PIDE WORKING PAPERS

No.: 171

PAKISTAN INSTITUTE OF DEVELOPMENT ECONOMICS

Vulnerability in Food Supply and Food Access—Evidence from ECO Region

Madeeha Qureshi
Ejaz Ghani
Musleh-ud Din
Usman Qadir

November 2019

PIDE Working Papers
No. 171

Vulnerability in Food Supply and Food Access—Evidence from ECO Region

Madeeha Qureshi
Pakistan Institute of Development Economics, Islamabad

Ejaz Ghani
Pakistan Institute of Development Economics, Islamabad

Musleh-ud Din
Pakistan Institute of Development Economics, Islamabad

and

Usman Qadir
Pakistan Institute of Development Economics, Islamabad

PAKISTAN INSTITUTE OF DEVELOPMENT ECONOMICS
ISLAMABAD
2019

Pakistan Institute of Development Economics
Islamabad, Pakistan

E-mail: publications@pide.org.pk
Website: http://www.pide.org.pk
Fax: +92-51-9248065

Designed, composed, and finished at the Publications Division, PIDE.

C O N T E N T S

List of Tables

List of Figures

ABSTRACT

The notion of secure food availability aspect within a country cannot be seen only in context of domestic demand and supply gaps only. Rather to capture the totality of the process it is important to identify risks faced by a country from changes in international food markets. Against this backdrop, this paper explores two channels of impact in the context of ECO member countries; focusing on international food price variation and production and trading patterns. Our research identifies member countries that are at risk to international price shocks, as well as those that have experienced a change in food demand patterns. Furthermore, the avenues of regional cooperation that can open up and prove beneficial to all ECO member countries have been identified.

Keywords: ECO Region, International Price Shocks, Agricultural Diversification, Food Independence Policy, Animal Protein Rich Food.

1. INTRODUCTION

Concept of vulnerability in food supply and access for the population is directly related to issue of food stability dimension of food security which can be generated though both price and non-price mechanisms that is both via international price shocks and also because of domestic demand and supply pressures [Sinha, Lipton, and Yaqub (2002), Meerman and Aphane (2012), FAO The State of Food Insecurity in the World (2015)]. Hence stable and secure food supply in a country call for an environment where food generation processes can respond effectively not only to changing demand patterns of its population but also require built-in mechanism to protect one's population from demand and price shocks arising from evolving global environment. All this requires balance across different set of policies within an economy such as agricultural policy, trade policy and policies related to overall macroeconomic management to name a few[1]. So what are the challenges facing ECO region in context of risk from changes in global and domestic food markets?

Here following three prominent channels of impact need analysis within ECO region from perspective of risk from shocks originating out of changes in international and domestic food demands.

- Firstly impact of two major international food price shocks of recent times that is that of 2007-08 and 2010-11 which originated out of changes in international demand of cereal and impact of decrease in global oil prices of 2014-15.
- Secondly how countries are coping with changing domestic and international demand patterns where there is a clear shift towards high protein products and away from staple foods.
- Thirdly and most importantly which policy focus a country has that is food independence policy in sense of being self-sufficient in its staple food requirement through local production and/or diversification away from food crops into high value non-staple food crops in face of evolving international food demands.[2]

---

[1]To assess how economic and trade policy interacts with agricultural growth to create an atmosphere of poverty and hunger eradication please refer to trade focused Computable general equilibrium models presented in Harris (2001), Löfgren, *et al*. (2001), Löfgren, El-Said, and Robinson (2002) and also work in Robinson, El-Said, and San (1998) so as to see how trade policy has consequence for agricultural outcomes.

[2]Please refer to case studies related to South Asia on the policy issue of diversification to high valued crops as oppose to staple crops in Joshi and Cummings Jr. (eds.) (2007).

Given that we do not have information regarding pricing behaviour by food groups for any of the ECO country, hence discussion pertaining to above second and third questions in context of how capable are ECO countries in meeting much higher local and foreign demand for animal protein and self-sufficiency in staple food production versus diversification debate will be tackled through analysis of production and trade patterns by food groups across low and high food deficit ECO sub-regions.[3] Further in regard to first query of how vulnerable ECO region has been to international price shocks evaluation will follow at two levels. Whereby for ECO countries namely Pakistan, Iran and Turkey for which data on food price index is available, it will be seen how food price index along with analysis of food price inflation and food price variability has evolved overtime so as to see the extent of these shocks in domestic food prices within these countries and for other seven ECO countries that do not have information on food prices, this question will be addressed through an indirect approach employing following three questions as a base of analysis:

- What is the level and extent of food production and what are growth patterns pre and post 2000 benchmark in value of food production within a country?
- Further is this growth in food production sufficient to meet the demand of staple food or is there some sorts of external dependence?
- Moreover in case there exist reliance on global markets to fill-in on staple food shortages within a country, then to what extent is this economy vulnerable to external price shocks such as global food price shocks, oil shocks, financial crisis etc?

In next section after brief discussion of issue related to data and employed empirical methodology, empirical analysis of vulnerability to international price shocks will be presented in section 3 whereas section 4 titled as agricultural trade and production patterns in face of changing domestic and international demands will bring out empirical evidence in context of food independence versus agricultural diversification food policy and ability of ECO region to satisfy rising demand for animal protein. Last section concludes the discussion by bringing out key policy messages from our empirical analysis.

[3]Low and high food deficit sub-zones within ECO region will be categorised according to criterion of fulfilment and non-fulfilment of MDG 1c hunger target by 2015. Accordingly countries that had successfully achieved hunger target by 2015 will be considered as low food deficit and the ones that fail the test will be categorised as high food deficit. This is standard FAO methodology that has been employed in all their regional reports on food security (please refer to FAO The State of Food Insecurity in the World (2015), FAO Regional Overview of Food Insecurity Asia and the Pacific (2015), FAO Regional Overview of Food Insecurity Europe and Central Asia (2015) and Regional Overview of Food Insecurity Latin America and the Caribbean (2015).

