	-234	11 788	347
2030	11 743	11 470	-273	12 100	357

Source: Authors' projections.

As shown in Table 3, if growth in wheat production were to follow the assumptions in the second scenario, the requirement for imports would be in the range of 1.2 million tonnes to 97 000 tonnes between 2014 and 2026. Afghanistan would cease to be an importer beginning in 2027, with a net surplus of 42 000 tonnes of wheat grain. Surplus production would reach 357 000 tonnes in 2030, raising the prospect for Afghanistan to become an exporter of food and grain.

The situation will be different if production grows at a slower pace than assumed in the first scenario. There will still be a deficit of domestic production, and wheat imports, at around 0.28 million tonnes, will be needed to meet the demand by 2030. But if growth in demand follows a pattern consistent with the assumptions of the second scenario, at 9.34 million tonnes of wheat by 2025 (Table 1), the country will cease to be an importer of wheat beginning in 2025. Thus, Afghanistan ceases to be a wheat importer under both scenarios. The possibilities exist to move this timeline even closer, achieving self-sufficiency in domestic wheat production between 2020 and 2025.

Figure 7. Comparison of projected demand and production of wheat, 2013–2030



Source: Authors' projections.

The yield targets selected for developing the scenarios of production growth were conservative rather than overtly ambitious. In 2012, high yields of irrigated wheat, ranging from 3.5 tonnes per ha to 4.13 tonnes per ha, were recorded in the provinces of Logar, Wardak, Paktya, Paktika, Khost and Nangarhar (SMIO, 2012). Similar findings were also obtained in the SMIO survey of farm households conducted in seven provinces in 2012 (SMIO, 2012). In Herat, Bamyan and Parwan Provinces, farmers harvested yields of irrigated wheat ranging from 3.01 tonnes per ha to 3.76 tonnes per ha. To make the projections, the yield targets were set at 3.45 tonnes per ha in 2020 and 3.79 tonnes per ha by 2025. If yield levels envisaged for 2025 and beyond are now achievable in some regions of the country, then there are real prospects for considering a faster growth of irrigated wheat yield than envisaged in the production models.

Yields of rainfed wheat in the high end were in the range of 1.20–1.50 tonnes per ha, recorded in the northern and north-eastern regions of the country. In contrast with irrigated wheat, sustaining the growth of rainfed wheat yields at rates envisaged in the production projections will be more challenging and will require more focused interventions to manage the agro-climatic risks of rainfed wheat cultivation. The likelihood of success in reaching the overall target lies with increasing the share of irrigated wheat area and its productivity to compensate for the sluggish growth of rainfed wheat productivity.

The additional opportunities not reflected in the models of production growth but that can accelerate progress include a reduction in post-harvest losses; increased irrigation water-use efficiency, with sizeable gains in the vertical expansion of irrigated wheat cropping; and

improvements in marketing, trade terms and policies that make domestic cultivation competitive and provide incentives for farmers to allocate more of their productive land to wheat cultivation – raising the profitability of wheat cultivation is a prerequisite for the envisioned steady growth in the country’s wheat area. Increasing the growth in the wheat-cultivated area by only a decimal percentage point beyond what is envisaged will likely push the achievement of self-sufficiency in domestic wheat production from 2025 to anytime between 2022 and 2024.

4. Strategies to accelerate wheat sector development

The analysis underlying the projections up to 2030 provided the basis for formulating the key elements of the WSDP that would accelerate wheat production in Afghanistan, with the goal of achieving self-sufficiency in the supply of wheat by 2025. The elements were designed to compensate for weakness in some areas and find synergy in others. The possibility exists for reaching the goal sooner, depending on how the strengths and weaknesses are evaluated and whether the synergies are deftly manipulated during the programme’s implementation.

The guidance provided in the National Wheat Policy and the recommendations in the six sector studies of the wheat value chain commissioned under the FAO-supported TCP/AFG/3302 project provided the following inputs in formulating strategies for Afghanistan’s wheat sector development.

- Increase the share of irrigated area in the total area under wheat cultivation to at least 54 percent by 2016, 58 percent by 2020, 63 percent by 2025 and 68 percent by 2030.
- Expand the area under wheat cultivation at a minimum growth rate of 2.35 percent per annum from 2013 to 2030 so that the total wheat area increases from 2.51 million ha in 2012 to not less than 2.73 million ha by 2016, 2.95 million ha by 2020, 3.23 million ha by 2025 and 3.5 million ha by 2030. This expansion of the wheat area is in line with the National Wheat Policy target for bringing 4.1 million ha of rainfed land under cultivation.
- Maximize achievable farm-level yields of wheat in irrigated areas and close the exploitable yield gap so that the growth pattern of irrigated wheat yields between 2013 and 2030 follows the trend growth rate of 5.83 percent per annum achieved between 2000 and 2012. The minimum national average yields of irrigated wheat targeted are: 3.17 tonnes per ha by 2016, 3.45 tonnes per ha by 2020, 3.79 tonnes per ha by 2025 and 4.14 tonnes per ha by 2030.
- Stabilize wheat yields under rainfed cultivation and close the yield gap to reach the target of average rainfed wheat yields of not less than 1.41 tonnes per ha by 2016, 1.64 tonnes per ha by 2020, 1.92 tonnes per ha by 2025 and 2 tonnes per ha by 2030, with a focus on minimizing the interregional variations of rainfed wheat yields. Between 2009 and 2012, coefficients of variation of regional yields of rainfed wheat in Afghanistan ranged between 13.4 percent and 33.2 percent.

- Increase irrigation water-use efficiency from the current 25 percent to at least 40 percent by 2030, thus multiplying gains from the horizontal expansion of irrigated cropping. A simultaneous increase in the efficiency of irrigation water use and expansion of irrigation will contribute towards reaching the target of increasing the share of irrigated area faster than envisaged in the production models.
- Improve farmers' access to inputs, technology and knowhow by eliminating existing weaknesses and adopting new approaches for the efficient provision of extension support services and training.
- Increase farm-level efficiency of input use – fertilizer, seed and labour – by stepping up mechanization and introducing improved production practices.
- Minimize post-harvest losses of wheat along the value chain, from within post-harvest operations to transportation and storage, which are estimated currently at about 15–20 percent.
- Improve the quality of domestically produced flour by introducing new wheat varieties with superior quality for making flatbreads and by modernizing the wheat milling industry.
- Upgrade wheat marketing practices – market price information collection and dissemination, market infrastructure, transportation and storage (and thus eliminate weak links in the supply chain) – to a level commensurate with the need to accelerate the transition of the Afghan wheat economy from household-centred subsistence to a competitive commercial sector.
- Provide incentives to farmers – concessional loans, minimum guaranteed procurement prices, access to production inputs, duties on imports, squeezing the flow of the illegal trade, targeted subsidies and other policies – to make domestic wheat production profitable and competitive with the quality of imported wheat.
- Create a human resource base in anticipation of staffing requirements for scientific, technical, administrative and managerial positions to support wheat sector development through training at different levels – tertiary education (including at the M.Sc. and Ph.D. levels), short-term training, refresher training, study tours and field visits.
- Improve wheat sector governance through capacity-building associated with the principles of good governance – transparency, accountability, participation, effectiveness and efficiency, inclusiveness and equity – starting with project design and carrying on through all stages of implementation, including financial management and audits, the processing of competitive bidding for the procurement of supplies and services, the negotiation of contracts, managing partnerships and collaborations and monitoring and evaluation.

5. Programme interventions

The Wheat Sector Development Programme interventions were designed to put the proposed strategies into action and transform the quantitative targets into reality, with specific timelines for achieving them. These interventions are broken down into short-term (five years) and medium-term (ten years) implementing periods. Institutional arrangements will be made to exploit synergies with ongoing projects and other projects in the pipeline that could impact the development of the wheat sector.

5.1 Closing the gaps in wheat yields

Justification

The “yield gap” is the difference in yield produced by the same crop variety grown with the application of different levels of technology and crop management practices within similar climate zones. The benchmark is the potential yield, obtained in experimental trials with various nutrients and levels of water and different types of technology. The potential yield level is hardly attained in farmers’ fields because farmers seldom adopt research-recommended technology in full; they skip certain elements and adapt recommendations according to their own judgement, primarily based on the costs and returns on investment.

It is more practical to think about an exploitable yield gap between the average yield and the maximum attainable yield in farmers’ fields using current technology and crop management practices. However, it is possible to increase the range of exploitable yields in that gap, moving closer to potential yield, by undertaking large-scale on-farm demonstrations, farmers’ training and facilitating farmers’ access to production inputs by keeping their prices affordable and by removing the constraints in the supply chain. The purpose is to influence how farmers judge the merits of new technology and nudge them towards adoption rather than adaptation of recommended technology packages. Closing a yield gap by 100 percent is hardly achievable because as the yield increases, the law of diminishing returns on investment comes into play and the advantage of a new variety is gradually eroded due to the emergence of new threats, such as more virulent strains of some common wheat diseases.

In assessing the exploitable yield gaps of wheat in Afghanistan in preparation for the WSDP, the average potential yield of improved varieties of wheat currently in use was estimated at 5.2 tonnes per ha (Niane et al., 2011). The national average yield of wheat in 2009–2012 was estimated at 2.82 tonnes per ha for irrigated wheat and 0.83 tonnes per ha for rainfed wheat (MAIL, various years). At the farm level, the average yields of wheat harvested by 6 020 households in 2012 (representing seven provinces of the country) were 2.85 tonnes per ha for irrigated wheat and 0.94 tonnes per ha for rainfed wheat (SMIO, 2012). Farm-level yield data

collected in another survey also conducted in 2012 in 284 villages, covering 28 districts of six provinces (Balkh, Kunduz, Bamyan, Nangarhar, Herat and Ghor) was also used. The average yield of irrigated wheat in that survey was 2.42 tonnes per ha for irrigated wheat and 1.39 tonnes per ha for rainfed wheat (SMIO, 2012). The theoretical yield gap, measured as a difference between potential yield and an average of farmers' yields, was estimated at 45–54 percent for irrigated wheat and 70–80 percent for rainfed wheat.

The maximum yields attained in farmers' fields were then used to estimate the extent of the exploitable yield gap with the current level of technology and typical crop management practices. The highest yield harvested in 2012 was 4.13 tonnes per ha for irrigated wheat, recorded in Paktika and Khost Provinces, and 1.5 tonnes per ha for rainfed wheat, recorded in Balkh Province. The gap between the maximum yields and farmers' average yields stands at 30–40 percent for irrigated wheat and 7–37 percent for rainfed wheat.

Closing the yield gap by at least 30 percent for irrigated wheat and by 20 percent for rainfed wheat seems feasible in light of the most conservative assessment of the potential for closing existing yield gaps of wheat in Afghanistan. If the 30 percent exploitable yield gap in irrigated wheat is narrowed at an annual 2 percent rate over a 15-year period beginning in 2014, then the yield level of 4.14 tonnes per ha targeted for 2030 comes within reach by 2025 (4 021 kg per ha). At that rate, production from irrigated areas would increase, with total production of wheat climbing to 10.496 million tonnes by 2025 instead of the projected 10.004 million tonnes. Demand would be exceeded by surplus production varying in the range of 79 000 to 1.1 million tonnes of wheat grain (Table 2). Bridging the yield gap in rainfed areas will be more challenging due to the vulnerability of rainfed wheat cultivation to seasonal variations of rainfall, the occurrence of droughts and the absence of suitable technologies to mitigate the agro-climatic constraints. But even a fraction of the expected gain in closing the yield gap of rainfed wheat would raise the prospect of shifting the timeline to achieve self-sufficiency in the domestic supply of wheat closer to 2020.

The WSDP will require a better understanding of the wheat-growing environments of Afghanistan. With a total of 34 provinces and 170 districts, the country is characterized by unique mountains, valleys and plains and thus has no large ecological zones because every valley and plain differs. Nevertheless, the country is usually divided into four geographic regions and seven agro-ecological zones (Akbarzad, 2013).

When drawing the boundaries of wheat-growing zones, land-gradient elevation (mountains, hills, valleys, plains and river basins) and altitude-linked climate (annual precipitation and its distribution, seasonal variations in temperatures, duration of the winter and natural vegetation) are considered. Examples of designated wheat-growing zones are the Northern Hills, Western

Plains, Central Arid Zone and Southern Hills. After designating the mega wheat-growing zones, they can be further delineated at the micro level as the Agricultural Research Institute of Afghanistan's institutional capacities are expanded and more field data are collected to enable such planning.

The WSDP is a multi-component programme. It promotes applied and adaptive research; improvement of the extension services through training of staff and front-line demonstrations, farmers' training and field visits; the delineation of wheat-growing zones and wheat-growing environments; the packaging of production technologies tailored to specific wheat-growing zones; and the improved supply and quality of inputs. It draws on attempts to maximize the use of what is best currently available in terms of knowledge, technology and physical infrastructure while providing guidance for making new investments in emerging frontiers of knowledge and technology that will sustain wheat sector development. It is essentially a platform for amassing critical strength in the drive for making rapid progress in the country's production of wheat.

Even in countries that went through green revolutions but are now caught in the midst of stagnation and sluggish growth in the productivity of staple cereals, closing the yield gap is considered a practical option to stabilize the domestic production of food cereals. The WSDP provides the key thrust for sustaining the recent gains in wheat productivity and for rapidly boosting wheat production in Afghanistan.

