

2 Real Sector

2.1 Overview

FY14 is the first year when quarterly national accounts were disseminated publicly.¹ It is encouraging to have these timely macroeconomic indicators for intra-year policy decisions, as these deepen and update the analysis upon which such decisions are based. Just as encouraging are the growth estimates for the first quarter: real GDP recorded an increase of 5.0 percent during Q1-FY14, compared to only 2.9 percent in Q1-FY13 (Table 2.1). This growth is heartening considering the target of 4.4 percent set for the year.

Table 2.1: Estimates of Economic Growth

	FY13 ^P	FY14 ^T	Q1-FY13 ^P	Q1-FY14 ^E
Real GDP	3.6	4.4	2.9	5.0
Agriculture	3.3	3.8	2.7	2.5
Industry	3.5	4.5	3.1	5.2
Services	3.7	4.5	2.9	5.7

^P Provisional; ^T Target; ^E Estimates

Source: Pakistan Bureau of Statistics

The impetus to Q1-FY14 growth came from industry and services, as agriculture is below the annual target. While a number of factors can be identified that supported local industry this year (e.g., low palm oil prices; steady demand in advanced economies; higher capacities; and modest construction activity), we believe the deciding factor was the settlement of circular debt right on the eve of FY14, which improved energy supplies and enabled the industrial sector to capitalize on available opportunities (Section 2.3). Equally important was an increase in gas allocation to fertilizer sector, which rebounded strongly during the quarter.

Given this pick-up by local industry, and the rise in trade volumes that directly impacts *wholesale and retail trade*, services appears to have recovered from the previous year's weak performance. Value addition by *telecommunication* has also posted a recovery during the quarter on the back of impressive growth in broadband and international businesses.

¹ So far, the Pakistan Bureau of Statistics has released only the growth numbers of quarterly GDP. Actual GDP volumes are not yet released, and the methodology for computing the Quarterly National Accounts has still not been made public. We believe that quarterly GDP data will be more insightful, when these numbers are reconciled with the Annual National Accounts.

As far as agriculture was concerned, initial estimates suggest the growth in FY14 will remain lower than the previous year. Cotton crop has shown a production decline due to reduced area under cultivation, and lower yields, whereas sugarcane has remained below target. Water shortage during the sowing period, and excessive rainfalls before the harvest, has become a norm in the previous few years, which has kept agriculture growth below potential (**Section 2.2**).

2.2 Agriculture

Initial estimates suggest a decline in cotton, which more than offset the increase in sugarcane and rice production (**Table 2.2**). A detailed crop-specific assessment is presented below:

Table 2.2: Production Estimates of Kharif Crops

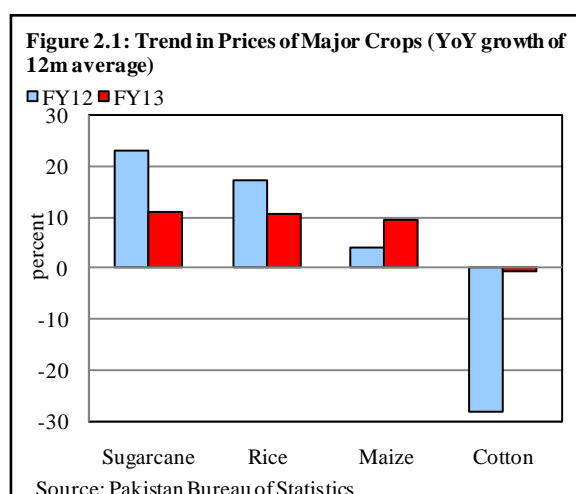
	FY13		FY14	
	Target	Actual	Target	Estimates
Rice	6.9	5.5	6.2	6.4
Sugarcane	59.0	62.7	65.0	63.0
Cotton	14.5	13.1	14.1	12.3

Source: Planning Commission, and Ministry of Food Security & Research

Cotton

The Cotton Crop Assessment Committee has estimated the size of FY14 crop at 12.3 million bales (170 kg each), which is well below the target for the year, and also FY13 crop (**Table 2.2**).² This decline can be traced to a fall in area under cultivation, particularly in Punjab,³ as water remained short at sowing time,⁴ while the crop did not earn enough in the previous season to make up for rising costs in this season.⁵

Farmers were therefore more interested in growing maize, sugarcane and rice over



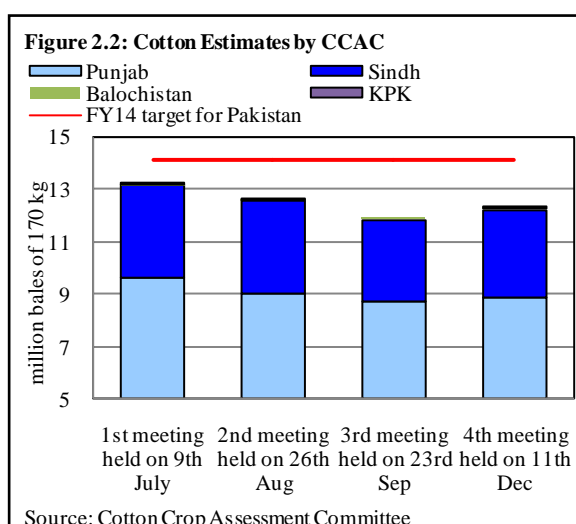
² Pakistan Cotton Ginners' Association (PCGA) reports cotton arrivals at 13.1 million bales by 1st February 2014. We analyze cotton production as per the estimates provided by CCAC because size of bales quoted by PCGA is not standardized across time. Moreover, crop estimates provided by CCAC are used to prepare national income accounts.