2. EMPIRICAL METHODOLOGY AND DATA

Before going into description of empirical model especially in context of food price forecast, let us remind ourselves of why we may be interested in studying the pricing behaviour of food items for each ECO country at first place. At domestic level studying food price is important because in most countries food prices especially that of staple food items are supported by governments as its level not only defines production incentives for the farmers but its inflation rate has direct relevance for food security of overall population (both net buyers and net sellers). Beside that government not only has to look into conflicting interests of net sellers of food items (that is higher food prices to increase their profitability) with that of net consumer of food (that is lower food inflation) but also place these important pricing variable that is food price level and food price inflation in context of changes in international markets so as to protect their population from any price shocks with international source. Now let us look into employed empirical methodology for analysis of food prices and its forecast along with discussion on data limitation in context of ECO countries as below:

2.1. Data Limitation within ECO Region

In defining the empirical methodology to answer our stated research questions, we had to go around following two major data limitation in context of ECO region:

- Firstly we have data on food prices for only three countries that is Turkey, Iran and Pakistan and that only for merely fifteen time periods that is from 2000 to 2014. Hence not only for much of ECO countries we have no scope of analysis for food prices and their forecasts but for three countries with available information on food prices also our analysis remain restricted in context of forecast quality given the slim data size of only 15 data points.
- Secondly data on food prices is only available at aggregate level within Turkey, Iran and Pakistan[4]. This further limits our analysis as with this much information all we can assess is how these countries may have responded to international food price shocks of 2007-08 and 2010-11 and international fuel shock of 2014-15 somewhat but there is no scope to go deeper to further evaluate in context of diversification behaviour across staple and non-staple food items or in context of response to increased demand for animal protein products. Such an analysis would

[4]Our project team has also tried to get to price data for all ten ECO countries at aggregate and disaggregate level through personal request to FAO so as to rule out possibility of availability of information on request basis. However no favourable response was received in this context confirming that only available information on food prices for ECO region is what has been is publicly provided on FAOSTAT website.

have required information on prices at disaggregated level by food groups and by matching patterns of such prices (both actual and their forecasts) overtime with that of global prices levels for each of such food group we could have come to some conclusive patterns.

2.2. Empirical Methodology for Assessment of Vulnerability to International Price Shocks

Assessment of vulnerability to international price shocks (both food and non-food) will use direct and indirect approaches—a brief description of which are as below:

2.2(a) *Direct Approach*

Assessment of the extent of the risk faced by each ECO country to international price shock using food prices as key indicator of interest can only done for Turkey, Iran and Pakistan given data unavailability for other ECO counties. In case of these three countries we will rely on evidence from food prices and its inflation rate directly so as to evaluate how much of impact was transferred from global market into domestic price levels in these countries at data points of two food price shocks that is 2007-08 and 2010-11 within actual food price series and at 2015 onwards within forecasted price series to trace impact of decrease in global oil prices of 2014-15.

The following general forecasting equation is used for generation of forecasts for food prices and inflation series through ARIMA modelling:

$$\hat{y}t \;=\; \mu + \phi 1\, yt-1 + \cdots + \phi p\, yt-p - \theta 1 et-1 - \cdots - \theta q et-q$$

In above equation parameters ϕs define the autoregressive part of the series that captures how current series depend on its previous values, whereby the moving average part of the series are captured as by parameters θ's[5] which captures how current deviations of mean deviates from its previous values. To identify the appropriate ARIMA model for forecasting the food prices and its inflation rate for Iran, Turkey and Pakistan, it is important to identify the order with which a series is impacted by its autoregressive and moving average parts and also with what order the series becomes stationary (that is order of integration). For these identification we will follow methodology developed by Box and Jenkins which is primarily hit and trial method.

It is important to note here that our adopted methodology for seeing the impact of food and non-food prices shocks through reliance on a-theoretical modelling using box-Jenkins methodology to get forecasts based on identification of ARIMA structure of series is not only because of limited

[5] θ's signs are negative in above equation following the convention introduced by Box and Jenkins.

data points but also because in time series research it has been observed over the years that predictions from a-theoretical modelling in general has been more accurate as compared to theoretical models. However the drop side of this that through this we were at maximum able to get a forecast that can guide us as to how food price series or food inflation series are trending and when there will be a dip or peak in forecasted time period given the information generated from its auto-regressive and moving average parts. Hence for assessment of risk to future vulnerabilities arising from international markets, we have no option but to rely on upcoming indirect approach for all ECO countries. This is so given that we had only fifteen data points on prices for Iran, Turkey and Pakistan and that too at aggregate level with no information on disaggregated prices such as yearly domestic wheat and other crops prices, their domestic production levels and domestic demand etc., hence we did not have the capacity to go into theoretical models such as VAR anyways where we could have estimated demand or supply response functions for a crop and introduce a shock to international price of food items such as wheat or some other crop and assess impact of such a shock on the chosen crop's demand or supply through impulse function response.

2.2(b) *Indirect Approach*

Give data on food prices is missing for seven out of ten ECO countries, hence vulnerability to international food and non-food price shocks with each Eco country will be checked through an indirect route employing indicators of food stability as defined by FAO (refer to Table 1). Whereby in this analysis countries will categorised in three categories those facing no risks, those facing moderate risk and those facing high risks by their relative assessment of how dependent these countries are on cereal imports and what capacity their accumulated stocks of foreign reserves as compared to regional mean create so as to act a buffer in case of plausible international price shocks.

Table 1

Summary of Key Indicators for Indirect Approach

Indicators	Data Source	Food Insecurity Dimension As Per FAO Definition
Cereal Import Dependency Ratio (%)	FAO	Stability
Gross International Reserves (Million US$)	FAO	Stability
Value of food imports over total merchandise exports (%) (3-year average)	FAO	Stability

2.3. Empirical Methodology for Assessment of Food Independence versus Food Diversification Policy and ECO Potential to cater to Rising Demand of Animal Protein

In evaluation of these two research questions, we will use descriptive quantitative analysis to evaluate the production and trade patterns of various food groups both across divisions by low and high food deficit ECO sub-regions and also at country level. Through this by identifying on which food products an ECO country has trade surplus or trade deficit, we shall firstly try to come to conclusion on varied policy stance across ten ECO countries as to whether they choose food independence policy to food security or not. Further at second level of analysis, looking at consumer demand patterns for cereal, roots, and tubers and average supply patterns for protein production both of animal and non-animal origin at one level we shall try to identify the preference patterns for food rich in protein for each ECO county level and at other level through assessment of trade patterns will also try to see that which ECO country has potential to cater to rising domestic and international demand for animal protein.