Proposed outcome

This WSDP component on closing the yield gaps will help Afghanistan achieve self-sufficiency in the domestic supply of wheat by 2025. Eliminating dependence on large-scale annual imports of wheat and wheat flour – the country's staple food grain – will bolster food security, both at the national and household levels.

Outputs

1. Establishment of front-line demonstrations and other field demonstrations in each wheat-growing district of Afghanistan.
2. New technologies adopted by lead farmers and others exposed to front-line demonstrations.
3. Improved rural network for the faster flow of certified good-quality seeds and other inputs.
4. Delineated wheat-growing zones for technology development and improved production planning.
5. Development of zone-specific packages of production practices for winter and spring wheat grown under both irrigated and rainfed conditions.
6. Introduction of technologies for improving input-use efficiency.

7. Reduced gaps in yields.
8. Domestic production of wheat at par with consumer demand.

Activities

1. Establish front-line demonstrations in farmers' fields, under the close supervision of scientists, to display the performance of the full technology package – new seed varieties and crop management practices (seed sowing, seed rate, balanced fertilization, land levelling, pest management, irrigation scheduling, water conservation and life-saving irrigation to rainfed wheat). These front-line demonstrations will be used for continuous field evaluation of the advantages of new technology by communities of farmers in the vicinity of a lead farmer (the owner of the plot where each front-line demonstration is established). In addition to newly released wheat varieties, the front-line demonstrations will include elite lines of seeds awaiting formal release as a variety that will give growers a head start on the uptake of new varieties.
2. Conduct farmers' field days and farm fairs to increase the number of farmers exposed to the front-line demonstrations.
3. Increase the farm-level supplies of quality seeds by linking lead farmers with other farmers in the same village as a supplier of seeds (harvested from the front-line demonstrations), strengthening other channels of farmer-to-farmer seed exchange and improving the quality of farm-saved seeds by providing hands-on training to farmers in the techniques of quality seed production.
4. Distribute to farmers minikits that contain 4–5 kg of foundation seeds, along with fertilizer, for the faster penetration of improved varieties and to enhance farmers' access to quality seeds.
5. Build national institutional capacity for providing extension services (through the central MAIL and the district extension departments, NGOs and private companies) by increasing the number of field-level extension agents and their technical competence and skills in setting up field demonstrations and conducting farmers' training.
6. Develop appropriate educational and instructional materials, taking into account the low literacy level of Afghan farmers. More emphasis should be placed on demonstration films and videos, hands-on training and personal visits rather than printed materials. The printed materials should be simple fact sheets describing recommendations, with extensive use of pictures and diagrams and limited use of text; whatever text is used must be in local languages.
7. Delineate wheat-growing zones to capture the diversity of the wheat-growing environments of Afghanistan, including both seasonal types (winter wheat and spring wheat) and the availability of water (irrigated and rainfed). Such zoning would encourage the restructuring of technology development to fit those environments, particularly the

identification, testing and release of suitable wheat varieties for each wheat-growing zone.

8. Develop a package of production practices for each zone – sowing time, seeding rate, depth of seeding, spacing, optimization of irrigation water use and scheduling, supplemental irrigation, fertilizer application, weed control, pest monitoring and control, and diversification of cropping systems for improving soil health.
9. Conduct field demonstrations of the technologies for improving water-use efficiency, particularly laser land levelling and bed planting of wheat.
10. Conduct training for farmers on wheat production, based on the concepts of whole family training and mobile training.
11. Improve farmers' access to fertilizers and low-cost farm machinery, such as two-wheel tractors, and seeders, bed planters, laser land levellers, reapers and harvesters.

Implementing agencies

Agricultural Research Institute of Afghanistan (ARIA) and its regional and field stations, MAIL Research and Extension Directorate, Directorate of Agriculture, Irrigation and Livestock (DAIL), farmers' cooperatives, NGOs and agri-business companies

Implementation modality

For the effective coordination of the proposed activities, a small National Working Group will be formed by drawing members from the implementing agencies. The Working Group will be headed by a programme director, designated by MAIL, and will report to the Wheat Coordination Committee within MAIL. A national consultant will be recruited to assist the programme director with the technical supervision of programme activities, in maintaining links with stakeholders and coordinating all activities at the provincial level. Technical assistance will be needed for the collection of relevant data and information and the development of a suitable methodology for the delineation of the wheat-growing environments in Afghanistan. An international consultant with sufficient experience in agro-ecological data management, simulation and modelling will be recruited to conduct the zoning of the wheat agro-ecological areas of the country and to tailor location-specific technology development for wheat cultivation.

The Working Group, through a consultative procedure, will develop a work plan for the first phase (2014–2018) of the programme, incorporating all activities. The Wheat Coordination Committee will review progress on each activity against the WSDP targets and suggest recommendations improving performance as needed.

Duration:

Phase 1: five years (2014–2018)

Phase 2: five years (2019–2023)

Indicative budget phase 1 (2014–2018)

Item	Quantity/unit	Cost per unit (\$)	Total cost (\$)
Technical assistance: international consultant	12 months	10 000	120 000
National consultant	60 months	1 500	90 000
Duty travel and transportation			1 050 000
Administration/finance assistant			15 000
Establishment of field demonstrations	4 250	500	2 125 000
Operating costs			
Adaptive research and technology packaging			2 000 000
Farmers' field days and farm fairs	4 250	250	1 062 500
Farmers' training	2 000	150	300 000
Distribution of minikits (4–5 kg) of foundation seeds	100 000	5	500 000
Farmers' field visits			50 000
Extension training materials (videos, films, fact sheets, etc.)			200 000
On-farm seed production: training and seed exchange			200 000
Field demonstration of farm machinery			
Laser land levellers			100 000
Tractors, seeders, bed planters, reapers, combine harvesters			200 000
Short-term training (six months to one year)			
Extension personnel			150 000
Research staff			150 000
Expendable equipment			
General office supplies			32 500
Miscellaneous			10 000
Non-expendable equipment			
Computer with accessories, office supplies			15 000
Mapping, colour printing			15 000
Workshops, meetings			15 000
Technical support services: reporting costs			10 000
Grand total			8 410 000

5.2 Strengthening the institutional capacity for wheat research and seed production

Justification

Adequate institutional capacity in terms of trained human resources, organizational skills and physical infrastructure is a key prerequisite for the emergence of a sound agricultural research system that is capable of taking on the national challenges in agriculture and food production.

The Agricultural Research Institute of Afghanistan, under MAIL, conducts and coordinates agricultural research in the country. In addition to its head office in Kabul, ARIA has 18 research stations representing all agro-ecological zones, of which 15 are located in 13 provinces, with three stations in Kabul. Not all the stations are reasonably equipped and fully functioning. ARIA's total staff strength is 125, including 105 technical specialists. The system has yet to recover the institutional capacity that was in place before 1979.

The existing gap in ARIA's scientific and managerial capabilities is addressed by contingency measures that largely draw on the sustained engagement of international organizations in running research programmes, including wheat research and seed production. The key players are the International Centre for Research in Dry Areas (CIMMYT) and the International Centre for Improvement of Maize and Wheat (ICARDA), which assist ARIA with the introduction of elite lines of seeds and improved germplasm from external sources, setting up multi-location trials for the evaluation of their performance and the release of the best-yielding and disease-resistant varieties. They receive funding through donors; AusAID, with the Australian Centre for International Agricultural Research (ACIAR), has been a major donor, funding a series of projects: Stress-tolerant wheat and maize for Afghanistan (2002–2004), Wheat and maize productivity improvement in Afghanistan (2004–2007) and Sustainable wheat and maize production in Afghanistan (2007–2012). JICA is currently funding a project, Development of wheat breeding materials for sustainable food production (2011–2016). JICA also supported MAIL in the rehabilitation of research infrastructure and capacity-building through the National agricultural experiment stations rehabilitation project (2005–2011). At the national level, FAO remains heavily engaged in the rehabilitation and revitalization of Afghanistan's agriculture sector, with the total value of its project portfolio for 2008–2011 at \$220 500 325; its assistance is channelled under the Country Programming Framework (FAO, 2012b).

Although continuing international support is meeting the current needs, it is imperative to mobilize domestic resources and look for solutions that address not only gaps in programme financing but also in organizational skills and management competency. In the absence of an efficient organizational structure and proper management capacity, it will be difficult to scale up programme interventions, both in scope and content; increasing funding levels would only encourage wastage of resources and corruption.

Ideally, organizational restructuring should address the gaps in the scientific, technical and managerial competence and aim to fill those gaps so that international funding assistance is drawn in through a project format, with implementation fully in the hands of national authorities and international technical assistance provided in the form negotiated contracts and consultancies.

Existing deficiencies are prominent in the weak and ad hoc programme planning, and there is no vetting process to assess and endorse ARIA's research programmes. Lines of communication along the managerial hierarchy are weak, leading to inadequate coordination in carrying out assigned responsibilities. These deficiencies in organizational capability must be taken into account in designing programme approaches for strengthening the institutional capacity of wheat research and seed production in Afghanistan.

At the programme level, adaptive breeding constitutes the bulk of ARIA's research programmes on wheat. This approach has led to the release of 30 varieties since 1992 that belong to different seasonal types – winter wheat, spring wheat and facultative wheat, which are suitable for cultivation under rainfed and irrigated conditions. The National Catalogue of Wheat Varieties in Afghanistan documents these varieties using characterization data for 36 descriptors (Niane et al., 2011). Since 2009, four varieties have been released – Baghlan 09, Koshan 09, Muqawim 09 and Chonte 1 – that are resistant to the Ug99 race of stem rust disease, which is an emerging global threat with potential for inflicting significant damage to wheat yields. The farm-level impact of cultivation of improved varieties has been impressive, with average wheat yields increasing at 1.97 percent annually from 1991 to 2010. Yield gains were more consistent and superior in irrigated wheat than in rainfed cultivation.

But there is growing realization of the limits of a breeding programme that is structured almost exclusively on adaptive trials and oriented to releasing exotic germplasm as varieties. A major shortcoming is the absence of a structured programme for the development of high-yielding wheat varieties with resistance to biotic and abiotic stresses for different agro-ecological conditions. Addressing this limitation is dictated by the need to develop adequate strategies for coping with the adverse impacts of global climate change on agricultural production. Such change is expected to be pronounced, with increases in the incidence of prolonged heat spells and drought as well as seasonal redistribution of annual rainfall. To cope with these challenges, there is need for significant expansion of the scope of wheat research and capacity-building (research, human resources and regulatory mechanisms) in novel approaches in wheat breeding, such as molecular breeding and biotechnology and including genetically modified organisms (GMOs) and hybrid technology.

Additionally, the grain quality of most of the Afghan wheat varieties is poor and unsuitable for making good-quality naan (flatbread). Many quality-conscious urban consumers prefer the imported flour to the flour produced from domestically grown wheat. This is a major impediment to the emergence of a competitive domestic wheat flour milling industry. Steps were taken in the 2011/2012 season to start a home-grown breeding programme. This involved identification of donors for yield improvements, adaptation and disease resistance and then making more than 200 crosses (Sharma, Qayum and Mohmand, 2012).

Eliminating bottlenecks in the rapid multiplication of seeds is a basic precondition for the faster diffusion of improved varieties and their adoption by farmers. FAO's long involvement in Afghanistan's seed sector was vital for sustaining the supply of quality seeds to farmers during the years of turmoil in the 1990s and also in rebuilding and revitalizing the seed system during the past decade. Post-2002, FAO, with European Union funding, has executed two projects – Strengthening national seed production capacity in Afghanistan GCP/AFG/018/EC (2003–2006)

and the Variety and seed industry development project CP/AFG/045/EC (2007–2012). The European Union funded a transition project for implementation by FAO in cooperation with MAIL for 15 months (April 2012–June 2013) as a follow-up measure until the new agriculture funding portfolio of the European Union was endorsed in 2013. In addition to the EU/FAO projects, other donors and partners,⁵ through their involvement in seed production, multiplication and distribution activities, also have contributed to the development of the seed sector.¹² The World Bank, under the five-year Afghan Agriculture Input Programme (2013–2017), earmarked an investment of \$30.2 million for improved seed production and certification.

These projects established necessary institutional structures (the Improved Seed Enterprise, the Afghanistan National Seed Organization, private seed enterprises and contract growers), created a regulatory framework (the National Seed Board, the Variety Release Committee, the Seed Certification Agency, the National Seed Policy and the Seed Law) and supported human resource development, all of which paved the way for the emergence of a seed industry in Afghanistan.

Achievements gained in the decade-long EU/FAO engagement in the seed sector have also created favourable conditions for tapping additional donor support to promote further growth of the seed industry, focusing on capacity-building and enhancing efficiency along the seed chain. This is important, considering that the emergence of supply-side institutional structures was not the result of spontaneous market-based mechanisms based on supply and demand but rather the product of government-sponsored and donor-supported efforts that often had to overcome the harsh norms and rigor under which the markets operate. The seed industry was promoted side by side with the subsidized and free distribution of seeds, entrenching a dependency culture among many farmers who look at seeds not as a product of business enterprise but rather a gift to be distributed through government and NGO programmes. New approaches are now needed to avoid the practise of policies that distort market mechanisms and dampen entrepreneurial drive.