³ In Punjab, cotton crop was planted on an area of 2.1 million hectare, showing an 11 percent decrease from the target, and 7.3 percent less from the last year's area sown.

⁴ Water shortages at sowing time: irrigation water releases in Kharif 2013 season stood at 57.7 million acre feet, representing a shortage of 14 percent in this period compared to the average usage.

⁵ While price of fertilizer and pesticides has respectively increased by 3.3 percent and 12.1 percent in Q1-FY14, cotton prices had declined by 0.8 percent in FY13.

cotton (**Figure 2.1**). In the post sowing period, conditions were not ideal: germination suffered due to poor quality seeds, and later, standing crop struggled with pest attacks, rains and high temperatures. Therefore CCAC, which had already estimated a lower-than-target crop size, further revised down its annual targets in subsequent meetings (**Figure 2.2**).⁶ Fortunately, due to available inventory, demand for cotton from the textile industry was met, and the country was even able to export 36.9 thousand MT of cotton during the quarter (**Chapter 5**).⁷



Rice

Latest estimates show rice production of 6.4 million tons during FY14, which exceeds the target of 6.2 million tons. A strong recovery in Sindh and Balochistan over the previous year, more than offset the lower production in the Punjab.

Encouragingly, basmati rice which is mainly grown in Northern Punjab, recorded 15.8 percent increase over FY13, mainly reflecting a larger area under cultivation in Gujranwala.

Being a mainstay of Pakistan's rice exports, a recovery in basmati production is a good sign for the country's external sector. As

Table 2.3: Rice Crop

	2012-13			2013-14		
	Basmati	Other	Total	Basmati	Other	Total
Area in 000 hectare						
Punjab	995	716	1,711	1,173	586	1,759
Sindh	0	511	511	0	741	741
KPK	0	49	49	0	48	48
Balochistan	0	38	38	0	179	179
Pakistan	995	1,314	2,309	1,173	1,554	2,726
Production in 000 tons						
Punjab	1,758	1,720	3,478	2,036	1,351	3,387
Sindh	0	1,844	1,844	0	2,366	2,366
KPK	0	94	94	0	91	91
Balochistan	0	120	120	0	577	577
Pakistan	1,758	3,778	5,536	2,036	4,385	6,421

Source: Ministry of Food Security and Research

⁶ Production decline was more notable in Vehari, Multan, Sahiwal, Jhang and Okara districts of Punjab; and Ghotki and Shaheed Benazirabad districts of Sindh.

⁷ The real short fall in the cotton crop depends on the requirement of local spinners. If they meet their requirement through imports, then local production is not hurt, but it impacts the balance of payments.

far as non-basmati varieties are concerned, despite a lower production in Punjab, the overall output rose by 16.1 percent in FY14, which was led by a sharp recovery in Sindh (particularly in Jacobabad, Kashmore, Shikarpur, Badin and Ghotki) and Balochistan. Export of these lower value varieties has increased recently, due to rising demand in China and Indonesia (**Chapter 5**).

Sugarcane

Sugarcane continued to benefit from heavier rains, and the crop is expected to record an increase for the fourth consecutive year (**Table 2.4**).⁸ Similar to FY13, the crop benefited from a larger area under cultivation, as well as higher yields.⁹ Furthermore, farmers in some areas preferred sugarcane over cotton, which also enhanced the crop size. While the increased area can be traced to a sharp rise in procurement price in the preceding two years, yields also improved because of heavy rains and minor flooding.

Table 2.4: Sugarcane Crop

	2010-11	2011-12	2012-13	2013-14
Area in 000 hectare				
Punjab	672	761	760	724
Sindh	226	190	254	298
KPK	88	106	107	107
Balochistan	1	1	1	1
Pakistan	987	1,058	1,121	1,129
Production in 000 Tons				
Punjab	37,481	42,893	43,014	40,846
Sindh	13,766	10,788	14,909	17,371
KPK	4,030	4,684	4,770	4,772
Balochistan	31	31	32	32
Pakistan	55,309	58,397	62,724	63,022

Source: Ministry of Food Security and Research

Nonetheless, despite the rise in sugarcane production, sugar prices have surged in FY14. This increase was mainly due to delays in cane crushing, as the government's procurement prices came quite late in the season. A late arrival of fresh sugar, coupled with liberal exports of the commodity in H2-FY13, has put significant upward pressure on its domestic price (**Chapter 3**).¹⁰