3. ASSESSMENT OF VULNERABILITY TO INTERNATIONAL PRICE SHOCK

Vulnerability to International Price shocks will be addressed using direct and indirect approaches. Whereby in direct approach, data on food prices will be used directly for assessment of issue in hand. However given data on food prices is available only for Iran, Turkey and Pakistan and hence we will make assessment for ECO region country-wise employing indicators of food supply stability related to access of a country to international market—an approach termed as assessment of vulnerability to international price shock via indirect approach. Let us look into these evidence for ECO region as below:

3.1. Assessment of Vulnerability to International Price Shock— Direct Approach

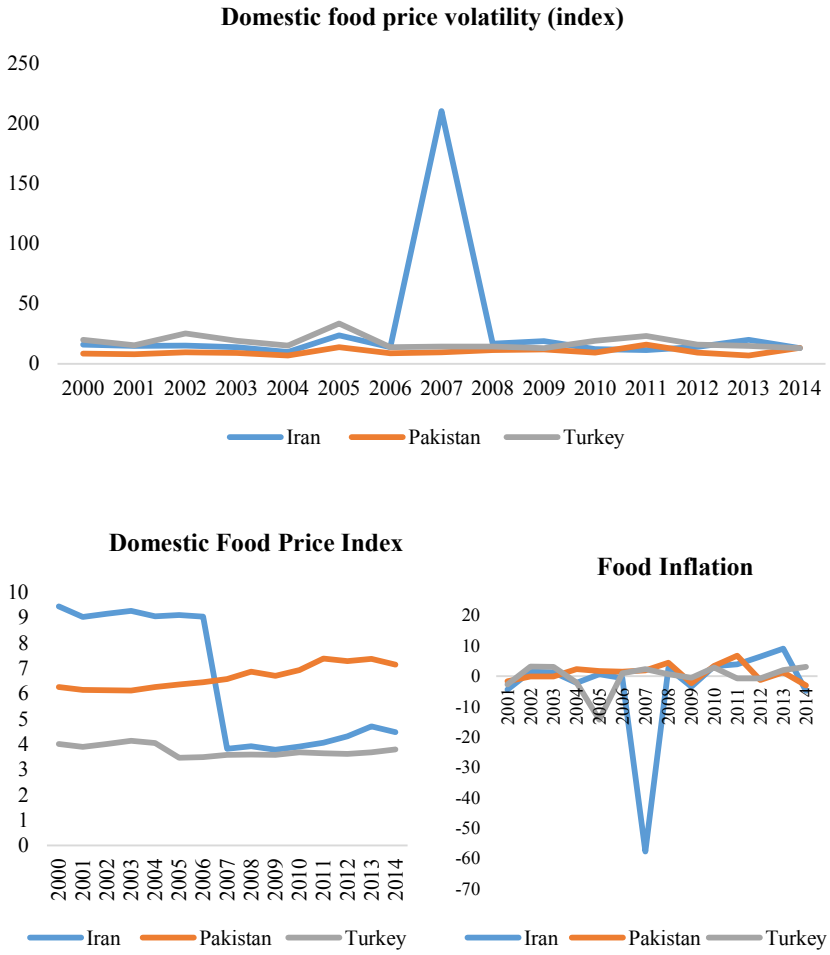
Employing data on domestic food prices and its forecast for Iran, Turkey and Pakistan, let us discuss in detail the patterns that come out regarding response to important international price shocks such as those emerging out from global food markets in 2007-08 and 2010-11 and that from global oil market in 2014-15 within these three ECO countries as below:

3.1(a) Assessment of Vulnerability to International Price Shock in Iran

Looking at patterns in figure 1, of the three ECO countries with available information for food prices post 2000 (Iran, Turkey and Pakistan), Iran is the only country that is documenting prominent variability in food

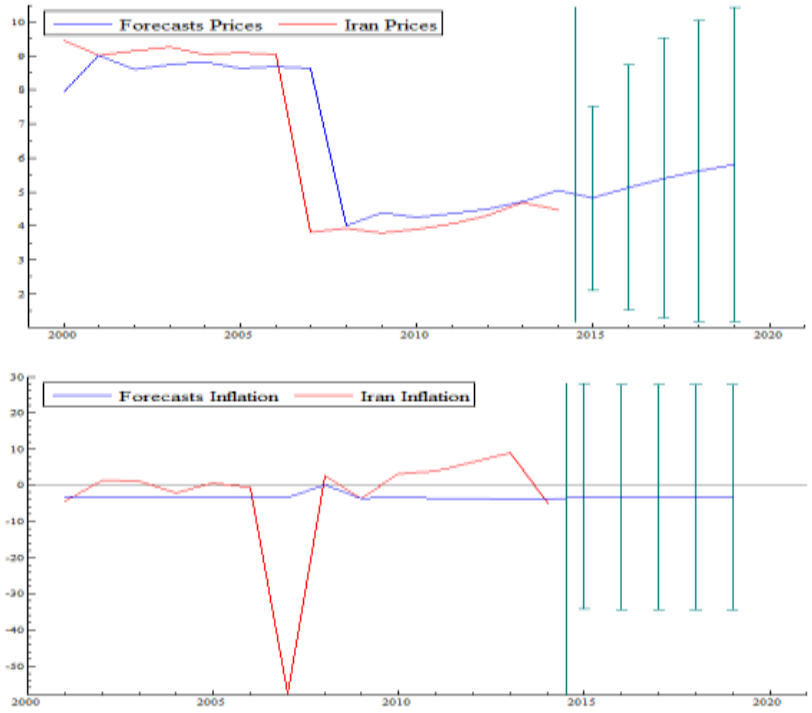
prices at time of first price shock that is 2007-08. However once we look closely during this period rather than seeing increase in food prices we find dramatic decrease in domestic food prices (both in its level and its rate of change) in Iran resulting in considerable decline in food inflation at time of 2007-08 price shock in spite of it high dependence on global markets for cereal procurement (Figures 1, 2 and 5). Hence though Iran may have reliance on international food markets for covering its staple requirement yet it is not vulnerable to international price shocks as clearly can be seen from patterns in Figures 1, 2 and 5.