The results of sustained investment in the seed sector are evident in the increase of wheat seed production, from 207 740 tonnes in 2005 to 328 000 tonnes in 2011. This amount of seed production is adequate to meet the requirement of wheat seed, estimated at 316 000 tonnes in 2012. The production of certified wheat seed also has increased, from 12 948 tonnes in 2009 to 24 136 tonnes in 2011, with a seed replacement rate of 7.6 percent, which was short of the 10 percent rate stipulated in the 2012 National Seed Policy. Investments in the production, sale and distribution of certified seeds need to be stepped up to increase the seed replacement rate to at least 25 percent by 2030.

⁵ *United States Agency for International Development (USAID), United States Department of Agriculture (USDA), Japan International Cooperation Agency (JICA), AusAID, French Cooperation Office for MAIL (FCOMAIL) and numerous NGOs, including the Swedish Committee for Afghanistan.*

Higher-priced seed, in comparison with the supply from neighbouring countries, is a major constraint to increasing the selling of certified seeds. Solutions lie in cutting the cost of production of foundation and registered seeds by the Improved Seed Enterprise, a state-owned operation, by eliminating its inefficiencies and reorienting its functions towards more collaboration with the private sector. Selected private seed enterprises with experience in EU/FAO seed projects and with contract growers also can be assigned responsibility for producing foundation and registered seeds.

The availability of adequate breeder seed is important for the rapid multiplication of seeds for dissemination to farmers. Adequate capacities should be established at ARIA's central and regional stations for the production of breeder seeds. The status of the marketing infrastructure in terms of depots, stores and stalls is rudimentary, and farmers face difficulties in buying seeds in the marketplace. MAIL extension services are better options for seed distribution. Development of the informal seed sector is another option for increasing farm-level supplies of quality seeds.

Other than adaptive breeding, little meaningful research has been done in wheat agronomy. The current recommendations on crop management practices are based on trials conducted by FAO in the 1990s. For effective planning, coordination and management of multi-dimensional research on wheat in the country, a separate Wheat Research Centre should be established. A dedicated national institution to promote wheat research and development (R&D) would be better positioned to mobilize and orchestrate efforts to achieve the technology mission envisaged in the WSDP.

The WSDP is expected to lead to the development of new varieties of wheat with higher yield potential that can better adapt to the local growing conditions and to improved grain quality and crop management technology. The programme will also focus on the needed capacities for the rapid multiplication of all categories of wheat seed (foundation, registered and certified), for improving the quality of on-farm seed production and for increasing the farm-level supply of quality seed aimed at faster penetration of improved varieties. With an improved technology base, it will be possible to foster a growth rate of average yields that is at or exceeds the levels envisioned in the strategies for wheat sector development in Afghanistan.

Proposed outcome

This WSDP component will strengthen national capacity (organizational, managerial, scientific/technical and human resources) to manage the development of new varieties of wheat suitable for diverse wheat-growing environments. The programme will put in place production technologies and an efficient seed supply system as part of the greater outcome of achieving or exceeding by 2025 the targeted level of wheat production.

Outputs

1. Improved organizational and management structure of agricultural research for the diversification and scaling up of wheat research and seed production.
2. Development of a wide range of new varieties of wheat and production technologies that are suitable for specific wheat-growing zones, seasonal types (winter, spring and facultative) and growing conditions (irrigated and rainfed).
3. Establishment of a Genetic Resources Unit with modern storage and maintenance facilities for the conservation of wheat genetic resources.
4. Establishment of a separate Wheat Research Centre.
5. Improved efficiency of the seed supply system and faster penetration of new varieties to the farm level.
6. Human resources trained at different levels for conducting wheat research and managing seed production.

Activities

1. Undertake organizational reform by elevating the status of the Agricultural Research Institute of Afghanistan to an autonomous organization, affiliated with MAIL and led by its own governing council or board of management. This is needed to allow ARIA to function truly as the apex institution of the national agricultural research system in terms of coordinating and conducting agricultural research in the country. In this capacity, ARIA will have broad authority for administration and finance, including programme planning, research coordination, priority setting, allocation of budgets, recruitment of personnel and procurement systems.
2. Conduct a third-party periodic review of ARIA's scientific research programmes as a mechanism for exercising oversight on their adequacy and relevance and to address specific issues.
3. Strengthen ARIA's regional research stations to expand the scope of their work beyond the outreach of ARIA's central station. Enable them to undertake their own wheat breeding and component technologies development programmes that are suitable for the wheat-growing zones within their respective jurisdiction. ARIA's regional research stations will take the lead in formulating location-specific technology packages, which should then lead to substantial gains in the efficiency of inputs (seeds, fertilizers and water).
4. Expand the scope of home-grown wheat-breeding programmes by identifying suitable parental lines of seeds for their high-yield potential, grain quality and resistance to biotic and abiotic stresses (such as resistance to yellow rust and stem rust (Ug99)) and their tolerance to heat stress and drought.

5. Enhance genetic resources and develop novel breeding material by introgression and by backcrossing beneficial alleles from local Afghan wheat cultivars, landraces and wild relatives. The goal will be to broaden the genetic basis for adaptation to local growing conditions, including resistance to diseases and tolerance to heat stress and suboptimal growing conditions.
6. Establish a central repository for local germplasm – a Genetic Resources Unit – for the collection, conservation, characterization and utilization of Afghan landraces, local varieties and wild relatives of wheat. This activity can build on the JICA-supported Development of wheat breeding materials for sustainable food production project, which is ongoing (2011–2016).
7. Undertake preparatory measures, including a feasibility study, land acquisition, design plans and resource mobilization, for establishing a separate Wheat Research Centre as a dedicated national institution for conducting wheat research and development in Afghanistan.
8. Develop varieties for specific wheat-growing zones, seasonal types (winter and spring) and growing conditions (rainfed and limited irrigation) through applied, adaptive and farmer-participatory breeding.
9. Develop crop-management technologies for rainfed wheat-growing environments.
10. Streamline seed variety registration and release processes and remove obsolete varieties of seeds from the national roster as well as the seed production chain.
11. Accelerate formal sector seed production along the seed chain (breeder seed, foundation seed, registered seed and certified seed) by increasing ARIA’s capacity of breeder seed production and the capacity of other stakeholders down the chain, focusing on increasing efficiency of operations and the reduction of seed production costs. In addition to the Improved Seed Enterprise, capable private seed enterprises may be allowed to buy breeder seed directly from ARIA to produce foundation and registered seeds.
12. Establish demonstration plots on farmers’ fields, conduct field days, organize farm fairs, develop farmer-level seed sharing and exchange mechanisms and undertake other extension activities aimed at creating both demand for quality seeds and improving the supply of quality seeds at the farmer level.
13. Minimize the lag time between approval and release of varieties and seed availability to farmers by distributing minikits of foundation seeds to farmers for their multiplication through the on-farm seed production system.
14. Strengthen the capacity of the informal seed sector by providing training to farmers on seed production and supporting institutional links at the farmer level for making quality seeds available to farmers.
15. Undertake a training programme for the development of human resources for wheat research and seed production, as follows:

- Refresher training to staff from ARIA and the Improved Seed Enterprise and community seed assistants on the production of breeder, foundation and certified seeds as well as crop handling and field management.
- Training on the operation and maintenance of seed processing equipment for all private seed enterprises and on marketing management for small and medium-sized enterprises.
- Training in the transfer of technology to farmers through on-farm demonstrations and to staff from MAIL's Directorate of Extension on electronic and mass media communication.
- Study tours for senior staff of MAIL to neighbouring countries for exposure to recent developments in wheat research and production.
- M.Sc. and Ph.D. degree courses to deserving staff and new recruits in disciplines of agronomy, seed production, crop protection, irrigation management and business management.
- Specialized training in module and audio-visual aids development to design publicity and teaching materials that target farmers who are not very literate.
- Training to ARIA staff on the maintenance of breeding for nucleus seed production.

Implementing agencies

ARIA in partnership with CIMMYT/ICARDA, MAIL/DAIL Research and Extension Directorate, the Improved Seed Enterprise, private seed enterprises, NGOs and farmers' cooperatives

Implementation modality

For the effective coordination of activities, a Project Implementation Unit (PIU) will be formed by drawing members from the involved organizations. The PIU will be housed at MAIL headquarters and will report to the Wheat Coordination Committee. A small Technical Working Group will be formed with one representative each from ARIA, the MAIL Research and Extension Directorate, CIMMYT and ICARDA for the planning and management of wheat research programmes. A senior MAIL official with sufficient knowledge in contemporary issues of agricultural research and development in Afghanistan and experience in public administration will be the project director. The project director should have sufficient authority for undertaking required steps and initiatives and engaging different levels of government bureaucracy for the organizational restructuring of ARIA. A national consultant will be recruited to assist the project director with the technical supervision of programme activities, maintaining links with stakeholders and coordinating activities at the provincial level.

The Working Group, through a consultative procedure, will develop a work plan for the first phase (2014–2018) of the programme, incorporating all activities. The Wheat Coordination Committee will review the progress of the activities against the WSDP targets and suggest recommendations for performance improvements as needed.

Duration:

Phase 1: five years (2014–2018)

Phase 2: five years (2019–2023)

Indicative budget phase 1 (2014–2018)

Item	Quantity/unit	Cost per unit (\$)	Total cost (\$)
Investment cost			
Establishment of a central Genetic Resources Unit	1		1 000 000
Establishment of a grain quality testing laboratory	1		500 000
Upgrading of physical facilities, laboratory and field research capacities of ARIA and regional stations	TBD		10 000 000
Establishment of a Breeder Seed Production Unit at ARIA	1		1 000 000
Operating cost			
Research operating cost (breeding, germplasm testing and component technology development)			10 000 000
Seed extension (field demonstrations, field days, farm fairs and informal seed sharing)			2 500 000
Farmers' training in on-farm seed production			500 000
Improved Seed Enterprise/private seed enterprises/contact growers			
Training, technical assistance and equipment for foundation, registered and certified seed production			5 000 000
Training cost			
Graduate studies (M.Sc. degree for research staff)	10	3 500??	840 000
Extension staff	10	3 500??	840 000
Ph.D. degree (research staff)	5		1 500 000
Short-term training (one year)			
Research staff	5	3 500??	420 000
Extension staff	5	3 500	420 000
Study tours	5	5 000	25 000
In-country workshops			25 000
Travel			
Transportation and communication equipment for extension staff	15		150 000
In-country duty travel for project personnel			100 000
Technical assistance			
National consultant	60 months	1 500	90 000
Administration/finance assistant			15 000
Expendable equipment			
General office supplies			30 000
Miscellaneous			10 000
Non-expendable equipment			

Computer with accessories, office supplies			15 000
Technical support services (reporting costs)			10 000
Grand total			34 990 000

5.3 Support for the enhanced utilization of inputs for accelerating wheat production

Justification

Farmers' improved access to production inputs and their efficient utilization will be a major prerequisite to simulating higher growth in yields and thus elevating domestic wheat production to self-sufficiency by 2025 or sooner. The efficiency of input use is determined by the supply, delivery systems, timeliness and techniques of their application. When applied judiciously, inputs produce a synergistic effect on crop yields. The inputs considered under the WSDP are fertilizers, pesticides, farm machinery, credit and land.

Fertilizer use in Afghanistan falls much below the level needed to support consistent growth in wheat production. A major constraint is the limited industrial capacity in the domestic production of chemical fertilizers. In 2011/2012, the total production of chemical fertilizers was 376 445 tonnes, while 339 611 tonnes were imported. The domestic production accounted for only 9.8 percent of the total consumption of fertilizers. The private sector handles all the importing of fertilizers, more than half of which occurs through unregulated cross-border trade. In the absence of proper inspection, the quality of imported fertilizers does not always match the required standards and the prices are also high. According to the findings of the 2012 farm-level survey conducted in seven provinces, fertilizers, on average, accounted for 35 percent of the total cost of irrigated wheat production (SMIO, 2012).

Existing fertilizer use is overly simplistic and is not based on sound experimentation. Urea and diammonium phosphate (DAP) are two fertilizers that Afghan farmers commonly use in wheat cultivation. In the SMIO survey, the average use of urea in irrigated wheat cultivation amounted to 34 kg per ha, varying from 46 kg per ha in Herat Province to as low as 16 kg per ha in Kabul Province. In rainfed wheat, farmers applied an average of 4 kg per ha of urea. The average use of DAP was 23 kg per ha in irrigated wheat and 4 kg per ha in rainfed wheat. Of the total households surveyed, 81 percent attributed the low level of fertilizer use to the unavailability of good-quality options. Although But farmers recognized the importance of fertilizer, with 32 percent of those surveyed believing change in fertilizer management is the major factor needed for increasing the yield of wheat crops (SMIO, 2012).

Improved access and use of quality fertilizer is only part of the solution, however. Correct portions and the use of balanced fertilizers also make a difference in efficacy and profitability.