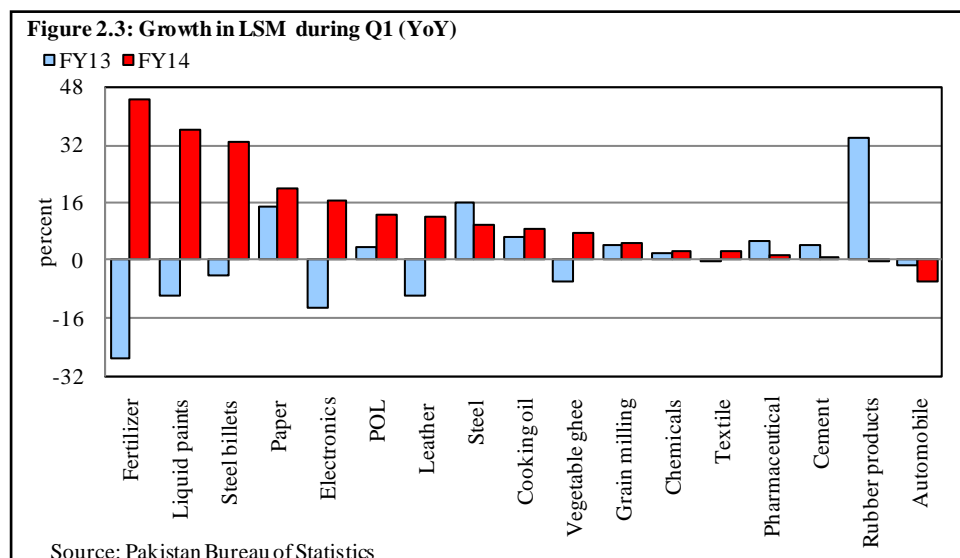
⁸ The data for FY13 in this table has been taken from Working Paper for Meeting of Federal Committee on Agriculture for Rabi Season 2013-14, prepared by Ministry of National Food Security and Research (MNFSR) in November 2013. The data for FY13 provided in this report differs from the one provided by PBS on its website: while MNFSR reports sugarcane production at 62.7 million tons in FY13, PBS estimates the same at 63.7 million tons.

⁹ The increased area under sugarcane crop in Sindh mainly reflects the impact of new sugar mills in Ghotki district.

¹⁰ By end-November 2013, sugar prices have reached Rs 60.4 per kg, compared to 54.5 and 54.7 at end-June 2013 and November 2012, respectively.

2.3 Large-scale manufacturing (LSM)

LSM recorded an increase of 6.3 percent in Q1-FY14, compared to only 0.5 percent in the corresponding period of FY13. This strong growth came primarily from a rebound in domestic fertilizer production, as gas supply improved considerably (**Figure 2.3**).



In addition, the resolution of circular debt at end-June 2013, not only improved petroleum refining, but also benefited other industries by improving power supplies. Further support to LSM came from capacity enhancement; steady construction; increase in exports;¹¹ favorable palm oil prices during the period; and use of alternate energy sources by various industries (**Table 2.5**).

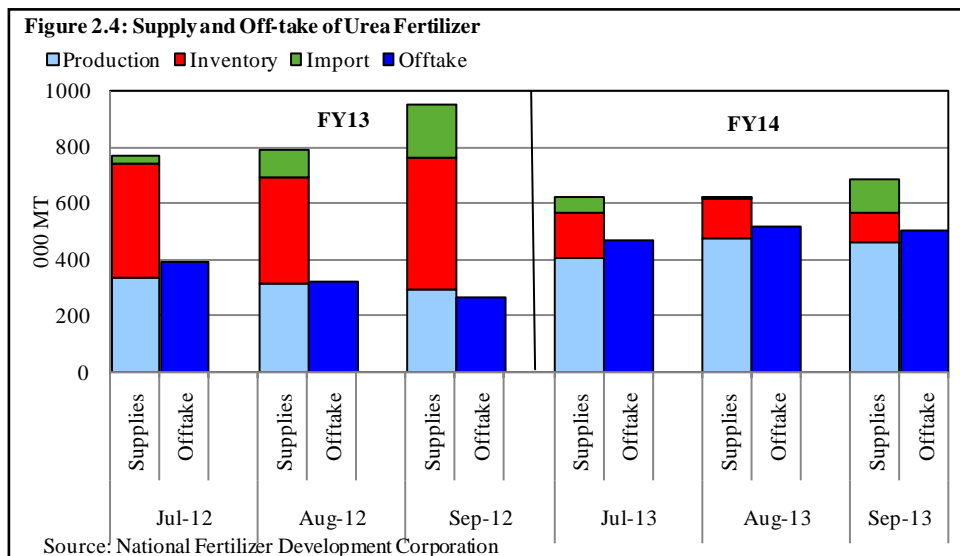
Favorable gas allocation benefited fertilizer

After a poor performance in the previous year, the fertilizer sector rebounded in Q1-FY14 as gas supplies to manufacturing plants improved, especially the Enven plant of Engro Chemicals (the largest in South Asia). This plant was earlier connected to the SNGPL network that was unable to provide the contracted volume of gas from Qadirpur fields. In April 2013, supply of Mari gas from Engro's base (old) plant was diverted to the Enven plant to enhance efficiency. Later in July 2013, the government decided to allocate an additional 60 mmcf/d to Enven, as Guddu power plant – the key gas recipient from Mari fields – shut down for maintenance till March 2014. However, this additional gas is just a temporary

¹¹ Although textile and leather exports increased during Q1-FY14 (**Chapter 5**), these had a marginal impact on LSM growth.

arrangement, and as soon as Guddu power plant resumes operation, gas supplies to Engro are likely to revert to previous level. If this were to happen, Engro’s old plant is likely to face production declines in Q4-FY14. Fatima Fertilizer also posted a sharp increase in production during Q1-FY14, as its plant successfully completed the Annual Turn Around (ATA) back in April 2013.