Fig. 1: Evolving Dynamics in Domestic Food Prices in Iran, Turkey and Pakistan (at Level, in its Rate of Change and its Variability)



Source: FAOSTAT.

Fig. 2. Evolving Dynamics in Domestic Food Prices and Food Inflation in Iran (Actual and Forecast)



Source: FAOSTAT.

Note: In sample and out of sample forecasts for food price data of Iran (log-likelihood -26.4232153 ARMA(1,0,1) 2000-2014) and in sample and out of sample forecasts for food inflation data of Iran (log-likelihood -58.3030352 ARMA(1,0,0) 2001-2014) (For supporting ACF and PAC plots please refer to Appendix Figures A..1 and A. 2).

From patterns in Figures 1 and 2, it is evident that not only Iranian government supported food prices to much lower prices than pre-shock level from 2007 onwards but in case of second shock of 2010-11 again we find though prices increased somewhat with food inflation taking a peak around 2013 and reaching close to double digit figure but in terms of comparison in level, food prices remain substantially below the level of food prices in 2006 (Appendix Table A.1). In terms of patterns in forecasted food price level and inflation rate for food as a group, for Iran we find an increasing trend in food price level[6] and a constant trend in inflation rate within the forecasted

[6]Increasing trend in forecasted food price series may very well be reflection of negative impact of substantial decrease in global oil prices in 2014-15 since Iran is net exporter of oil and decrease in value of its oil exports and hence oil revenues may have generated a heavy macroeconomic shock within its economy.

duration of 2015-19 (Figure 2). However given much better in sample match of forecasted price level of Iran with patterns out of actual data during 2000-14 period and out of place patterns in in-sample forecasted inflation rate with that of patterns of actual inflation rate in Iran as is evident from patterns in Figure 2 show that only reliable forecast patterns are those out of food price data. Further in this context important observation to note is that though Iranian government may have supported food price levels to much lower level than that of 2006 level, yet increasing trend post 2009 overtime both in actual and forecasted food prices does indicate that profitability of the farmers is also in mind of policymakers within Iran. However which food groups are being focused (for example cereal versus non-cereal crops) by creating price incentives to increase production of food cannot be assessed here since we do not have access to disaggregated price data by food groups. Further since policy variable of concern for net buyers of food is inflation rate and not food prices, hence in context of positioning of food consumers within Iran we do find that though food inflation facing them may have reached close to double digits in 2013 but since then it has considerably decreased to negative figure in 2014 (Figure 1). Hence within Iran from pattern of food prices and its inflation rate it seems government is taking on considerable fiscal burden to support both net buyers and net producers of food. How is Iran managing this we will come to this in next level of analysis where we will assess the strength of a country in terms of its international reserves

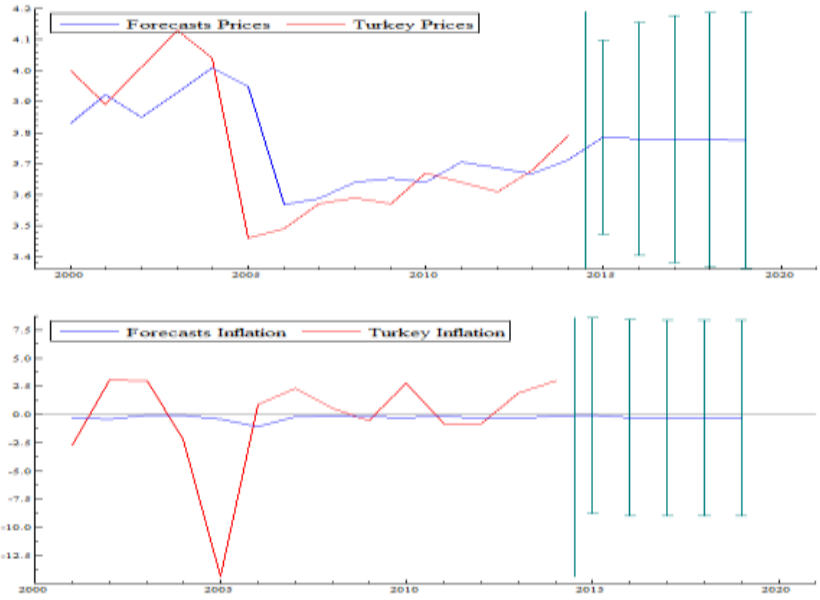
3.1(b) Assessment of Vulnerability to International Price Shock in Turkey

Next in line after Iran in terms of stable patterns is Turkey whereby we get a clear picture of stability at all fronts and find very little effect of international food prices shocks on evolution of domestic food prices (both in terms of impact on its level and/or on its rate of change) (Figures 1and 3; Appendix A.1). Looking closely in to how actual data series for food price level and its inflation rate have evolved overtime within Turkey in figures 1 and 3, we can see just like dip at 2007 in Iran series, there is a huge fall in both food prices and food inflation at 2005 from previous levels in Turkey and even till 2014 these series do not recover to pre-2005 levels. Hence this show that within Turkey (just like in Iran) government is playing a proactive policymaking role where not only consumers are supported by keeping food inflation in check to sustainable levels but also food production incentive are also being defined through management of food prices.

However important thing to note here is from patterns out of actual and forecast data of food price in Turkey in figure 3 we can see that at one level patterns within Turkey not only remain lower than values pre 2005 even till 2014 with a slight declining trend in food price forecast in forecasted duration of

2015-19[7] but in terms of comparison with Iran and Pakistan within Figure 1 food prices in Turkey stand at lowest level at all data points. Further in terms of food inflation, patterns within Turkey do show increased peaks at point of impact of the two international price shocks at 2007-08 and 2010-11, however food inflation even at these peaks remain less than 3.0 percent and at sustainable single digit value unlike Pakistan which has food inflation above 6 percent at all data points and Iran which though has low food inflation in most data points but still documents high rate of change in food prices of magnitude 6.41 percent in 2012 and 9.04 percent in 2013 (Appendix Table A.1).[8] Hence overall Turkey is among the most stable ECO country in terms of how food inflation and food prices have evolved overtime.