Farm-level fertilizer use is only a fraction of what is recommended. If affordable, the highest dose recommended is 250 kg per ha of urea and 200 kg per ha of DAP; the second-best recommended dose is 250 kg per ha of urea and 100 kg per ha of DAP for growing improved varieties of wheat under irrigation and 60 kg per ha of urea and 25 kg per ha of DAP for rainfed wheat (MAIL, 2013). The recommended 250 kg per ha of urea provides 136 kg of nitrogen per ha. Wheat removes 20–30 kg of nitrogen per tonne of yield. Based on the following formula, with 136 kg of nitrogen, only 2.5 tonnes per ha yield can be achieved:

$$\text{N rate (kg/ha)} = \frac{\text{Yield} \left(\frac{\text{t}}{\text{ha}}\right) \times \text{crop removal} \left(\frac{\text{kg N}}{\text{t}}\right)}{\text{N uptake efficiency (\%)}}$$

A major shortcoming in fertilizer use is the absence of potassium, although there is no experimental basis for the non-use of potassium fertilizer. Afghan soils are reported to be deficient in potassium. Systematic non-use of potassium could result in nutrient mining. From the WSDP perspective, even the recommended rates of nitrogen and phosphorous do not seem adequate to maintain a consistent upward trend in the growth of the wheat yield without efforts to boost native soil fertility, which is critically important for greater efficiency in nutrient uptake. This can be achieved through balanced fertilization (between the use of mineral fertilizers and organic manures) or the cultivation of leguminous and green manure crops as part of the expanding cropping systems approach in wheat growing in Afghanistan.

As noted, the importing and distribution of fertilizers are handled by the private sector, mainly trading companies, agricultural cooperatives, NGOs and aid agencies. In an import-driven market supply of fertilizers, a key intervention should be public sector capacity-building in the enforcement of quality standards and the certification scheme for fertilizers through the expansion of the network of quality-control labs, trained personnel and logistics facilities for transportation, sampling and analysis.

As with fertilizers, almost 100 percent of pesticides are imported into Afghanistan. The Plant Protection and Quarantine Department of MAIL is responsible for the registration of pesticides, formulation analysis, quality control, implementation of plant quarantine rules in the country and diagnoses of plant pests and diseases. The Transit and Border Authority of Afghanistan and the Ministry of Commerce and Industries are responsible for prohibiting the entry of unregistered, World Health Organization Class 1A and 1B and banned pesticides. The University of California, Davis in the United States is involved in training (with MAIL and NGO staff) on pesticide regulations, including registration, import, storage, sale and safety in use.

Farmers are aware of the need for various pesticides. In the SMIO farm-level survey conducted in seven provinces, 8.1 percent of farmers reported using herbicides for controlling weeds. The use of insecticides or pesticides was more prevalent, with 83 percent of surveyed farmers using

them to control pests and diseases in their crop fields. About 15 percent of farmers practised integrated pest management to control pests and diseases (SMIO, 2012). A major public sector initiative in the agro-chemical sector is the investment, under the World Bank-supported Afghan Agriculture Input Programme, of \$8.2 million for national capacity-building in quality control and safety of fertilizers and other agro-chemicals and their safe use.

The existing state of farmers' access to institutional credit is not conducive for the rapid expansion of input use, including the capital asset formation needed to scale up wheat production. In the SMIO survey, only 14 percent of the farm households reported access to credit. Of them, 87 percent received loans from relatives and friends, 8 percent received loans from NGOs and 5 percent from banks. Of the total farmer households surveyed, 32 percent used loans for agricultural purposes and 68 percent for other needs (SMIO, 2012).

To improve farmers' access to institutional credit, MAIL, with USAID assistance, established an Agricultural Development Fund and an Agricultural Credit Enhancement Programme. This \$150 million programme over four years (2010–2014) focuses on expanding commercial lending and building institutional capacity for loan processing and financial product development for disbursement through financial and non-financial intermediaries to individual farmers, producer groups and associations. The Enterprise and Market Development (EMD) subcomponent of the second National Priority Programme (NPP2) envisages increasing the volume of credit transactions, from a 2012 baseline of \$65 million to \$120 million in 2015 and \$150 million in 2012, and the number of financial and non-financial intermediaries, from ten in 2012 to 120 by 2015 and 150 by 2022.

Ongoing efforts at agricultural mechanization have produced visible results on wheat cultivation in Afghanistan. About 39 percent of tillage operations are managed mainly with four-wheel tractors and 90 percent of threshing operations are handled with tractor-operated threshers. But the other operations that could be mechanized, which would then lead to substantial gains in seed rates, improvement of irrigation water-use efficiency and the reduction of pre-harvest losses, are mostly done manually.

Recently, through promotional efforts under various projects, two-wheel tractors were introduced and are becoming popular because of their low-cost affordability to small- and medium-scale farmers. These tractors can be equipped with various attachments, such as seeders, reapers, threshers and trailers, that enable farmers to use the tractor for tilling, sowing, harvesting, transporting and puddling for rice-seedling transplantation. Due to the versatile uses, farmers can recover their investment within a short time, and these tractors are seen to be more competitive in terms of cost savings when compared with human labour and animal draft power.

USAID, through the Afghanistan Vouchers for Increased Production in Agriculture (AVIPA) and AVIPA-Plus (2009–2011) programme provided substantial assistance to farmers throughout the country in accessing production inputs, such as seeds, fertilizers and farm machinery.

Land is a capital asset and key physical input in crop cultivation. Despite the abundant supply of cultivable land in the country, much of it cannot be used for crop cultivation due to the poor regulatory framework and administrative capacity for coping with land titles management (defining and enforcing), ownership, transfer, land development and other aspects of land management. The Afghanistan Land Authority, established in 2010 as an executive agency, is the nodal public sector organization responsible for improving access to public lands for economic use and investment. Expansion of the total area under wheat cultivation is one of the central strategies for increasing wheat production.

The WSDP envisages land to be brought incrementally under wheat cultivation – 397 000 ha by 2020 and 990 000 ha by 2030. This is above the target set in the EMD component of the NPP2, at 35 000 ha by 2015 and 100 000 ha by 2022. Sustained growth in wheat can come from the substitution of wheat cultivation for illicit crops (such as poppies) as well as the development of new land areas for crop cultivation through the dryland farming component of the NPP2.

This component was designed to improve the availability of quality inputs (fertilizers, pesticides, farm machinery, institutional credit and land) and the provision of services to enhance their use in wheat cultivation, all aimed at increasing farm-level production and the profitability of wheat growing.

Proposed outcome

This WSDP component will boost the institutional capacity needed for augmenting the supply of quality inputs and their delivery to farmers, which will allow them to enhance the level and efficiency of input use in wheat cultivation so as to sustain consistent growth in wheat production to achieve self-sufficiency by 2025 or sooner.

Outputs

1. Improved efficiency of input supply chain driven by effective public–private sector collaboration.
2. Effective quality-control safeguards, mechanisms and systems for fertilizers and agro-chemicals.
3. Improved recommendations for fertilizer and pesticide use, based on soil test-crop response studies.
4. Balanced use of fertilizers and improved soil nutrient management.

5. Suitable institutional models for expanding access of farmers in rural areas to institutional credit.
6. Additional land area developed for the expansion of wheat cultivation.
7. Higher level of mechanization of wheat cultivation and crop management practices.
8. Human resources trained in the efficient use of production inputs.

Activities

1. Streamline the administrative procedures for issuing import permits/licenses and customs clearance at the border entry; revise import duties and sales taxes as deemed feasible; and establish a network of pre-approved private sector dealers at the district level for private sector capacity development in the distribution and sale of fertilizers and agro-chemicals.
2. Undertake adequate measures, both incentives and penalties, for discouraging the unauthorized cross-border trade in fertilizers and agro-chemicals, which could potentially introduce harmful substances into the food chain and the natural ecosystems. Government policies should consider subsidizing fertilizer use until adequate capacities are in place in the market sector to supply approved fertilizers at affordable prices.
3. Build public sector capacity for the quality control of imported fertilizers and agro-chemicals by expanding the technical, human resources and logistics capacity for quality testing (with a focus on adulteration and misbranding, deliberate manufacturing of low-quality fertilizers and the short weight of bags), labelling and certification.
4. Elevate quality control into a legal requirement that is enforceable on the entire territory of Afghanistan by introducing suitable mechanisms to regulate the sale, price and quality of fertilizers and agro-chemicals. This can be in the form of a Fertilizer and Agro-chemicals Control Order (FACO), with the provincial government (agencies) mandated to enforce its provisions. The FACO should include, among other things, compulsory registration of all fertilizer manufacturers, importers and dealers; specifications for the content of fertilizers manufactured in the country and those imported from other countries; appointment of enforcement agencies; specifications for setting up quality-control laboratories; and prohibition on the manufacture or import and sale of non-standard, spurious or adulterated fertilizers.
5. Upgrade the institutional capacity for delivering inputs and associated support services to farmers in both the public and private sectors through infrastructure development, institution-building and improving inter-institution links and the training for extension service providers. Expand the capacity of agricultural service cooperatives and farm service centres in terms of storage facilities, logistics and trained human resources to serve a large number of farmers in the provision of inputs and other market-oriented activities along the supply chain. This activity can build on the completed Farm service alliance project (2008–2012) and forge synergy with the ongoing Agricultural Research, Extension and Education Development Programme (2012–2017).

6. Focus public–private sector collaboration on the development of innovative institutional models for the cost-effective provision of input delivery services to farmers in the larger context of supporting market-led approaches for supply chain development.
7. Undertake systematic soil test-crop response studies in all regional stations to develop appropriate recommendations for the application rate and timing of fertilizers and agro-chemicals in wheat production.
8. Encourage farmers through demonstration and training in how and why they should balance the application of mineral fertilizer with organic manure.
9. Undertake adequate measures through the Plant Protection and Quarantine Directorate and qualified private dealers for making available sufficient quantities of suitable herbicides for controlling weeds. Weeding is typically managed by hand and thus often neglected, severely affecting wheat yields. Excellent combination herbicides, such as sulfosulfuron and metasulfuron or isoproturon plus 2,4-D, are now available to control complex weed flora.
10. Through MAIL’s Directorate of Agricultural Machinery and the Directorate of Extension and Agriculture Development, organize demonstrations of modern agricultural machinery, such as four-wheel tractors and two-wheel tractors and their attachments (wheat seeders, bed planters, zero-till drills and reapers) as well as combine harvesters.
11. Establish an agricultural machinery research unit under MAIL’s Directorate of Agricultural Machinery to conduct research through small workshops and establish machine-testing facilities.
12. Conduct a feasibility study of tillage mechanization in hilly areas with two-wheel tractors.
13. Accelerate public–private sector collaboration through the involvement of agricultural cooperatives, NGOs and seed companies for the faster mechanization of sowing, land levelling and harvesting, which is expected to lead to sizeable gains in the efficiency of resources used. Such collaboration should focus on setting up on-farm demonstrations of machinery and training farmers in their use.
14. Design policy-led interventions to encourage the farm-level use of machinery. Support domestic manufacturing and fabrication of agricultural machinery, such as concessional loans and subsidies for the purchase of machinery and reducing taxes and duties for the importation of raw materials for the domestic manufacturing of machinery.
15. Enhance farmers’ access to institutional credit as a necessary precondition for expanding the use of inputs in wheat cultivation. This can be done by improving the national capacity for generating financial resources for lending through the development of suitable loan and other financial products and their disbursement to farmers, making use of formal banking and informal financial and non-financial intermediary institutions.
16. Undertake steps, through the Afghanistan Land Authority and other appropriate government institutions, to make additional land available for the expansion of wheat

cultivation. This activity can benefit from the System of Wheat Intensification as planned under the dryland farming subcomponent of NPP2.

17. Coordinate with other government ministries and departments to find suitable interventions for encouraging farmers to switch from illicit cropping to wheat-based cropping systems as an avenue for increasing the supply of cultivable land for the incremental increase in wheat area, as envisaged in the WSDP.

Implementing agencies

MAIL/DAIL Research and Extension Directorate, ARIA, Arazi, Ministry of Finance, NGOs and farmers' cooperatives

Implementation modality

Implementation of this programme requires setting up a PIU at MAIL for the effective coordination of programme activities across relevant organizations. A senior MAIL official with sufficient experience in agricultural administration will be designated as the project director to lead the PIU. The PIU will consist of members representing all stakeholders in the MSDP. It will report to MAIL's Wheat Coordination Committee. A national consultant with sufficient experience in wheat research and development will be recruited to exercise technical oversight and assist the project director in implementing programme activities. A Technical Working Group will be formed for programme planning, development of work plans and the technical reporting of activities.

The Wheat Coordination Committee will review progress on the activities against the WSDP targets and suggest recommendations for performance improvements as needed.