Higher capacity utilization in the fertilizer sector enabled the country to meet increased domestic demand for urea and other nutrients. However, production volumes remained lower than off-take throughout the quarter, causing a degree of inventory depletion (**Figure 2.4**).¹² Therefore, a rise in import was observed from September 2013 onwards, which is higher than the imports seen last year.¹³



Paper industry benefited from booming FMCGs and use of alternate fuels

Consolidating on its impressive performance last year, the paper industry posted strong growth of 19.6 percent during Q1-FY14. This growth can be traced to rising demand for packaging from fast moving consumer goods (FMCGs) – especially, processed food products that are thriving due to growing public awareness and popularity. Furthermore, similar to steel and cement, the paper industry has also shifted to alternate fuels to run smoothly, which has improved production (**Table 2.5** and **Special Section 2.1**). Specifically, one of the largest

¹² By end-September 2013, the country had stock of only 106 thousand MT of fertilizer, compared to 416 thousand MT at end-September 2012.

¹³ In September and October 2013, the country imported 307 thousand MT of fertilizer; whereas last year, this amount totaled 250 thousand MT.

paper manufacturing plants, has recently installed coal/biomass fired boilers, with a capacity of 30 tons per hour of steam. This has reduced the company's dependence on natural gas, and had a positive impact on Q1-FY14 production.

Table 2.5: Use of Alternate Energy Sources by Various Industries in Pakistan

Industry	Conventional Energy Resource	Alternate Energy Resource
Steel melting	Electricity	Diesel-run generators
Steel re-rolling	Natural Gas: SNGPL,SSGC	Coal gasification plants
Textile composite	Natural Gas: SNGPL,SSGC	Combined-cycle power plants; waste heat recovery boilers
Textile spinning	Electricity	Diesel-run generators
Textile weaving	Electricity	Diesel-run generators
Textile dyeing/bleaching	Natural Gas: SNGPL,SSGC	Biomass/coal run boilers
Paper	Electricity, Natural Gas: SNGPL,SSGC	Coal/biomass run boilers
Ceramics	Natural Gas and LPG	Coal gasification
Leather	Electricity, Natural Gas: SNGPL,SSGC	Solar thermal boilers/diesel-run generators
Edible oil/ghee	Natural Gas: SNGPL,SSGC	Diesel run generators
Plastic	Electricity	Diesel run generators
Cement	Electricity	Coal/biomass/waste heat recovery
Caustic soda	Natural Gas: SNGPL,SSGC	Coal fired boilers
Soda ash	Natural Gas: SNGPL,SSGC	Coal /waste heat boilers
Polyester fiber	Natural Gas: SNGPL,SSGC	Combined cycle gas-run power plant
Pharmaceutical	Electricity	Diesel-run generators
Paints	Electricity	Diesel-run generators
Dairy	Electricity	Solar thermal boiler
Glass	Natural Gas: SNGPL,SSGC	LPG; initiated the arrangements for coal gasifiers
Sugar	Electricity	Bagasse/cogeneration

Source: Companies' websites; Financial Reports; Telephonic conversation

Improved liquidity helped petroleum refining

Settlement of the circular debt during June and July 2013, eased the liquidity constraints of petroleum refineries that enabled them to increase capacity utilization. As a result, production of petroleum products improved in Q1-FY14, after seeing a modest recovery a year earlier. Furthermore, demand for major petroleum products remained strong – while petrol sales were boosted by the continued shortage of CNG in the country, furnace oil sales recovered with the improving financial position of thermal power plants.

As far as high speed diesel is concerned, demand increased by 6.5 percent in Q1-FY14. However, increase in domestic production by 18.4 percent not only met the higher domestic demand, but also substituted import of diesel that declined by 17.5 percent during Q1-FY14. This switch in diesel supply can be traced to two

reasons: first, in Q1-FY13, liquidity constraints did not allow local refineries to produce sufficient HSD that necessitated higher imports; and secondly, PSO imported extra diesel during Q1-FY13, anticipating lower domestic production and strong demand.¹⁴

Steady construction strengthened allied industries

Iron & steel industries were the major beneficiaries of steady construction activity in the country, these sectors operated at higher capacities in Q1-FY14. In particular, three new plants have started commercial operations in recent years; these plants have grabbed the market share of imported cold-rolled coil steel, by charging lower margins.¹⁵ Importantly, the steel industry now seems largely immune to power shortages, since most of the newly established plants are running on captive power. In addition, anecdotal evidence suggests that some Punjab based steel plants switch to old tyres as alternate fuel when power shortages intensify.

In addition to steel, other construction allied industries also performed well (e.g., glass, and paints). In the case of cement, however, production was affected by a sharp decline in exports (**Chapter 5**). Local sales, on the other hand, posted a modest growth of 2.2 percent YoY in Q1-FY14, mainly due to Ramadan effect. In subsequent months, sales recovered especially in November and December 2013.¹⁶

Decent performance of exporting industries

The steady consumer spending in the US and Europe, supported exports in some of Pakistan's key industries like textile, leather and grain milling. For instance, as noted in some detail in **Chapter 5**, while the increase in production of cotton yarn can be traced to higher demand from China, cotton fabric benefited from rising demand in the EU. In case of leather, higher production was required to meet rising demand from European countries, including the UK, Italy, Germany and the Netherlands. Similarly, export demand for processed coarse rice increased

¹⁴ OCAC data shows a growth of 25 percent in HSD imports during Q1-FY13. In subsequent quarters, imports declined sharply.