Fig. 3. Evolving Dynamics in Domestic Food Prices and Food Inflation in Turkey (Actual and Forecast)



Source: FAOSTAT.

Note: In sample and out of sample forecasts for food price data of Turkey (log-likelihood 6.22344208 ARMA(1,0,0) 2000-2014) and in sample and out of sample forecasts for food inflation data of Turkey (log-likelihood -40.4062581 ARMA(1,0,0) 2001-2014) (For supporting ACF and PAC plots please refer to appendix figures A.1 and A.2).

[7] Given Turkey is importer of oil, declining trend in forecasted food prices in Turkey post 2015 may very well reflect impact of fall in global oil price that occurred in 2014-2015 (Figure 3).

[8]The forecasted inflation rate for Turkey has a constant trend. However since in-sample forecasted value do not match well with the actual data patterns within 2001-2014, hence constant pattern of forecasted inflation rate in Turkey given its poor quality has no analytical relevance in present context and rather we have for our analysis relied only on patterns out of actual data series for inflation.

3.1(c) Assessment of Vulnerability to International Price Shock in Pakistan

Third in line among ECO country with available information on domestic food price and its inflation rate is Pakistan. Unlike Iran and Turkey where we observe government capacity to effectively buffer both food prices and food inflation from international price shock keeping the interest of both food producers and consumers intact, Pakistan seems most impacted among these three ECO countries in face of two price hikes of 2007-08 and 2010-11 originating out of changes in international cereal demand (Figures 1 and 4). From patterns out of how food prices and food inflation have varied overtime in Pakistan it is evident that not only overall there exist a sharp increasing trend in food prices between period 2006-2011 in Pakistan along with prominent increases in food inflation at the two shock time periods that is 2007-08 and 2010-11 but these dynamics being relatively much more pronounced in Pakistan as compared with that in Iran and Turkey validate relatively much more binding internal constraints for Pakistan as was highlighted within analysis on structural heterogeneities in context of Pakistan in chapter 3 (Figure 1; Appendix Tables A.1).

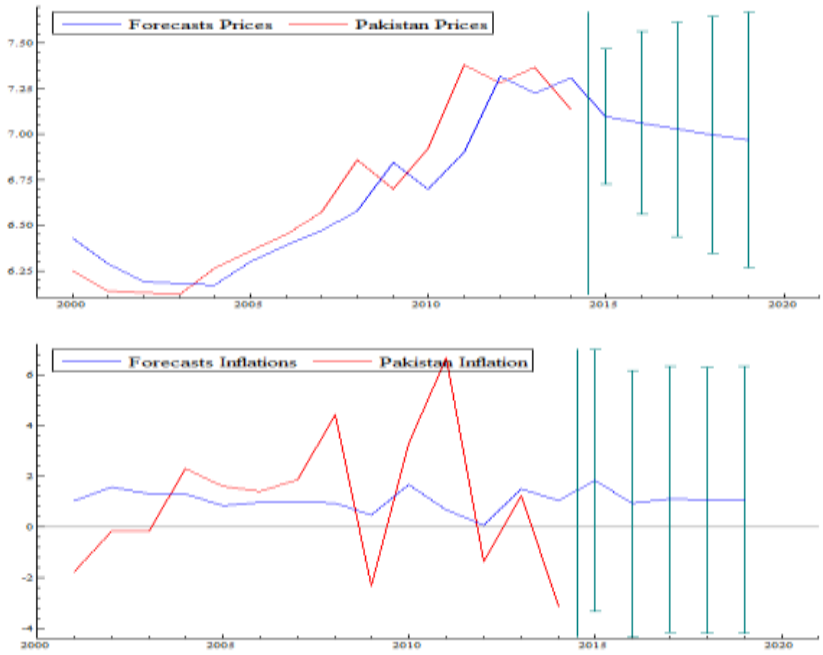
However important key note to take away from patterns in figure 4 above is post 2011 not only we are seeing declining trend in food price but also in forecasted food price level during 2015-19 time period[9] along with food inflation rate being managed below 2 percent (both in actual data values and in patterns of forecasted inflation rate). So does this mean that to secure food interest of consumer at some level government has compromised farmer's interest by decreasing food prices overtime and hence keeping farmer profitability in check? No not all as it will be unwise to get to this conclusion from patterns out of aggregate food price and its inflation rate for such a conclusion requires in-depth evaluation of this question by going into dynamics by food groups and analysing the varied incentive given out by government for production of different crops—a context that we cannot go into due to non-availability of price data by food groups.

Beside the issue of how food price level and its inflation rate has shown impact in phase of international price shocks, some important vulnerabilities within Pakistan can be observed out of patterns in net food trade for Pakistan in figure 5 that needs to be pointed out here whereby not only trade deficit in overall food exchanges in international markets is clearly evident but that with positive trend between period 2000-2014 (Figure 5; Appendix Table A.2). However there does exist some positive notes for Pakistani economy firstly not only Pakistan is documenting negative cereal import dependency post 2000 with downward trend across 2000 and 2014 timeframes but also has accumulated

[9]Given Pakistan is importer of oil just like Turkey within ECO region hence declining trend in forecasted food prices in Pakistan post 2015 may very well reflect impact of fall in global oil price that occurred in 2014-2015 (Figure 4).

stock of foreign reserves to cover its food requirement and that these stocks are showing positive trend overtime post 2000 (Figure 5; Appendix Tables A.2). However not only such stock of foreign reserves in Pakistan are much lower than the regional mean value for ECO countries as per 2014 estimates but as compared to Iran and Turkey - the two countries which have shown no impact of international food price shocks these stock are less by proportion of 91.9 percent and 92.8 percent respectively (Appendix Tables A.2). Hence there exist inherent vulnerabilities within Pakistan economy that needs to be addressed.

Fig. 4. Evolving Dynamics in Domestic Food Prices and Food Inflation in Pakistan (Actual and Forecast)



Source: FAOSTAT.