Duration:

Phase 1: five years (2014–2018)

Phase 2: five years (2019–2023)

Indicative budget phase 1 (2014–2018)

Item	Quantity/unit	Cost per unit (\$)	Total cost (\$)
Investment cost			
Building new infrastructure and renovating existing facilities for public extension services at the district level			10 000 000
Construction of storage facilities (stores and depots)	TBD		2 000 000
Provision of logistics (equipment and transportation)			1 000 000
Staffing provincial and district extension services with qualified personnel	TBD		1 000 000
Support to private sector institutional building in the delivery of inputs (farmer groups, cooperatives, farm service centres, input traders, etc.)			2 000 000
Upgrading lab facilities and logistics for soil testing and fertilizer	10	25 000?	1 250 000?

quality control			
Establishment of a farm machinery research unit	1		1 000 000
Support to enterprise development – through small-scale workshops and service centres – for local fabrication and manufacturing of farm machinery			1 000 000
Development of publicly owned land for expansion of the total area under wheat cultivation	TBD		2 000 000
Operating cost			
Feasibility study of tillage with two-wheel tractors in hilly areas	1		50 000
Soil test-crop response studies for the development of fertilizer recommendations at the subnational level	15	??	1 000 000
Demonstration of farm machinery (four-wheel and two-wheel tractors, wheat seeders, bed planters, reapers and combine harvesters)	TBD		500,000
Staffing of the quarantine and quality control services with adequate inspectors	TBD		1 000 000
Training cost			
Short-term training for private sector capacity development in the supply chain management for inputs	TBD		600 000
Farmers' training (use of balanced fertilizers and farm machinery)	TBD		500 000
Short-term staff training: research and extension	10	3 500??	840 000
Short-term training for quality control personnel	TBD		500 000
In-country duty travel			500 000
Technical assistance			
National consultant	60 months	1 500	90 000
Administration/finance assistant			15 000
Miscellaneous costs			100 000
Grand total			26 945 000

5.4 Intensification of irrigated wheat and improving the productivity of rainfed wheat through supplemental irrigation

Justification

The progressive increase in the proportion of wheat area that is irrigated is another key strategy of the WSDP. Afghanistan's annual renewable surface water resources are estimated at 57 billion cu m. They are distributed and managed within five river basins. Of them, the Panj-Amu River Basin supplies 38.6 percent, the Northern River supplies 3.3 percent, Helmand River supplies 16.3 percent, Harirod-Murghab River supplies 5.4 percent and the Kabul River supplies 36.4 percent of water resources. Groundwater constitutes 18 billion cu m of potentially available water resources.

Apparently adequate for satisfying the needs of the population of Afghanistan for domestic use and irrigation, these water resources are so unevenly distributed across the river basins, population settlements and agricultural areas that the country uses only 33 percent of its available surface water resources (Zimmermann, 2011). The remainder is lost as downstream flow to

neighbouring countries. River basins that contain the greatest amounts of water, such as the Panj-Amu or the Kabul, are not necessarily associated with the largest shares of irrigable land or population. In contrast, river basins, such as the Helmand or the Northern, that are associated with large shares of available irrigable land do not benefit from proportionate shares of water.

In Afghanistan, surface water systems – rivers and streams – are the most extensive irrigation type, estimated to account for 86 percent of the total irrigated area. The remainder is irrigated from groundwater sources (springs, karezes and wells). Surface water resources are largely dependent on spring and early summer snowmelt, which results in peak flows in early to late spring, depending on the river morphology and location within the catchment. Particularly in the northern catchments, perennial flow occurs in the larger rivers. In the southern and western catchments as well as small streams and washes, flow is largely confined to the spring and early summer months (Rout, 2008).

The relatively modern, formal river-diversion structures that were built in the 1960s and 1970s in Afghanistan account for only 15 percent of the total irrigated area. Traditional systems that employ informal river-diversion structures maintained by the users account for about 55 percent of the total irrigated area, while traditional systems that are based on natural springs account for the remaining 30 percent. In formal irrigation systems, canals are designed, developed, operated and maintained by engineers from the Ministry of Energy and Water. The major formal schemes with potential for irrigation under their command areas are: Nahr-e-Shahi (50 000 ha), Gawargan (8 000 ha), Kelagoy (20 000 ha), Saharawan (40 000 ha), Sang-e-Mahr (3 000 ha), Kunduz–Khanabad (30 000 ha), Nagarhar (39 000 ha), Parwan (24 800 ha), Sardeh (15 000 ha), Helmand (103 000 ha) and Boghra (50 000 ha) (Chaudhary, 2013).

Water availability at the field level for irrigating wheat shrank severely due to damages inflicted on the country's irrigation infrastructure during the armed conflict years. Many structures were damaged deliberately and many suffered from lack of maintenance. The reconstruction efforts led to the development of more than 28 716 small and medium-sized and 35 large irrigation projects. The World Bank helped 600 small, medium-sized and large irrigation schemes, comprising 618 000 ha. In 2009, the World Bank (2009) provided \$33.5 million for 85 medium and eight large irrigation schemes.

With World Bank funding, MAIL is currently implementing a \$40.6 million On-farm water management project in the provinces of Kabul, Nangarhar, Balkh and Bamyan. The Ministry of Energy and Water is implementing two projects: i) a \$148.7 million Emergency irrigation rehabilitation project and ii) a \$5 million Afghanistan water resources development technical assistance project. The European Union is funding a \$1.77 million Kunduz integrated water initiative, implemented by MAIL, and a \$5 million Kunduz River Basin Programme and the

Amu Darya River Basin Programme, implemented by the Ministry of Energy and Water. These investments are designed to rehabilitate canals and increase the delivery of irrigation water, improve the management of water by irrigation-water users and build the capacity of government staff as well as water users' associations.

Irrigation water-use efficiency, which is a measure of the amount of water supplied by an irrigation system and effectively used by crops, is low. Indeed, not all water from a source, whether river or well, reaches the roots of plants. Average water-use efficiency is about 25–30 percent. This low efficiency is due to conveyance losses in the primary, secondary and tertiary canals and lack of good on-farm water management practices (Roy, 2013). Efficiency of the tertiary distribution system mainly depends on soil type, the layout of canals, water distribution systems, knowledge of water management practices and the organizational aspects of irrigation users' and water users' associations. Conveyance loss in tertiary canals and other canals occurs mainly because of excessive seepage, over-topping of canal banks, excessive weeds in the canals, the topography of the canals, the non-alignment of canals and weak banks. This loss can be minimized significantly by improving the technical and management aspects of the canals.

“Technical aspects” refer to the lining of critical canal sections (both canal bed and bank), periodic cleaning, de-silting and reshaping sections where necessary and the provision of water-control structures, such as turnouts and foot culverts. “Management aspects” refer to the democratic formation of irrigation users' and water users' associations and their involvement with government (specifically with the Ministry of Energy and Water) officials who are responsible for the rehabilitation and other development works of the canals and the equitable distribution of canal water.

There is also opportunity for making additional and substantial gains towards improving water-use efficiency by changing the amount, timing and method of application of irrigation water in wheat cultivation. Wheat requires 450–650 mm of water during its growing period. The Manual of Wheat Production in Afghanistan recommends four irrigations: (i) at the crown root initiation stage, (ii) the jointing stage, (iii) the heading stage and (iv) the milk dough stage. If there is an irrigation water shortage, three irrigations will still produce higher yields (at the crown root initiation, the heading and the milk dough stages).

These recommendations are in sharp contrast with the typical practice of up to ten times of application by some farmers because they lack knowledge about irrigation scheduling and matching crop water needs with critical crop growth stages. In all areas of the country, wild flooding is the delivery method used in fields. This leads to substantial waste because farmers are careless about levelling during the preparation of their land and, as a result, raised portions of the field do not receive any water while the lower portions become over irrigated, negatively

impacting both growth and the yield. Training farmers on improved scheduling of irrigation, land levelling and furrow and bed-planting methods would considerably contribute towards increasing average water-use efficiency, at up to 40 percent in the short term.

In the rainfed areas, a crop life-saving supplemental irrigation is key to stabilizing wheat yields and reducing the large interregional variability of rainfed-wheat yields. In these rainfed areas, a study of groundwater aquifers is needed to determine the feasibility of tube well installation. If supplemental irrigation can be given either by tube well or by rainwater harvesting, then the yield of wheat would increase significantly.

Of the country's 7.7 million ha of cultivated land, 3.2 million ha were equipped for irrigation, with 1.167 million ha available for wheat in 2012 (MAIL Agricultural Prospects Report, 2012). Despite ongoing investment in rebuilding the irrigation infrastructure, the share of irrigated area in the total wheat cultivated area in Afghanistan is stagnating rather than expanding. Between 2004 and 2012, irrigated areas accounted for an average of 47.6 percent of the total area, with the largest area, at 1.199 million ha, recorded in 2004 (MAIL Agricultural Prospects Report, 2012,).

A steady increase in wheat areas under irrigation is the centrepiece of this WSDP component to accelerate wheat production. The programme envisages an average growth of irrigated areas under wheat at between 3.5 per cent and 3.8 percent per annum from 2013 to 2030, with the expectation that the share of irrigated areas in the total area under wheat increases to 50–54 percent by 2016, 55–58 percent by 2020, 59–63 percent by 2025 and 64–68 percent by 2030.

Multiple approaches should be in place for maintaining the expansion of irrigated areas at such robust rates. Horizontal expansion through the rehabilitation of existing structures and building new ones will have a critical role in developing additional water resources for irrigation purposes. But a sizeable gain, which can be harnessed in a shorter time frame by making better use of existing water resources, can be achieved through improved efficiency. This involves improvement in the technical design and maintenance of canals to reduce seepage loss, in on-farm water management and in wheat irrigation agronomy practices – land levelling, scheduling irrigation that matches crop water needs, and furrow and bed planting for the delivery of water through furrows instead of wild flooding. Construction of facilities for supplemental irrigation in rain-dependent areas (such as rainwater harvesting at the community level, water reservoirs and tube wells) will stabilize rainfed-wheat yields at higher levels. All these changes will help in reaching or exceeding the yield targets of rainfed wheat.

This programme was designed to create the necessary knowledge and technology base as well as physical infrastructure that will facilitate the faster conversion of rainfed-wheat areas to irrigated areas and provide limited irrigation to areas expected to remain rain-dependent for wheat cultivation.

Proposed outcome

This WSDP component to enlarge the area that is irrigated will steadily expand the irrigation coverage of areas under wheat cultivation through improved water-use efficiency and the physical expansion of irrigation infrastructure. Facilities for providing supplemental irrigation in rainfed areas also will be expanded. With that expansion of irrigation coverage, wheat yields and production are expected to increase at, or exceed, the rates needed to achieve self-sufficiency in the domestic supply of wheat by 2025.

Outputs

1. Increased surface water and groundwater resources available for irrigating wheat in all wheat-growing zones of Afghanistan.
2. Sustained annual increase in the share of irrigated areas in total areas under wheat cultivation.
3. Increased farm-level use of improved practices – land levelling, reduction in the number of irrigations applied during a crop’s life cycle, efficient methods of water delivery and supplemental irrigation in rainfed-wheat cultivation.
4. Establishment of irrigation users’ and water users’ associations in wheat-growing areas.
5. Newly trained human resources available for the allocation, distribution and on-farm management of irrigation water.
6. Overall water-use efficiency improved by at least 50 percent by 2020.

Activities

1. Develop water resources for the progressive increase in coverage of wheat-cultivated areas under irrigation through the construction of structures and other facilities – dams, canals, water reservoirs, flow diversion structures, tubewells and pumping stations – in the five river basins and the flat arid areas.
2. Expedite and expand the rehabilitation and development of primary, secondary and tertiary canals, karezes, springs and wells.
3. Improve canal design and structure, including the lining, to reduce seepage losses and sedimentation and to increase water distribution.
4. Establish demonstration plots displaying the performance of laser land levellers during land preparation and its benefits in improving water-use efficiency and grain yield. Organize farmers’ field days around these plots during the growing season to demonstrate the advantages of laser land levelling in terms of the uniform distribution of water in the field and the reduction in the water needed (thus, cost savings). An ICARDA study (2011) found that proper land levelling can reduce water use by as much as 33–50 percent.

5. Establish field demonstrations of the bed and furrow method of irrigation to reduce the amount of water required for irrigation. Delivery of water through furrows instead of wild flooding reduces the loss of water in conveying water within the field. This technology could contribute towards saving 20–50 percent of irrigation water, as demonstrated in a 2011–2012 trial conducted at the Badam Bagh research station (Wheat Production Manual, 2013).
6. Conduct farmers' training in on-farm water management practices, such as land levelling, identification of growth stages of wheat most sensitive to moisture stress and the associated scheduling of irrigation, bed planting of wheat, soil moisture conservation through mulching and minimum tillage, rainwater harvesting through the construction of mini ponds and reservoirs, and conforming to the recommended sowing time in rainfed areas.
7. Improve community-level management by democratizing the traditional mirab system for the equitable and efficient allocation and distribution of water through the involvement of irrigation users' and water users' associations, as envisaged in Afghanistan's new Water Law.
8. Build institutional capacity in terms of technical knowledge and managerial skills of the irrigation users' and water users' associations, government staff and other stakeholders in the allocation and distribution of water in formal and informal irrigation systems.
9. Undertake research to determine soil properties affecting moisture retention, crop coefficients and actual crop evapo-transpiration in the major irrigation-command areas to determine the water requirement of a wheat crop, and improve the scheduling of irrigation to match crop-water needs.
10. Conduct a feasibility study on groundwater aquifers in rainfed areas to explore the potential for supplemental irrigation through tubewells that will extract the groundwater.
11. Introduce machinery for improving water-use efficiency – laser land levellers, seed drills and bed planters – by adopting appropriate policies for importing, local fabrication and manufacturing and by involving farmers' associations, cooperatives, NGOs and financial institutions in designing suitable approaches for small-scale farmers to access such machinery.
12. Coordinate the design and implementation of investment projects in the irrigation sector with the Ministry of Energy and Water to avoid duplication; exploit synergy in efforts through the formation of a high-level inter-ministerial coordination committee.
13. Develop a long-term national perspective (2020–2050) on the availability of river water for irrigation, in view of the increasing demand for water and shrinking flows due to climate change.
14. Build diplomatic clout and negotiating skills to arrive at an understanding with Pakistan and Iran in building large-scale dams and diversion structures along the common rivers to

increase Afghanistan’s legitimate entitlement to available water resources that are commensurate with its needs.