¹⁵ Aisha Steel, which started its commercial production from October 2012, has a manufacturing capacity of 220,000 MT per year of cold-rolled steel. Similarly, International Steel started its commercial operations from January 2011. It has a capacity of producing 250,000 tons of steel and 150,000 MT of hot dip galvanized steel per annum. Finally, Tuwairqi Steel started its commercial operations in January 2013; this plant has a capacity to produce 1.28 million tons per annum of pellets of direct reduced iron.

¹⁶ In November and December 2013, local sales posted a YoY increase of 8.6 percent and 3.8 percent, respectively.

production in the grain milling industry. This sector posted a growth of 4.8 percent in Q1-FY14, compared to 4.0 percent in the previous year.

Automobile production continues to decline

Production of automobiles (mainly cars) declined for the fourth consecutive year. In Q1-FY14, although car sales posted a marginal increase over the corresponding period last year, production continued to

Table 2.6 Production and Sales in Car Segment in numbers

	Q1-FY12	Q1-FY13	Q1-FY14
Production	30,069	26,398	24,398
Sales	33,976	24,193	25,372
Import	9,225	14,223	4,965

Source: Pakistan Automotive Manufacturers Association

slide. This decline can be traced to the phasing out of an old model of Toyota, which is to be replaced by a new model in mid-2014. Excluding this one make, all other cars posted a rise in production, following a stricter import policy for used cars. Specifically, the import of used cars declined by a factor of three in Q1-FY14, as the government reduced the age limit on imported used vehicles from five to three years (Table 2.6).

Services¹⁷

As mentioned before, we cannot analyze the PBS estimates for services sector growth during Q1-FY14 till the detailed information is available.¹⁸ Although these estimates show a strong YoY recovery – increasing from 2.9 percent in Q1-FY13 to 5.9 percent in Q1-FY14, leading indicators in the sector showed a mixed performance. While *transport* and *finance* are likely to exhibit lower growth during FY14 compared to the preceding year, *communication* and *wholesale & retail trade* are expected to post a recovery.

The *wholesale & retail trade* sector clearly got some support from the broad-based recovery in manufacturing, along with a modest rise in import volumes during Q1-FY14. However, a part of these gains could be offset by underperformance of agriculture sector.

In contrast to FY13, the *finance & insurance* sub-sector appears to have weakened during Q1-FY14, mainly due to shrinking interest margins. The aggregate after tax profits of banks stood at Rs 82 billion in Q1-FY14, which shows a decline of 11.2 percent over Q1-FY13. This trend is likely to continue going forward, however, profitability position will become clearer after banks finalize their year-

¹⁷ The break-up of services sector growth during Q1-FY14 is not yet available. Therefore, this section is based on the leading indicators for services sector's performance during the year.

¹⁸ The detailed information on services sector is available only on an annual basis.

end audited accounts, and incorporate conclusive provisioning and recovery figures.

Within the *transportation sector*, private air transport performed better in FY13, but PIA could not overcome its operating losses.¹⁹ In addition to its long standing operational inefficiencies, PIA suffered multiple setbacks during FY14: (i) Saudi government reduced the quota of Pakistanis by 30 percent for the Hajj season, which significantly reduced the available seat kilometer (ASK) during Q1-FY14;²⁰ (ii) a sharp depreciation of PKR has increased FX liabilities, and the airline's operating losses; and (iii) number of serviceable aircrafts has been reduced from 29 available last year, to only 23 in Q1-FY14.

The *communication sector* is likely to recover as in FY14, PTCL earned Rs 4.6 billion profit before tax in Q1- FY14, against a loss of Rs 9.2 billion in the same quarter last year. Most of the improvement has come from its international business and broadband services; the voice segment of PTCL's business could not perform well due to stiff competition from cellular companies. A sharp rise in the import of telecom machinery also reflects a recovery in this sector.

¹⁹ PIA suffered by a loss of Rs 31.6 billion during Jan-Sep 2013, compared to Rs 22.2 billion in the same period last year.

²⁰ Available seat kilometer is the number of seats on an airplane, multiplied by the number of kilometers flown (empty or full). ASK is a key indicator of revenue of the airline industry. PIA's ASK declined from 14.7 billion in Q1-FY13, to 13.04 billion in Q1-FY14.

Special Section 2.1 Alternate Energy Resources²¹

2.1.1 Introduction

Energy availability in Pakistan has been declining over the past few years due to: a lack of investment; stagnant supply of domestic gas; persistent inefficiencies in energy-related PSEs; and inadequate infrastructure for gas import. While all economic sectors have been affected by the energy shortages, the industrial sector has been hurt the most. Due to technical differences in how the energy is used (fuel types), the impact on Pakistan's industry has varied across sectors.