Note: In sample and out of sample forecasts for food price data of Pakistan (log -likelihood 3.09467699 ARMA(1,0,0) 2000-2014)) and in sample and out of sample forecasts for food inflation data of Pakistan (log-likelihood -33.1399383 ARMA(1,0,0) 2001-2014) (For supporting ACF and PAC plots please refer to appendix Figures A.1 and A. 2).

3.2. Assessment of Vulnerability to International Price Shock— Indirect Approach

In context of profile for remaining ECO countries with no data on food prices, let us take the indirect route. Overall we can see that food production has gone up in ECO region, however from patterns in figure 5 it is evident that post 2000 the growth in food production is slightly relatively higher for low food

deficit region[10]. Irrespective of this positive and sizable growth in food production in ECO region we find that not only overall on average there is trade deficit in food groups as a whole for both high and low food deficit but the magnitude of this deficit has increased for both these regions by significant amount[11]. Looking closely at patterns in Figure 5, we can see that Turkey and Kazakhstan are the only two countries which document trade surplus within 1990 to 2014 timeline whereby in the former food exports are higher than food imports in all three time periods but for the later net trade indicator in food items show positive estimate in 1990 and 2000 and negative value in 2014 (Appendix Table A.2). Further in case of patterns of cereal import dependency ratio within ECO region as can be seen in figure 5, except for Turkey, Kazakhstan and Pakistan which have negative cereal import dependency and hence are supplier of cereal in world market, all other countries are showing positive dependence on world market for meeting their cereal demands (Appendix Table A.2). Hence we can conclude from these patterns that except for Turkey[12] all other ECO countries have positive dependence on global markets for meeting their overall food requirements in one sense or the other.

So the important policy question that originate in face of this reliance of most ECO countries on international food markets is how to identify the countries that are most likely to face crisis in case of sudden increase in food prices say that of cereal as has happened in recent past in 2007-08 and in 2010-11. This vulnerability in our analysis will be checked through patterns in two indicators that is extent of Gross International Reserves in a country from regional mean and how ratio of food import value to total merchandise exports has evolved over time. As we will see in evaluation below that through this analysis, ECO countries can be divided into three categories namely countries at Extreme Risk, Countries at No Risk and Counties at Moderate Risk to International Price Shock:

- *ECO Countries at Extreme Risk in Face of International Price Shock:* In terms of how far is stock of gross foreign reserves from regional mean for ECO as whole is concerned the four ECO countries that show significant risks are Tajikistan, Kyrgyzstan, Afghanistan and Pakistan, whereby their stocks come out to be below regional mean by 98.5 percent, 94.5 percent, 79.9 percent and 74.8 percent respectively as per 2014 estimates (Appendix Table A.2).

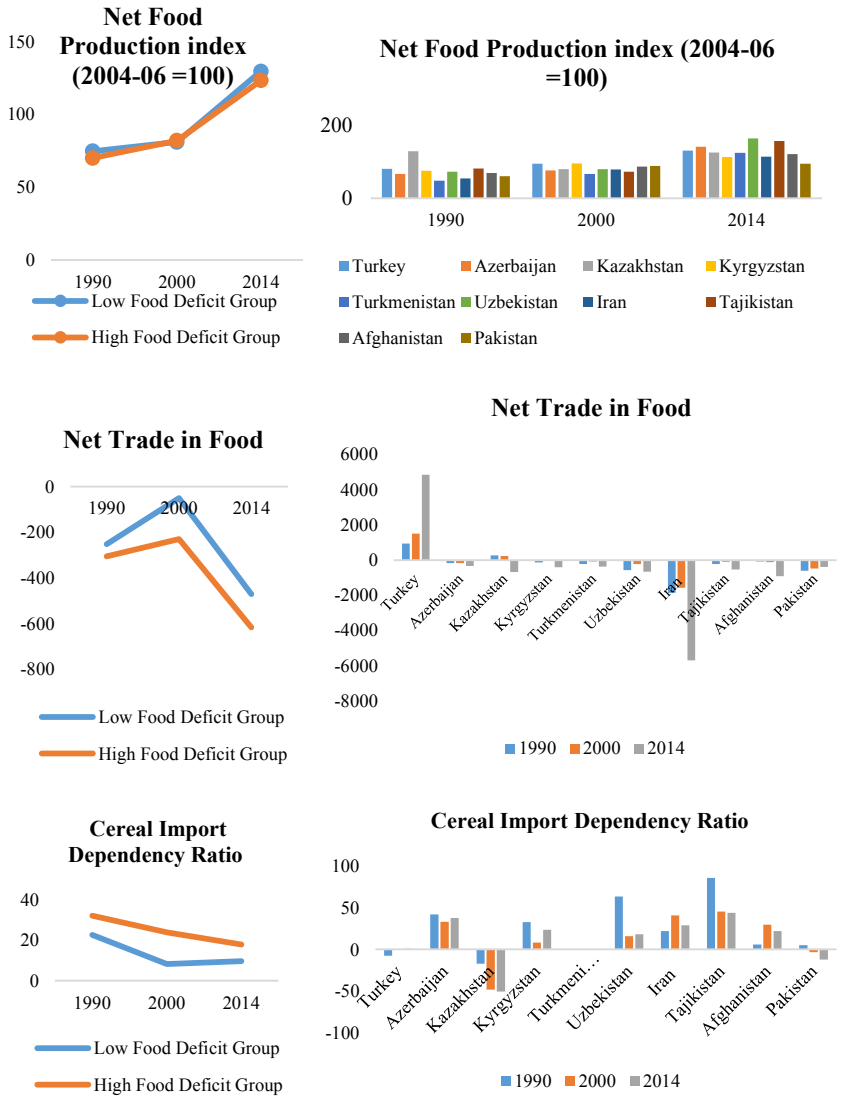
[10]Net food production index is showing positive growth for ECO region with average growth rate of 17.2 percent for 1990-2000 period and 60 percent for 2000-14 period however post 2000 magnitude comes out to be higher for low food deficit countries (59.9 percent for low food deficit zone and 50.4 percent for high food deficit zone (Appendix Table A.2).

[11]Net trade deficit in food items is growing at rate of 167 percent for high food deficit zone and 825 percent for low food deficit zone (Appendix Tables A.2).