Implementing agencies

ARIA, MAIL Research and Extension Directorate and the Ministry of Energy and Water

Implementation modality

A PCU will be set up in MAIL’s Irrigation Department for undertaking new investment projects, drawing on the effective exploitation of complementarities and synergies with ongoing irrigation infrastructure rehabilitation and development projects. Another important PCU task will be to coordinate with the Ministry of Energy and Water in formulating a long-term national perspective on water resources development for meeting the increasing demand for irrigation water and planning major irrigation infrastructure projects. The goal is to make enough water available to increase the coverage of irrigation in wheat-cultivated areas, as envisaged in the WSDP. The PCU will also consider suitable institutional arrangements with the dryland farming component of the NPP2 in examining options for supplemental irrigation in rainfed-wheat areas through the construction of water reservoirs, the installation of tubewells and the promotion of conservation technology.

The PCU will be formed with members representing all organizations involved and headed by a project coordinator, to be deputed from MAIL’s irrigation wing. It will be staffed with adequate administration and finance personnel to ensure that the procurement, preparation and processing of bidding documents, approval of work orders, the fielding of contractors and suppliers, and fund release are handled efficiently so that implementation schedules of planned activities are properly maintained. The project coordinator will report to the Wheat Coordination Committee. The Wheat Coordination Committee will conduct an annual review of the activities against the WSDP targets for increasing the coverage of irrigation in wheat growing areas. It will suggest remedial measures to improve performance and ensure that the planned increases in irrigated wheat areas are achieved on schedule.

Duration:

Phase 1: five years (2014–2018)

Phase 2: five years (2019–2023)

Indicative budget phase 1: five years (2014–2018)

Item	Quantity/unit	Cost per unit (\$)	Total cost (\$)
Investment cost			
Development of new irrigation schemes and rehabilitation of existing infrastructure	TBD		45 000 000

Infrastructure for supplemental irrigation in rainfed areas (water storage tanks, reservoirs and tubewells)	TBD		150 000 000
Operating cost			
Research on the zone-based water requirement of wheat and improved scheduling of irrigation	TBD		1 000 000
Research on the potential of groundwater aquifers in rainfed areas to support tubewell-based irrigation			500 000
Formulation of a long-term national perspective (2020–2050) of availability of river water for irrigation	1		100 000
Demonstration of on-farm water management practices			
Laser land levellers			500 000
Bed and furrow irrigation			500 000
Demonstration of conservation practices in rainfed wheat cultivation (mulching, minimum tillage, rainwater harvesting, etc.)			200 000
Training cost			
Farmers' training in on-farm water management	TBD		1 000 000
Training for water users' associations	TBD		200 000
Capacity-building of MAIL officials in irrigation management (short-term training and study tours)	TBD		400 000
Academic training in wheat irrigation agronomy			
M.Sc. (two-year degree programme)	5	3 500??	420 000
Ph.D. (three-year degree programme)	5	????	1 500 000
Miscellaneous costs			200 000
Grand total			606 520 000

5.5 Crop diversification for improving productivity and the sustainability of wheat cultivation

Justification

The arable land in Afghanistan, at 7.8 million ha, constitutes only 12 percent of the country's total land area. Despite a harsh climate, limited water availability and a challenging landscape of varying elevations and vegetation cover, farmers grow a wide range of crops, including cereals, vegetables, pulses (mungbeans, mungbeans, lentils and chickpeas), saffron, sugar beets, sugarcane, sunflowers and soybeans. The tree crop-based horticulture production consists of fruits (apples, grapes, apricots, peaches, pomegranates, walnuts, almonds, plums, quince, cherries and figs). Wheat is grown in diverse cropping systems in Afghanistan (Table 4). Under irrigation, wheat is rotated with cereals (barley, rice and maize), legumes (chickpeas), potato, cotton, fruits (watermelon) and vegetables. Vegetables grown in summer include okra, tomato, eggplant, pepper, pumpkin, cucumber, spinach, lettuce and others. The winter vegetables include onion, cauliflower, turnip, spinach, radish, carrot, cabbage, etc. Irrigated cropping systems are more intensive (double- and triple-cropped) than rainfed ones, which are mostly double- and single-cropped wheat.

With per capita consumption now in excess of 180 kg per year, wheat will remain the most important food crop of Afghanistan and the central pillar of household food security. But in terms of profitability of cultivation, wheat trails behind other cereals (rice and barley) and vegetables and far behind horticultural crops. Domestic wheat production at present is also not competitive with the import of wheat. This is due to the higher production cost of wheat resulting from the high prices of imported fertilizers, which accounts for almost half of the total production cost of wheat.

In this situation, there is a strong temptation to abandon wheat cultivation in favour of more remunerative commercial horticultural crops and finance the importing of grain to meet the deficit through export-generated revenue. But this is fraught with the danger of exposing the nation's supply of staple food to the vagaries of market and policy decisions of the exporting countries.

In this context, crop diversification provides an option for sustaining wheat production while boosting total household income through the cultivation of more remunerative crops and broadening the base of household food and nutrition security. It also creates additional employment opportunities in the rural economy through downstream links in processing and marketing. Yields of wheat grown in sequence with other crops, particularly legumes, are also improved because of the improvement in soil fertility. Expansion of diversified cropping in suboptimal environments, such as rainfed areas, will contribute to improving the sustainability of rainfed wheat cultivation as well as yields.

Table 4. Important cropping patterns in selected provinces of Afghanistan

Province	Cropping pattern	
	Irrigated	Rainfed
Kabul	Wheat/barley–fallow Wheat/barley–fallow/vegetables	Wheat/barley–fallow
Parwan	Wheat/barley–fallow	Wheat/barley–fallow
Herat	Wheat–rice Wheat–vegetables Wheat–vegetables/rice Wheat–barley/potato Wheat–barley/wheat Cucumber/chickpea/sesame Wheat–barley/vegetables	Wheat Wheat–watermelon Wheat–chickpea/wheat Wheat–chickpea–cucumber
Jalalabad	Wheat–rice/vegetables (onion, potato, okra) Vegetable–rice Wheat–cotton Wheat–maize–vegetables	Nil
Balkh/Mazar	Wheat Cotton–vegetables	Wheat

	Wheat/barley Wheat/barley–vegetables	
Kunduz	Wheat–rice/maize	Rice/barley–wheat Rice–wheat
Bamyan	Wheat/barley Wheat–vegetables Wheat–rice	Wheat

This programme was designed to expand the diversification of the wheat-based cropping system as a means to enhance the sustainability of wheat production, improve rural livelihoods and strengthen household food and nutrition security. It will build on the strategies outlined in Save and Grow – FAO’s new paradigm of agricultural development based on sustainable crop production intensification. The programme has synergy with subcomponent 2 (Grains and Legumes) and 3 (Horticulture) of component 1 (Food for Life) of the NPP2.

Proposed outcome

This WSDP component on crop diversification will introduce new varieties and crops as well as locally produced seeds to expand their cultivation and thus expand coverage of wheat-based cropping systems in both rainfed and irrigated areas.

Outputs

1. Greater diversity of Afghanistan’s wheat farming systems and expanded coverage of wheat-based cropping patterns.
2. Increase in the institutional capacity to support crop diversification.
3. Increase in the availability of locally produced seeds of a wide array of food crops.
4. Farmers’ groups formed to grow wheat in wheat-based cropping systems.
5. Improved sustainability of wheat cultivation in Afghanistan.

Activities

1. Identify suitable provinces and districts with the most potential for diversification of wheat-based cropping systems under both irrigated and rainfed conditions.
2. Organize farmers’ groups willing to undertake the cultivation of diverse crops in their farming systems. Provide training in the production practices of crops selected for cultivation in wheat-based cropping systems.
3. Select a variety of vegetables, fruits, legumes and cereal crops, based on growers’ preferences, market demand and potential for fitting into the agro-ecological environments of targeted locations.
4. Conduct whole-family training on the consumption of nutritionally balanced food.
5. Establish cropping pattern-based block demonstrations in farmers’ fields.

6. Conduct farmers' training around these plots, focusing on improving the quality of farm-saved seeds harvested from them.
7. Encourage farmers participating in the demonstration trials to sell and share seeds of crops grown in these trials with other farmers for the dissemination of cropping pattern-based technology.
8. Link organized farmers' groups with institutional sources of credit and loans for the procurement of inputs.
9. Develop effective local seed supply systems for the faster dissemination of demonstrated technology.

Implementing agencies

ARIA, MAIL Research and Extension Directorate and NGOs

Implementation modality

For the effective coordination of the activities, a PCU will be formed by drawing members from relevant organizations. The PCU will be housed at ARIA and will be led by a project coordinator, who will be a senior scientist designated by ARIA. A small Technical Working Group will be formed to assist the project coordinator in the development of technical programmes, work plans and reporting the progress of activities. The PCU will be under the administrative oversight of MAIL's Wheat Coordination Committee. The Working Group will comprise scientists and specialists in cereals, horticulture and extension. The PCU will report to the Wheat Coordination Committee, who will review annual progress results against the WSDP targets and suggest recommendations for improving the performance, as needed.

Duration:

Phase 1: five years (2014–2018)

Phase 2: five years (2019–2023)

Indicative budget (2014–2018)

Item	Quantity/unit	Cost per unit (\$)	Total cost (\$)
Operating cost			
Formation of farmers' groups for diversified cropping	TBD		500 000
Establishment of demonstrations of wheat-based cropping systems	2 500	1 000	2 500 000
Farmers' training (production practices, on-farm seed production, informal seed exchange, etc.)	2 500	500	1 250 000
Support to farmers' groups and other institutional models for on-farm seed production and seed-sharing of different crops			1 000 000
Grand total			5 250 000

5.6 Strengthening the domestic supply of wheat through post-harvest loss reduction, improvement of on-farm storage and expanding the Strategic Grain Reserve

Justification

Not all of the wheat produced in a field finds its way to on-farm storage and ultimate use. A substantial loss may occur immediately before harvest if the optimum harvesting time is misused due to inclement weather or other reasons. Following a harvest, losses occur at each step of grain handling: threshing, transport, processing and storage. In Afghanistan, these losses are estimated at 15–20 percent, although no study (either qualitative or quantitative) has been conducted to assess the extent of post-harvest losses (Ahmed, 2013). Improving the technical efficiency of operations in each of the post-harvest steps is the key to bringing down aggregate losses to a minimum acceptable level. Even a modest 5 percent gain in reducing post-harvest losses in the short term would result in significant additional production, helping to advance the timeline for achieving self-sufficiency in the domestic supply of wheat.

Harvesting is still done manually by sickle; the use of combine harvesters (with harvesting, threshing, cleaning and bagging all done in one operation) is limited to less than 10 percent of the total wheat area, mainly in the northern and southern provinces. Threshing is mostly mechanized, with an estimated 90 percent of the threshing operations done by tractor-powered threshers. The recent introduction of low-cost two-wheel tractors opened opportunity to reduce the cost of threshing operations by allowing small-scale threshers to be powered by these two-wheel tractors.

About 70 percent of wheat produced in the country is stored at the household farm level. Traditional procedures and age-old practices are mostly used in on-farm storage. Farmers tend to keep as much wheat as possible for their own food security (consumption). The most common on-farm storage is with the kanda mahali, an above-ground structure made from clay bricks and measuring 1.2 m x 2.5 m, with clay plaster on the inner wall and exterior and plastic film covering the roof. The FAO and WFP Crops and Food Supply Assessment Mission Reports (2012) indicate that storage for personal consumption has not been reported as a major problem for many farmers. However, storage has been an issue for larger farmers, who have suffered huge losses, and thus many now prefer to sell their wheat immediately after harvest without waiting for favourable prices (SENAC, 2005).

Another method frequently used at the farm level is the wrapping of grains in plastic tubes or envelopes and placing them in underground pits. These pits may be in the form of proper well-shaped structures or temporary excavations. The use of metal bins was recently promoted by donor agencies as an improvement over traditional storage practices. Farmers can keep 1–2 tonnes of wheat in bulk form in this fashion.

Private sector storage in Afghanistan has not been developed. Most of the marketing is concerned with wheat flour, which does not have much shelf life. This restricts the private sector from investing in proper storage structures; traders own or rent go-downs, rooms or stores for storage. The warehouses of some of the government organizations near the border region are also rented on a short-term needs basis. Overall, this sector largely operates on a day-to-day basis.

Public sector infrastructure for grain storage is present in the form of silos and warehouses, some of which are being repaired for use by MAIL's Strategic Grain Reserve Directorate. After completion of necessary repairs and re-equipment, the five silos are expected to provide a total storage capacity of 170 000 tonnes and 24 warehouses with a total capacity of 50 000 tonnes. MAIL has targeted 200 000 tonnes of installed capacity for the Strategic Grain Reserve to be in place by 2015 and 300 000 tonnes by 2024. The concept of the Strategic Grain Reserve emerged in the wake of the food price hikes in 2008 as a public policy to bolster emergency preparedness and response. It was assumed that a reserve stock of 200 000 tonnes would assist about 2.5 million people in times of natural and human-made calamities for six months, at the rate of 80 kg per person. This will also serve as a buffer stock during the lead time required for arranging the availability of alternative supplies.