More specifically, when power and gas outages began in FY09, a number of industries suffered production declines, except those that run primarily on coal (e.g., cement). However, as these outages persisted, firms in the large-scale manufacturing sector started arranging for substitutes. While power-intensive units like steel melting, edible oil/ghee, and textile spinning, opted for generators that run on high speed diesel and/or furnace oil²², gas intensive units like paper, glass, and chemicals shifted to boilers that can run on coal, waste heat and biomass. A summary of the alternative arrangements is presented in **Table 2.5**.²³

2.1.2 Industry's Response to Energy Shortages in Pakistan

In this section, we will explore the alternative arrangements that various industries have made to ensure smoother production.

Steel

The steel sector in Pakistan comprises of melting and re-rolling units. In the steel melting process, scrap is melted by using arc furnaces to form billets. This process is 100 percent electricity intensive and cannot be substituted by any other energy source. Facing power shortages, smaller firms located in Punjab, switched to diesel-run generators, which not only increased production cost, but also reduced productivity, as uninterrupted power supply is required to melt steel scrap.²⁴ In contrast, larger units in Karachi switched to captive power, which

²¹ This section is based on discussion with a number of companies in each of the listed sub-sectors. Since we do not have hard data on energy consumption by Pakistan's industrial sector, the findings reported in this section are based on our conversation with various manufacturing firms and associations. Firm-level information is already in the public domain; via companies' websites and financial reports.

²² Although this switch entails huge financial and productivity costs on producers, production declines *can* be avoided.

²³ Only in FY13, Pakistan imported 55,920 waste heat (hybrid) boilers.

²⁴ Otherwise, the process has to start from beginning.

required higher fixed costs, but guaranteed smooth production without interruptions.²⁵

In contrast, the re-rolling process that requires the preheating of billets to shape final products, is a gas-intensive process. It is estimated that around 12 – 13 re-rolling units in Punjab have installed coal gasification plants in the previous two years. These plants have been imported from China, and their costs vary from Rs 4 million to Rs 30 million, depending upon size and specification. In addition to this, some smaller units in Punjab are also using used tyres for heating purposes.²⁶

Paper

The production of paper is a very energy-intensive process, and requires a combination of electricity and steam. Energy is required to compress air, process pulp, and dry paper. Most of this energy is consumed in the drying process, which requires a steady flow of steam. In Pakistan, natural gas was the main fuel source for generating steam; its shortage has forced many manufacturers to shift to alternative sources recently. For instance, a large number of pulp manufacturers (e.g. Premiere Paper Mills), are using bio-mass run boilers (mainly wheat straw, kai grass and bagasse) to drain extra moisture from the paper²⁷, while Century Papers – one of the largest paper manufacturers in the country, has recently installed a coal/bio-mass run boiler.²⁸

Textiles

Within textiles, spinning and weaving of fiber are electricity-intensive, whereas dyeing and finishing are gas-intensive processes as these require a steady supply of steam. In Pakistan, most spinning units are large-scale units, which can afford to run on back-up diesel generators. In the weaving sector, a large number of units located in Faisalabad, use power looms for fabric manufacturing. These power looms are small-scale units, and are forced to shut down in case of power outages as alternative energy sources are too expensive for their modest operations. Some medium-sized power looms have installed diesel generators, but as is the case in the steel sector, this has increased production costs.²⁹

²⁵ For instance, International Steel Limited has a gas-fired power plant that can produce 18 MW of electricity. Similarly, Tuwairqi Steel has installed a 38 MW combined cycle power plant

²⁶ It is important to mention here that the use burnt tyres for generating steam is illegal in Pakistan due to environmental hazards.

²⁷ The Wheat Straw Pulp is blended with imported bleached soft wood Kraft Pulp to achieve the required strength

²⁸ This boiler runs 99 percent on coal, and only 1 percent on bio mass.

²⁹ If a power loom shuts down all of a sudden, then the portion of fabric stuck in the loom gets wasted.

In contrast, a number of *textile processing* units have installed boilers that can run on bio-fuels like cotton waste, rice husk, and other waste (**Section 2.1.3**). As far as big textile groups are concerned, most of them have captive power plants of their own; Nishat, Gul Ahmed, Sitara, and Sapphire are a few examples. More importantly, these companies use gas fired combined-cycle power plants, which generate power from gas; and the waste produced is automatically used to generate steam. For gas-intensive processes, companies like Yunus Textile, Kohinoor, Chenab, and Fazal have installed waste heat recovery boilers.

Chemical

In the chemical sector, caustic soda and soda ash are highly gas-intensive products.³⁰ When gas shortages began, chemical producers in Punjab suffered the most. Recently, the two largest players in Punjab – Ittehad and Sitara Chemicals, have shifted part of their production to coal-fired boilers. The other two large producers in Karachi, have also reduced their dependence on natural gas. For instance, ICI Chemicals has installed a coal-fired boiler for its soda ash plant, while it has arranged solar thermal boilers for its polymer plant. Engro Polymers, on the other hand, is using excess energy from normal operations to generate steam using waste boilers, for the production of polymers. In the polyester business, the largest manufacturer (Ibrahim Fiber), has installed a gas run power plant, which produces steam as a by-product that is sufficient for the production of polyester staple fiber.

Leather

The leather industry requires both electricity and steam for its production process. As per our conversation with the industry, Punjab-based firms are using diesel-run generators as a back-up for electricity. For the gas-intensive process of drying of leather, a few companies have installed solar thermal boilers to generate steam. In Karachi, where gas outages are not as common as in Punjab, manufacturers only rely on diesel generators.