[12]Pakistan and Kazakhstan though have negative cereal import dependency but has overall food trade deficit as per 2014 estimates, hence these countries may be self-sufficient in cereal are dependent on international food supply for their other food requirement (Figure 5).

- *ECO Countries at No Risk in Face of International Price Shock:* In contrast to these countries Turkey and Iran come out to be most protected with much higher stock of foreign reserves than regional means by amount of 252 percent and 214 percent in year 2014 (Appendix Table A.2). Hence this endorse our previous analysis through assessment of food price and food inflation evolution overtime.

Fig. 5. Assessment of Vulnerability to International Price Shock



Source: FAO Yearbook 2015, FAOSTAT 2017.

Fig. 5. Assessment of Vulnerability to International Price Shock (Continued)

Source: FAO Yearbook 2015, FAOSTAT 2017.

- *ECO Countries at Moderate Risk in Face of International Price Shock:* Within low food deficit ECO countries there are some other countries which have stock of foreign reserves below ECO mean as per 2014 values namely Azerbaijan (less by 56.9 percent), Uzbekistan (less by 33.1 percent), Kazakhstan (less by19.1 percent) and Turkmenistan (less by10.3 percent) (Appendix Table A.2). However in comparison with Tajikistan, Kyrgyzstan, Afghanistan and Pakistan not only these countries are found to be much better placed in terms of availability of foreign reserves as of 2014 computations[13] but also once we match

[13]Stock for foreign reserves in 2014 come out to be US$ 15549 million in Azerbaijan, US$ 24140 million in Uzbekistan, US$ 29209 million in Kazakhstan, US$ 32400 million in Turkmenistan and that for Tajikistan, Kyrgyzstan, Afghanistan and Pakistan come out to be US$ 511 million, US$ 1958 million, US$ 7248 million and US$ 9098 million respectively (Appendix Table A.2).

these patterns with that of food imports to total merchandise trade, we find that this ratio is not only relatively much lower than regional average value for these countries (being less by 92.8 percent in Azerbaijan, less by 78.6 percent in Uzbekistan, less by 90.4 percent in Kazakhstan and 95.5 percent in Turkmenistan) but is also decreasing overtime within each of these countries (Appendix Tables 4.8a and 4.8b). In contrast to above patterns, estimates for Tajikistan, Kyrgyzstan, Afghanistan and Pakistan reveal not only within these countries the ratio of food import value to total merchandise exports in year 2014 to be higher than regional mean value by proportion of 603 percent in Afghanistan and 2.13 percent in Tajikistan and less by much lower proportion of 21.6 percent in Kyrgyzstan and 61.99 percent in Pakistan as compared to that in Azerbaijan (-92.8 percent), Uzbekistan (-78.6 percent), Kazakhstan (-90.4 percent) and Turkmenistan (-90.4 percent) but also this ratio to be increasing overtime post 2000 (Appendix Table A.2). Hence in comparative terms these counties are vulnerable to much less degree to external price shocks than Tajikistan, Kyrgyzstan, Afghanistan and Pakistan but nevertheless irrespective of these facts and figures from anecdotal country specific evidence we find that Azerbaijan, Kazakhstan Turkmenistan and Uzbekistan have been impacted from shocks emerging from global changes whereby first three economies in these group clearly being oil exporter are vulnerable to global decline in oil prices especially of drastic negative shock of 2015, beside other facing other structural problem such as dependence on remittances from Russia etc. while Uzbekistan though not being an oil exporter yet its reliance on external economies like Russia is an alarming concern that needs to be taken into account while analysis of vulnerability to external price shocks.

Hence it clear from patterns in Gross International Reserves and ratio of food import value to total merchandise exports that the four ECO countries which can be safely declared vulnerable to a possible price hike in international food markets are Tajikistan, Kyrgyzstan, Afghanistan and Pakistan given these countries have much lower amount of foreign reserves than other ECO countries while countries which are at risk to much lower degree include Azerbaijan, Uzbekistan, Kazakhstan and Turkmenistan.[14] While the two countries which come out as most protected are Turkey and Iran.

[14]Our findings are endorsed by Akramov and Ganga (2012), International Monetary Fund (2012) whereby within their work they show that the four central Asian countries namely Kazakhstan, Kyrgyzstan, Uzbekistan and Tajikistan that have been shown to be impacted to much larger degree than other countries in the world by the recent global food price shocks of 2007-08 and 2010-11.

Table 2

Categorisation ECO Countries by Extent of Risk to Food Security in Face of International Food Price Shocks—Summary

	Countries	Progress MDG hunger target	*Cereal Import Dependency	Percentage Deviation for Regional Mean for **Gross International Reserves	Percentage Deviation from Regional *Mean for Value of food imports over total merchandise exports
No Risk	Turkey	fulfilled	Not Dependent	252.70%	-85.70%
	Iran	fulfilled	Dependent	214.70%	-78.60%
Moderate Risk	Turkmenistan	fulfilled	Dependent	-10.30%	-95.20%
	Kazakhstan	fulfilled	Not Dependent	-19.10%	-90.40%
	Uzbekistan	fulfilled	Dependent	-33.10%	-78.60%
	Azerbaijan	fulfilled	Dependent	-56.90%	-92.80%
Extreme Risk	Tajikistan	Failed	Dependent	-98.50%	2.13%
	Kyrgyzstan	fulfilled	Dependent	-94.50%	-21.60%
	Afghanistan	Failed	Dependent	-79.90%	603.08%
	Pakistan	Failed	Not Dependent	-74.80%	-61.90%

Data Source: *FAOSTAT, **This information has been retrieved from secondary source namely PIDE Project Report on ECO Macroeconomic Modelling 2019; Primary data sources are IMF, ADB and WDI as per project report.