Unlike other countries in South Asia, Afghanistan, with its existing administrative, technical and financial capabilities, can hardly afford the accumulation and efficient management of a Strategic Grain Reserve of the size that would serve a national price-stabilization objective. The National Wheat Policy, however, envisages an expanded role for the Strategic Grain Reserve beyond emergency response. In the framework of the WSDP, the Strategic Grain Reserve is expected to contribute towards minimizing the post-harvest losses (through better grain handling), improving the grain supply and stabilizing food prices, in limited scale, so as to keep household food consumption at levels that do not exacerbate poverty and malnutrition. The Strategic Grain Reserve would also contribute towards improving the farm-level storage of wheat.

This programme element is a vital to the WSDP because reductions in pre-harvest and post-harvest losses would result in significant addition to the domestic supplies of wheat, likely in excess of the targets envisaged. The programme was designed to reduce post-harvest losses in the wheat supply chain from 2013 to 2030, setting the targets of post-harvest loss reduction at 10 percent by 2015 and 3 percent by 2022, in line with the Food for Life targets within the NPP2.

The strategy focuses on improving efficiency of post-harvest operations through the application of improved technology, farmer training and managerial competence in grain handling, storage and the Strategic Grain Reserve administration, with the goal of increasing the domestic supply

of wheat. The programme also draws on synergy with the Food for Life subcomponent 6 on Emergency Preparedness and Response.

Proposed outcome

This WSDP component will increase the domestic supply of wheat and enhance household food security through the reduction of post-harvest losses and the operations of the Strategic Grain Reserve Directorate.

Outputs

1. Expanded and improved facilities for grain storage and handling.
2. Increased mechanization of post-harvest operations.
3. Reduced post-harvest losses.
4. Increased efficiency of the wheat supply chain.
5. Trained human resources for running the Strategic Grain Reserve Directorate.

Activities

1. Provide training to farmers on the harvesting of wheat and grain storage procedures, focusing on harvesting at the appropriate time to avoid yield loss due to shattering and unfavourable weather. The focus on storage should be on the procedures that reduce storage loss and preserve grain quality for extended storage, such as drying, use of suitable storage containers, airtight sealing to prevent moisture absorption and fumigation to control storage insects.
2. Conduct a study to assess the extent of losses of production in the traditional on-farm storage of wheat and suggest improvements in the design, construction and maintenance of storage structures that will minimize losses.
3. Demonstrate improved methods of on-farm storage as alternatives to traditional structures that require intensive labour, skill and materials to build and may not be sufficient to accommodate the increase in production as envisaged in the WSDP.
4. Develop institutional models for expanding the use of machinery during the harvesting processes in the context of increasing labour costs and labour scarcity because harvesting needs to be completed within a short time. These models should take into account both ownership of farm machinery by farmers or use of machinery through renting on a needs basis.
5. Organize field demonstrations of machinery for harvesting, including combine harvesters (for harvesting and threshing) and reapers (for harvesting) that are suitable for use as an attachment to the low-cost two-wheel tractors. Farmers' cooperatives, NGOs and seed companies may be involved as facilitating partners for the demonstration of farm machinery.

6. Provide price subsidy, low-interest credit and bank loans to farmers for the purchase of modern farm machinery.
7. Through the reduction of taxes and duties and the simplification of import procedures, encourage private sector participation in the importation of farm machinery and setting up local manufacturing, fabrication and service centres.
8. Undertake investment projects to complete the rehabilitation and renovation of public sector-owned silos and warehouses and build additional warehouse capacities in different locations of Afghanistan (preferably in perennially wheat-deficit areas to save costs on transportation to move supplies from wheat-surplus areas) to build and expand the coverage of strategic grain reserves.
9. Develop institutional capacity – technical, human resources and administrative – to efficiently run the Strategic Grain Reserve programme and minimize post-harvest losses in the wheat supply chain.
10. Conduct staff training in all areas, including the building, maintenance and replenishment of the Strategic Grain Reserve. These areas include, among others, procurement, storage, marketing, stock inventory, silo management, operations and finance.
11. Build capacity in policy-making in such areas as evaluating and estimating the size of the Strategic Grain Reserve in the context of changing needs, strategic positioning of storage locations in relation to transportation costs and efficiency in serving the target population, formulation of a minimum guaranteed price and grain quality requirements for procurement and market interventions for price stabilization (with administered prices).
12. Create a separate semi-autonomous National Strategic Grain Reserve Authority (NASGRA) under MAIL, with administrative, financial and technical divisions for the efficient administration of the Strategic Grain Reserve. As the institutional capacity of NASGRA expands with the increasing size and scope of the Strategic Grain Reserve, NASGRA may evolve into a separate Ministry of Food, with a mandate for stabilizing the food supply in Afghanistan.

Implementing agencies

ARIA, MAIL Strategic Reserve Directorate, private companies, cooperatives and NGOs.

Implementation modality

Implementation of this programme element will require setting up a PIU at MAIL's Strategic Grain Reserve Directorate, under the administrative oversight of the Wheat Coordination Committee. The PIU will be formed with members representing all organizations involved in the execution of this programme. It will be headed by a project director, to be selected from the ranks of MAIL's senior officials, with adequate knowledge and experience in wheat supply chain management. A national consultant will be recruited to assist the project director for the technical supervision of programme activities, maintaining links with stakeholders and

coordinating activities at the provincial level. The Wheat Coordination Committee will conduct an annual review of the progress of activities against the WSDP targets and suggest recommendations for performance improvement as needed.

Duration:

Phase 1: five years (2014–2018)

Phase 2: five years (2019–2023)

Indicative budget: five years (2014–2018)

Item	Quantity/unit	Cost per unit (\$)	Total cost (\$)
Investment cost			
Renovation and rehabilitation of existing storage facilities (silos and warehouses)	TBD		400 000
Construction of smaller warehouses (≤500 tonnes) at the district level	170	36 000	6 120 000
Establishment of a wheat-quality testing laboratory	1		5 00 000
Public–private partnership fund for establishment of service centres and service cooperatives for manufacturing and importing or leasing of farm machinery			1 000 000
Establishment of Agricultural Mechanization Fund to provide credit and soft loans for the purchase of farm machinery			5 000 000
Operating cost			
Study to assess storage losses in traditional on-farm storage methods and suggest improvement for minimizing losses	1		50 000
Demonstration of simpler and efficient methods of on-farm grain storage	TBD		500 000
Field demonstration of combine harvesters and reapers			1 500 000
Training cost			
Farmers’ training on harvesting and improved methods of on-farm storage for post-harvest loss reduction			500 000
Staff training (technical/administrative) for the effective administration of the Strategic Grain Reserve programme			500 000
Capacity-building for an expanded Strategic Grain Reserve programme, with a National Strategic Grain Reserve Authority			1 000 000
Grand total			17 070 000

5.7 Commercialization of wheat production through wheat value chain and capacity-building in marketing

Justification

The presence of a dynamic, market-oriented production system is essential for contemplating suitable interventions in terms of policies, incentives and other mechanisms to stimulate consistent growth in the production of a commodity. However, wheat production in Afghanistan

is subsistence-oriented, and the insignificant share of domestic wheat production that is traded in the market has little potential to move the wheat economy beyond that subsistence level.

Afghan farmers at present have limited access to marketing information that would help them obtain the most remunerative prices for their produce. In the SMIO (2012) farm-level survey conducted in seven provinces, 75 percent of households, on average, sold cereals in the market and 25 percent sold at the farmgate. Of the total households, 66 percent sold cereals immediately after harvest, and 34 percent could hold their produce in storage to wait for good market prices. The average distance of various markets from home was in the range 22–37 km and the transportation cost for marketing cereals was on average 1 Afghani per kg per km. Farm households' own production accounted for 62 percent of total wheat consumption and the remainder came from purchases.

These findings illustrate the hurdles to the emergence of a commercial sector in Afghanistan's wheat economy – insufficient domestic production of wheat in relation to demand, considerable uncertainty surrounding the prospects of annual wheat harvests and inadequate storage facilities. On the other hand, inadequate infrastructure, including storage, distribution network, roads and transportation connecting rural areas to urban centres and major markets, discourage Afghan farmers from investing and producing for the market. Therefore, both demand- and supply-side constraints slow the pace at which the commercial segment can find its place in Afghanistan's wheat production sector.

A major boost towards commercialization can come from eliminating weak links in the existing wheat value chain – the sequence of steps at which value is added to the wheat grain as it is transformed into flour and other processed products. In Afghanistan, a typical wheat value chain consists of the following: farmers – wholesalers (grain) – wholesalers (flour) – retailers (flour) and retailers (naan bread). Wholesalers also sell flour to wholesalers (bakery) who then sell to retail bakeries. A portion of flour at the wholesale level also finds its way to further processing into pasta and cereal. The flour miller adds 66 percent of the value of wheat during the milling process. The highest value-added process in the value chain is the production of baked goods and pasta and cereal products (Kapoor, Kice and Azimi, 2005).

Most domestically produced wheat is processed by households using traditional water mills or small-scale diesel- or electric-powered mills. Little cleaning or sieving of wheat is done before milling, so the flour is discoloured and of poor quality. The local flour is also of inadequate baking quality due to the poor grain quality of the locally grown wheat varieties. Often blending with imported higher-quality wheat flour is needed in manufacturing quality flatbreads (naan). As a result, consumers' preference is decidedly in favour of imported flour.

Afghanistan's modern milling industry is underdeveloped. Currently, there are five public mills and 12 commercial mills with a milling capacity ranging from 80 to 500 tonnes per day. These mills do not operate year-round due to the non-availability of wheat grain and continuous supply of electricity in most areas. The industrial flour milling sector is struggling with limited and inconsistent local wheat supplies, high input costs (labour and electricity) and poor grain quality of local wheat and is losing its competitive edge to imported flour, particularly from Pakistan's subsidized flour milling industry.

Inadequate domestic production of wheat and limited industrial capacity for wheat processing have oriented the wheat marketing system in Afghanistan primarily towards securing supplies from external sources (Pakistan, Kazakhstan, Iran and Uzbekistan), with a sizeable share coming from informal cross-border trade. This marketing system has evolved into a distinct regional pattern of trade. In northern markets, trade with the Central Asian republics, and particularly with cereals imported from Kazakhstan, are much more predominant. Markets in the East and South have a greater orientation to supplies from Pakistan. Informal cross-border trade accounts for a sizeable share of what flour and grain coming into the country.

No systematic study has been conducted to gain insight into the pattern of this trade and thus assess the extent of supplies coming into the country. According to US Department of Agriculture (2012) estimates, informal trade in wheat and flour in MY2011/2012 was around 150 000 tonnes (7.5 percent) of a total import of 2 million tonnes and predicted to be 250 000 tonnes (13.2 percent) of an estimated total import of 1.9 million tonnes in MY2012/2013. There are reportedly 15 entry points where wheat and wheat flour are brought into Afghanistan through informal channels from Pakistan, with the majority of this trade centred in Paktia, Khost, Paktika, Nangarhar and Kunar Provinces.

Afghan wheat markets are reasonably well integrated and functioning (FASTA, 2012). This system, dominated by an intricate network of grain and flour traders, is adept at manipulating source destinations to fill the deficit in the market supply of wheat and flour at any time. Although this strategy benefits most Afghan consumers, who are net buyers of wheat, by providing access to imported grain and flour at cheaper prices, it also inadvertently hurts domestic production by disadvantaging local producers who must compete against government subsidies provided for wheat production and processing in the exporting countries, particularly Pakistan.

Market prices of wheat are collected and analysed by both public and private sector organizations. MAIL's Statistics and Market Information Office publishes the Agricultural Commodity Price Bulletin in the last week of every month to provide the latest information on the supply and price of wheat in the domestic, regional and international markets. It includes

average retail market prices of wheat in eight regions of the country, retail prices in 34 provincial centres and seven border towns, in addition to weekly market prices reported from eight major cities.

WFP publishes monthly price bulletins on the latest developments that have implications for food security. Prices of wheat grain, wheat flour, rice and cooking oil are collected from eight major cities and provincial centres of Afghanistan – Kabul, Kandahar, Jalalabad, Herat, Mazar-i-Sharif, Faizabad, Maimana and Nili – and are analysed for trends. The bulletin is followed later in the month by a supplement containing additional data received during that month. The market information provided by MAIL and WFP is oriented towards creating a statistical database targeted to a variety of audiences, including the Government’s policy-makers, and for internal administrative purposes. This information is presented in a format that hardly fulfils farmers’ actual market information needs. The gap has been highlighted in the NPP2, in its Food for Life component, where it stresses that information and data collection be made more specific to points on the value chain and the characteristics of the clients.

The private sector is starting to fill the information gap. Roshan, Afghanistan’s leading telecommunications service provider, has introduced a user-friendly mobile phone-based national price information system. Known as Malomat, the service provides farmers, input suppliers, traders and wholesalers with access to commodity information in 13 provincial wholesale markets. Malomat provides the latest pricing information for more than 30 commodities, including wheat, rice, pomegranates and chicken, to help farmers secure the highest value possible for their crops. The service is available in Dari, Pashto and English languages. This private sector model of service provision along with a public sector network of data collection and analysis will contribute towards improving competitiveness of Afghan farmers and encourage them to invest in capital assets and inputs.

Capacity-building along the wheat value chain is a much-needed investment that will accelerate commercialization of wheat production and substantially increase the wheat sector’s contribution to the national economy. Such capacity can be built through private sector enterprise development at all steps of the value chain where inefficiencies and weaknesses exist. Currently, the weak links in the wheat value chain are post-harvest grain handling and storage; cleaning, sorting, bagging, transportation and hygienic handling for processing, packing and packaging of flour; the manufacturing of baked consumer products; and the packaging of finished goods. At the high end of the wheat value chain, the development of industrial milling capacity and modern bakeries will be key for improving the quality and competitiveness of domestically produced flour and other value-added products.