Sugar

Sugar mills in Pakistan are using captive power generated from bagasse.³¹ This obvious synergy in the production process was initiated only four years back when the energy crisis was at its high. Presently, most of the large mills are generating power from by-products that is not only sufficient for their own needs, but could

³⁰ This sector is comprised of four major players: Ittehad Chemicals, Sitara Chemicals; ICI Chemicals; and Engro Polymers.

³¹ Bagasse, termed as a captive biomass, is fibrous in nature. It has a calorific value of 2,300 kcal/kg. Bagasse is an excellent raw material for power generation. It already provides a stable and reliable source of electricity and steam to power the sugar mills.

add (by some estimates) as much as 3,000 MW of power into the national grid. Realizing this potential, the ECC approved a Framework for Power Co-generation in March 2013, which sets the modalities related to co-generation, tariff determination, and sales to DISCOs. This process would be overseen by the Alternative Energy Development Board.

Cement

Cement production is the most energy-intensive within LSM. The process of clinkering, in which the blend of different raw materials (including clay and limestone) is partially melted to form a granular material requires a great deal of energy.³² This requires heating the rotary kiln using various fuels including pulverized coal or coke, natural gas, lignite, and fuel oil. In Pakistan, almost all cement manufacturers shifted from natural gas to coal in the early 2000s, which means this sector was largely immune to the worsening energy shortages in the country.³³

However, as a cost cutting measure, a number of cement manufacturers (e.g. DG Khan Cement, Lucky Cement, Fauji Cement) have started using bio-fuels, especially refused and tyre derived fuels (**Section 2.1.3**).³⁴ In addition, Bestway, Cherat, Fecto, Lucky and DG Khan, have also installed *heat recovery plants* to generate their own electricity.³⁵

Fertilizer

The fertilizer sector has no alternative, but to use natural gas as the principal raw material (feedstock) in the production process. Due to inadequate availability of gas, fertilizer production has declined in the previous 2 years, and the demand-supply gap in the country had to be met via imports.^{36,37}

³² As per Census of Manufacturing Industries (2005), fuel cost per manufacturing unit was highest in the cement sector compared to other industries. Since we do not have the data available on quantity of energy consumed by each sector, we are estimating it through comparing fuel costs. Here it is important to mention that since prices are not the same for different energy sources, the difference across industries would also reflect the kind of fuel they are using.

³³ Cement production has increased by 2.9 percent and 6.1 percent in FY12 and FY13, respectively.

³⁴ This is the major reason why import of coal did not increase in recent years. More specifically, although coal consumption in other industries has increased (to run boilers, or coal gasification plants), coal consumption by cement industry has declined.

³⁵ Electricity constitutes 11 percent of the energy usage in cement industry; and around 60 percent of the total production cost.

³⁶ Fertilizer sector is the second largest consumer of gas in Pakistan, after the power sector. In FY13, gas curtailment to the fertilizer industry was estimated at 20 percent on Sui Network plants, and 12 percent on Mari Network. During the winter season, gas load shedding has been increased from normal 45 days to 60 days on all networks (Source: Economic Survey 2012-13).

Edible oil/ghee

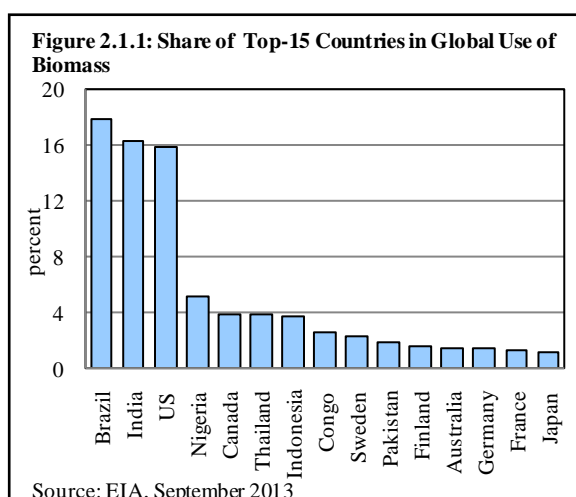
In Pakistan, edible oil manufacturing includes the refining, bleaching and deodorization of imported palm oil. These processes are highly energy-intensive as they require heating and cooling at different stages. Steam is a primary heating source, for which these units have installed boilers that run on furnace oil and high-speed diesel. Due to high costs and space limitations, manufacturing units cannot afford large boilers that run on bio-fuels, and hence are forced to operate on relatively expensive imported fuels.

Glass

Glass manufacturing is also an energy-intensive process. Most of the energy consumed comes from natural gas combustion, which is used to heat furnaces that melt the raw material to form glass. In Pakistan, these furnaces are typically fired on natural gas. The share of natural gas in total fuel cost is estimated at 62 percent.³⁸ Most of the large players in this sector are planning to install coal gasifiers within 2 years.

1.1.3 Use of Biofuels and Wastes in Pakistan

Presently, Pakistan is among the top10 countries in terms of the use of biomass for energy (**Figure 2.1.1**). Although, most users of biomass are rural household, the share of industrial use is growing sharply. We will now discuss different types of biofuels and waste derived fuel alternatives, which are presently being used in the industrial sector (**Table 2.1.2**).