In efforts to support private sector enterprise development in these areas, there is considerable synergy to be exploited from the Afghanistan Rural Enterprise Development Programme, a subcomponent of the Enterprise and Market Development Programme under the NPP2. Improvements in marketing and the strengthening of the wheat value chain through capacity-building are expected to set domestic production more firmly on a growth path to achieve self-sufficiency in the domestic supply of wheat by 2025 or sooner.

This programme element was designed to build capacities in marketing and the value chain of wheat in Afghanistan in the framework of investments needed to spur growth of the commercial sector to a point at which it is capable of providing sustained growth in the wheat economy. Such investments are also envisaged in the NPP2.

Proposed outcome

This WSDP component will cultivate the emergence of a rapidly expanding commercial sector in Afghanistan's wheat economy through capacity-building in wheat marketing and processing, which in turn should be the engine to stimulate and sustain the high growth rates of production needed to achieve self-sufficiency in the domestic supply of wheat by 2025 or sooner.

Output

1. Improved facilities for the marketing of wheat that are available to farmers, which includes an increase in the number of storage units and better marketing infrastructure.
2. Improved market information systems to benefit wheat farmers and traders.
3. Quantitative assessment of the informal trade of wheat in Afghanistan.
4. A regulatory framework and incentive packages to expand domestic wheat production.
5. Improved quality of domestic wheat flour.
6. A strong wheat value chain capable of increasing the contribution of the wheat sector to the national economy.

Activities

1. Improve market access and expand trading capacity by building suitable infrastructure in terms of storage, connecting roads and transportation, stalls and sheds, adequate spaces for the movement of traffic and merchandise and a regulatory framework to facilitate smooth business transactions, at least at the district level, with sufficient reach to cover remote rural areas.
2. Conduct a structured study on the informal wheat trade to determine its pattern, seasonality and magnitude in the context of the overall wheat trade. The output of such a study will provide an informed basis for sound policy-making in terms of removing market distortions and designing of regulatory instruments and incentive schemes to protect and encourage domestic wheat production.

3. Conduct a periodic review of the wheat import policy, including food aid, to adjust the contribution of external supplies so that it does not create disincentives for farmers to step up their wheat production.
4. In partnership with local governments, develop suitable grassroots-level institutions adapted to local culture and practices that can support efficient agricultural markets in rural areas. The NPP2 envisages District Development Assemblies and Community Development Councils at the village level, in addition to agricultural cooperatives, to foster links between development activities and local governance. Given the current level of regional orientation of Afghan wheat markets and their efficiency in functioning, a regional rather than national focus should receive priority in the development of marketing institutions and infrastructure.
5. Update market information collection, analysis and dissemination systems so that farmers and traders have access to a range of real-time trade-related data, including prices in major markets that they can use in decision-making. Such systems should be oriented towards greater public–private sector collaboration and expanded use of cheaper and efficient methods of information dissemination based on modern communications technology.
6. Introduce modern wheat processing technologies – post-harvest handling and storage, grain milling, baking, packing and packaging – to improve the competitiveness of domestically produced wheat flour and baked consumer products.
7. Facilitate private sector enterprise development (community enterprises, enterprise groups, small and medium-sized enterprises) along the wheat value chain to improve efficiency and value addition.
8. Examine the feasibility for establishing modern industrial wheat flour mills in wheat-surplus areas of the country through public–private partnership models as a major boost towards commercialization of wheat production.

Implementing agencies

ARIA, MAIL, Ministry of Commerce and Industries and Ministry of Finance

Implementation modality

A high-level inter-ministerial PCU will be set up at MAIL to mobilize investment resources through public sector expenditure allocation to line ministries for implementing the programme activities. The PCU, led by a project coordinator, will comprise representatives from ARIA, MAIL, the Ministry of Commerce and Industries, the Ministry of Finance and industry organizations in the wheat processing sector. A Technical Working Group will be formed to assist the PCU in drawing up annual work plans, exercising technical oversight of programme activities and following up on the implementation of relevant policies by ministries that affect the activities. The PCU will report to the Wheat Coordination Committee. The Committee will

conduct an annual review of all activities against the WSDP targets and suggest recommendations for performance improvement as needed.

Duration:

Phase 1: five years (2014–2018)

Phase 2: five years (2019–2023)

Indicative budget five years (2014–2018)

Item	Quantity/unit	Cost per unit (\$)	Total cost (\$)
Investment cost			
Building market infrastructure at provincial levels (storage, stalls, covered sheds, paved roads, transportation links, bank branches and other physical facilities)			10 000 000
Support to local governments for market development in rural areas			5 000 000
Public–private partnership (PPP) fund for building modern flour mills			100 000 000
PPP fund for enterprise development along the wheat value chain (grain handling, distribution, storage, milling, etc.)			100 000 000
Operating cost			
Research for the development of wheat varieties with improved grain quality			1 000 000
Structured study on the nature and extent of informal cross-border trade in wheat to develop policy recommendations			100 000
Upgrading of public sector price and market information collection and a dissemination system			1 000 000
PPP fund for development and expansion of user-friendly mobile phone-based products, such as Malomat and M-paisa			2 000 000
Feasibility study for the construction of industrial flour mills			100 000
Extension of modern wheat processing technologies (information materials, demonstration, industrial fairs, study visits, etc.)			500 000
Training cost			
Farmers’ training in post-harvest grain handling, storage and processing for milling			2 000 000
Training millers, bakers and other processors on improved technologies for processing, packing and packaging			2 000 000
Grand total			223 700 000

6. Financing the Wheat Sector Development Programme

The seven components of the WSDP were designed to implement strategies for accelerating Afghanistan’s wheat sector development, with the goal of achieving self-sufficiency in the domestic supply of wheat by 2025 or sooner. The total investment cost for the programme over the initial five-year period (2014–2018) is estimated at around \$910 million. A major chunk of this investment is earmarked for building infrastructure and creating capital assets in irrigation

and water management, marketing, storage and wheat processing as well as enterprise development along the wheat value chain.

Much of the proposed investment in these areas is not new and overlaps with ongoing and approved projects under MAIL and other ministries. Therefore, a sizeable source of financing in support of WSDP can be mobilized by finding convergence and complementarities with ongoing programmes and projects through improved planning. Major donors, such as USAID, the US Department of Agriculture, AusAID, JICA, the World Bank, the European Union and FAO, can be approached to examine their lending portfolios and realign priorities in committed and new investments in light of the proposed WSDP interventions.

In addition, the WSDP proposes the public–private partnership (PPP) model to tap into the private sector resources for financing. This model can be particularly suitable in mobilizing resources for the modernization of the wheat processing sector and rapid mechanization of wheat cultivation in Afghanistan. MAIL will undertake joint initiatives with the Ministry of Finance and the Ministry of Law to establish a PPP fund within the Government’s budgetary framework and to design the rules and regulations for the protection of private investments under a PPP. A transparent PPP procedure will be helpful in attracting foreign direct investment in food production, processing and enterprise development.

Other indirect measures for private sector financing will be the increased flow of financial resources to farmers in the form of credits and loans on concessional terms. This would help increase farm-level investment, particularly in the accumulation of capital assets (land, farm machinery and equipment and motor vehicles) and expanded use of production inputs in wheat cultivation.

7. Implementation, monitoring and evaluation

The WSDP considers monitoring and evaluation as instruments to support the component on good governance, as described in the strategies to accelerate wheat sector development in section 4. The MAIL General Directorate of Policy and Planning will be responsible for implementing the WSDP. Suitable institutional arrangements for implementation are described in detail in section 6 for each programme element of the WSDP. A Wheat Coordination Committee, established at MAIL and chaired by the Technical Deputy Minister, will be responsible for exercising top-level administrative oversight and the monitoring of the programme. The Wheat Coordination Committee, through suitable institutional mechanisms, for example, high-level interministerial coordination committees, will coordinate initiatives that cross-cut responsibilities of other ministries and departments and require their administrative and financial assistance.

These are the Ministry of Energy and Water, the Ministry of Commerce and Industries, the Ministry of Finance and the Ministry of Law.

Before the initiation of physical activities under the programme, MAIL should consider constituting separate task forces for each programme element to examine the opportunities for aligning activities under ongoing projects with activities proposed under the WSDP, developing additional strategies and rationalizing the indicative budgets. This exercise will be important in for capturing the missing elements within the framework and exploring options for new investments to address them.

Upon commencement of work, the Project Implementation/Coordination Units of all seven components will submit detailed progress reports to the Wheat Coordination Committee at six-month intervals, which will be closely scrutinized at Committee meetings for adherence of ongoing activities to the planned schedule, status of procurement, fund disbursement, floating of tender documents, progress on procurements, processing of work orders, fielding of contractors and consultants and other administrative and financial matters that affect the smooth implementation of the WSDP. The Wheat Coordination Committee would review the results and undertake specific measures to eliminate bottlenecks and improve performance of activities.

The six-monthly review by the Wheat Coordination Committee will assess the status of ongoing activities under all programme components for their adequacy and timeliness in reaching the specific targets for achieving self-sufficiency in the domestic supply of wheat within the stipulated time frame. This review will be done concomitantly with the review of the National Wheat Policy to ensure that any changes in the Policy are reflected in adjustments and course corrections in implementation of the WSDP.

The General Directorate of Policy and Planning will design appropriate linking mechanisms between the WSDP and the NPP2 to exploit complementarities and synergies, which will be vital in marshalling the needed investment resources. It will also conduct field monitoring of WSDP activities in cooperation with provincial branches of MAIL within the scope of its mandated activity. At the regional level, research and evaluation - workshops will be conducted annually to obtain local-level feedback on the status and quality of ongoing programme activities. Evaluation of the WSDP will be done mid-term on a component basis through a third-party review. The outputs of the mid-term evaluation will be used to make necessary adjustments in the programme implementation to achieve the objectives within the stipulated time.

8. Risks and assumptions

The key features of the WSDP determine the major risks in its implementation. The programme requires investment of considerable financial resources, with a major share destined for infrastructure building and institution development. The availability of these resources will be a challenge, given the limitations imposed by the commitments of the donor community to ongoing programmes and projects in the agriculture and rural development sector and their own spending priorities in supporting Afghanistan's development. The programme involves active participation of government ministries and departments as well as private sector stakeholders. Institutional capacities at the provincial and local levels will have significant bearing on the implementation of the programme activities as will the country's security situation (in the post-2014 transition to self-control of internal security).

The organizational capacity of MAIL, particularly in galvanizing the required level of support and coordination of efforts at different levels of government bureaucracy and among private sector stakeholders, will be a major risk. This can be mitigated by improving coordination through high-powered interministerial coordination committees with decision-making authority. Coordination with donors to secure adequate funding is a key risk. This can be alleviated by putting in place measures of credibility, based on administrative competence, accountability, transparency, orientation to results, participation of beneficiaries and good governance. These measures will also help in mitigating risks that emanate from delays in the initiation of project activities, cost overruns and the poor quality of completed projects. Capacity-building, devolution of greater administrative and financial controls to provincial departments of MAIL and contingency planning are intended to mitigate the security-related risks.

9. Social and environmental impact – Adaptation and mitigation measures

Incorporation of the principles of good governance at the design stage of projects under the WSDP would create a framework for devising suitable coping measures against unintended social and environmental consequences of the programme. In general, programme interventions envisaged under the WSDP are not entirely new. Many activities are currently ongoing and many are planned in the programmes/projects in the pipeline. Therefore, there is opportunity for pursuing an evidence-based approach in dealing with unintended social and environmental impacts the proposed institution building.

The projects in the irrigation and water management sector are clearly the frontrunners for needing assessments of the social and environmental impacts. The new local-level water management structures, such as irrigation users' associations or water users' associations, based on democratic principles, differ from the traditional mirab system, which is based on decision-making by village elders. Working in close partnership with the local population and providing them with training will help adapt this community-level water management practice to Afghanistan's traditional society. Environmental impact assessment studies will be conducted for

infrastructure projects in the irrigation sector, such as dams, canals and tubewells, so as to incorporate built-in adaptation and mitigation measures at the design stage. Projects on expanding the use of fertilizers, pesticides and other agro-chemicals in wheat production will need to put in place necessary safeguards for environmental protection – quality control, an improved regulatory framework for the enforcement of standards in the importation of agro-chemicals and procedures for their use and disposal to minimize adverse impacts on the natural ecosystems.

Projects on institutional capacity-building for the delivery of services and creating the absorptive capacity of beneficiaries and clientele at the local level must take into account gender-sensitive and other issues rooted in Afghan society's dominant value systems. For the sake of their acceptability, the design of financial products for disbursement as loans and credits may need to consider Shariah principles. The initiatives on group formation, village-level enterprise development and other structures to support market-based approaches in the wheat supply chain need to consider appropriate safeguards for enhancing the participation of women. It is likely that attempts to engineer institutional capacity-building for unleashing enterprise development and greater participation of beneficiaries may conflict with Afghan society's traditional value systems. The focus should be on seeking appropriate institutional models with participation of local people and village elders' consultative councils to overcome resistance to acceptance of innovations rather than conceding to compromise and retreat.

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