Waste Derived Fuels

Waste derived fuel include residue from industrial or commercial operations, such as rubber, used tires, battery cases, plastic residue, municipal waste, etc.

³⁷ For instance, urea production in the country declined by 8.6 percent in FY13; 1.8 percent in FY12; and 10.1 percent in FY11.

³⁸ Census of manufacturing industries 2005.

Refuse Derived Fuel (RDF): This technology was primarily designed to reduce the amount of solid waste in the country, but is now being used to meet the energy demand of various sectors. RDF plants utilize municipal solid waste after screening for clay, dust particles, debris and metal, etc. The cement industry is the prime beneficiary of this alternate energy resource in Pakistan, as almost a quarter of the entire cement industry has started using RDF.³⁹

Tire Derived Fuel (TDF): TDF refers to using old shredded tires to produce fuel. The government does not allow the use of TDF in industries other than cement, as burnt tires emanate hazardous elements into the atmosphere. Surprisingly, import of rubber scrap is the main source of shredded tires, as no viable domestic avenue exists for recycling of used tires in Pakistan.⁴⁰ The cement sector, which is presently using coal as the base fuel, has started to operate on TDF, not only because of its high energy content, but also because it is cheaper than coal. Moreover, anecdotal evidence suggests that small steel firms are also using this resource illegally for power generation, as the process of steel melting requires uninterrupted power supply.

Poultry Waste: Chicken litter⁴¹ can also be used for energy generation by combustion, using purpose-built incinerators.⁴² The cement sector and brick kilns are currently utilizing poultry waste for energy generation in Pakistan. Going forward, poultry waste biogas plants are being set-up to provide electricity to large poultry and dairy farms.

Biofuels

Biofuels include plant tissue such as wood and farm waste – the latter include rice husk, rice straw, coffee husk, wheat husk, corn cob, sugarcane bagasse, cotton sticks, cane trash, etc.

Rice Husk: Rice husk and straw is the most productive agricultural by-product in rice producing countries. It can be used for power generation via steam or gasification, and is being utilized by the cement, paper and board, brick kilns and

³⁹ Cement industry is fulfilling around 20 to 30 percent of its energy need from RDF resources.

⁴⁰ Imports data on rubber waste and scrap in form of plates stood USD 806.4 thousand in Jul-Sep FY14 compared to USD 25.1 thousand and nil imports same period in FY13 and FY12 respectively.

⁴¹ Poultry excreta, spilled feed, feathers, etc

⁴² Incineration is a waste treatment process that involves the combustion of organic substances contained in waste materials.

steel industries.⁴³ Rice husks are also being used in textile sector via boilers to generate power for dyeing and bleaching purposes.

Bagasse: Bagasse of crushed sugar cane is considered to be an important source for generating power. Currently almost all sugar mills in Pakistan have in-house bagasse-based power generation capability, though many are using inefficient boilers and primitive pressure turbines.⁴⁴ Going forward, co-generation of power on commercial basis is in the pipeline, for which sugar mills will install steam economization equipment and infrastructure for more efficient use of bagasse for power generation. This will be done by replacing existing low-pressure boilers with new high-pressure technology to increase efficiency.

Cotton Sticks: Cotton stick is a major residue of the cotton crop, which, by weight, constitutes as much as 3 times the cotton produced. Energy derived from cotton sticks are currently being used by brick kiln operators and cooking fuel by farmers.

Table 2.1.2: Alternate Fuel Options for Different Industries in Pakistan

Category	Type	K.Cal against Imported Coal*	Beneficiary Industries
Agricultural waste	Rice husk	1.94	Fabric dyeing, bleaching, cement, paper, steel, brick kilns
	Corn cob	1.59	Paper, cement
	Corn husk	2.09	Paper, cement
	Wheat straw	1.66	Textile processing, cement, brick kiln
	Cotton sticks	1.9	Cement, brick kiln
	Rice straw	1.94	Textile processing, cement, paper, steel, brick kilns
Industrial waste	Wood saw dust	1.85	Cement
	Bagasse	1.82	Sugar, textile cement,
	Dropping	2.27	Cement
	Tyre waste	0.78	Steel, cement
	RDF	2.46	Cement
Waste & biomass	Cow dung	2.03	Cement
	Chicken	2.15	Cement, brick kiln

*Imported Coal= 1, Local Coal=1.19

Source: Industry Estimates

⁴³ Rice straw can either be used alone or mixed with other biomass material. In this technology, combustion boilers are used in combination with steam turbines to produce energy.

⁴⁴ Sugar industry is fulfilling major part of its energy requirement through this method. Moreover, three small textile firms in Jhang, have recently utilized bagasse cogeneration power facility.

Other Sources: Wheat husk, corn cob, corn husk, maize stem, are other sources of power generation currently being used in the cement, paper and brick kiln industries.

In overall terms, such usage of agricultural and industrial by-products is a very positive step, as long as the resulting pollution is strictly regulated. Given the fact that user dependence on such renewable sources of energy is more common in the rural sector, this reduces the need to expand an already stretched national energy grid (be it power or gas). The AEDB must focus on this issue to reduce rural household dependence (or expectations) on piped gas.