Table 3

Summary of Prominent Macroeconomic Vulnerabilities

		Progress Towards MDG Hunger Target	Oil Exporter	Prominent Points
No Risk	Turkey	Fulfilled		Persistently High Current Account Deficit
	Iran	Fulfilled	Yes	High Unemployment Rates among Youth ; Economic Sanctions
Moderate Risk	Turkmenistan	Fulfilled	Yes	Exports Target Primarily China, Lowest External Debt to GDP Ratio
	Kazakhstan	Fulfilled	Yes	Dependent on Russian economy
	Uzbekistan	Fulfilled		Largely Dependent on Russian Economy, Main Agricultural Export is Cotton and Import is Grains
	Azerbaijan	Fulfilled	Yes	High Current Account Deficit
Extreme Risk	Tajikistan	Failed		Highly Dependent on Remittance, Export Earnings Dependent Mainly on Cotton and Aluminum
	Kyrgyzstan	Fulfilled		Highest Ratio of Total External Debt to Total GDP in the ECO region (97.2 %)
	Afghanistan	Failed		Conflict
	Pakistan	Failed		Agricultural Growth Slow Down, Unsustainable External Debt Levels

Source: PIDE ECO Macroeconomic Modelling Project Report 2019.

Hence from patterns in figure 1-5 (refer to Table 1 for summary), following key policy insights can be taken:

- Overall food production is growing within ECO region, however irrespective of increasing domestic productive base within each ECO country over time, we see that dependence on global markets for food items is also increasing. This increased reliance on global market for food items need to be checked against both evolving patterns in consumer demand and also in face of changes in demographic dynamics
- Overall trade deficits in food items are increasing overtime in most ECO countries except Pakistan where it is decreasing and Turkey where there are trade surplus. Hence these overall net trade patterns needs an assessment both in terms of trade patterns by various food groups and also in context of countries comparative advantage in production of different food items so as to see how much countries are depending on high value non-stable crops or other food items that are more in line with their agricultural capacities.
- Finally within ECO region the four countries that are found to be at risk of being affected greatly by international price shocks are Tajikistan, Kyrgyzstan, Afghanistan and Pakistan. Within Pakistan we can directly see that domestic food prices and food inflation has increased post these shock periods but in the other three countries though we do not have data on food prices for these countries but their vulnerabilities are evident from the fact that these countries are relying heavily on international markets for their food requirements (even that of cereal) in spite of having much lower foreign reserves compared to regional mean value and documenting much lower export base given their value of food imports are much higher in proportion to total merchandise exports than rest of ECO countries and further positive trend in ratio of food imports to total merchandise exports in these three countries show that these tendencies are increasing overtime.
- In rest of ECO countries the two countries which seem quite secure in all dimensions and not responsive to price shocks from international food are Turkey and Iran while for remaining ECO countries Azerbaijan, Kazakhstan, Turkmenistan, and Uzbekistan there is found evidence for some plausible risks but the extent of such possibility is observed to be much lower than that for Tajikistan, Kyrgyzstan, Afghanistan and Pakistan. In this context the evidence for Turkey and Iran is not only backed by direct analysis of domestic food prices and food inflation but also through their strong position in foreign reserves while for remaining countries Azerbaijan, Kazakhstan, Turkmenistan, and Uzbekistan due to non-availability of information on food prices we reach to this conclusion through indirect analysis of extent of cereal

import dependency and capacity to buffer against cereal price hikes by stock of international reserves.

4. AGRICUTURAL PRODUCTION AND TRADE PATTERNS IN FACE OF CHANGING INTERNATIONAL AND DOMESTIC DEMAND

In this section our objective will be to reach to conclusive viewpoint as to what is response within each ECO country and across the two food groups (low food deficit and high food deficit) within ECO region in following two policy dimensions:

- Firstly where does a country stand in terms of its position in policy debate of self-sufficiency in staple food supply versus diversification into high value non-staple agricultural produce?
- Secondly how capable is ECO region in reaping benefits out of increased demand (both local and global) for animal protein?

To answer these important policy questions we will divide discussion to come in three sections 4.1, 4.2 and 4.3. Whereby in first section 4.1 an attempt will be made to identify the food categories in which a country or a region (low or high food deficit ECO group) has a production advantage while other two sections through assessment of production and trade patterns of agricultural food groups will present empirical evidence to identify the policy practice in terms of diversification into high-valued non-staple agricultural produce or stress on self-sufficiency on staple food groups within each ECO country (section 4.2) and assessment of potential of each country in production and trade of animal protein products (section 4.3).

4.1. Assessment of Agricultural Productive Capacities—Production Patterns by Product Type

In this context, we will be assessing, what is the production mix across low and high deficit countries. That is in terms of production, how volume and also growth patterns for various agricultural products varies across different countries. This will be done so as to assess how countries vary in their production mix and in which food item they are showing sign of comparative advantage. Overall from patterns in figure 6a below we can see that there is positive growth in all food categories post 2000 for both low and high food deficit region. However on average we can see that high food deficit region has an edge on low food deficit ECO zone in production of cereal, roots and tubers, fish and sugar whereas both regions are showing equivalent growth patterns in fruits and vegetable category and clear comparative advantage of low food deficit zone in production of livestock, milk and vegetable oil products and slight advantage in that of meat as compared to high food deficit countries. However these patterns are aggregation and may hide country specific variations. To unmask such country specific heterogeneities let us match these

aggregate patterns in figure 6a with production patterns country wise in figure 6b. The key findings that come are as follows:

- Disaggregated analysis of level and growth patterns of cereal production countrywide show that in regard to edge of high food deficit region over low food deficit zone, all three high food deficit countries are contributing substantial amount in 2014 in terms of level of production whereas in reference to sharp positive growth post 2000 for high food deficit zone in comparison with low food deficit region the main contributing countries to this growth pattern come out to be Tajikistan and Afghanistan with growth rates of 104.5 percent and 230.5 percent respectively between period 2000-2014 (Appendix Table A.3). Further looking at patterns within the low food deficit countries, we see that contrary to aggregate behaviour, we find all countries except Turkmenistan in this region with extensive base of cereal production with estimates for cereal production in 2014 for Azerbaijan, Kazakhstan and Uzbekistan being close to range in which level production is estimated for Tajikistan and Afghanistan while that for Turkey, Kyrgyzstan, and Iran being near to estimates for that Pakistan (Appendix Table A.3). Hence aggregation has down-played this clear strong tendencies for cereal production in these six low food deficit region due to bad performance in Turkmenistan. On the whole the entire ECO region has devoted substantial resources in production of cereal crops and are showing positive trends in growth post 2000.

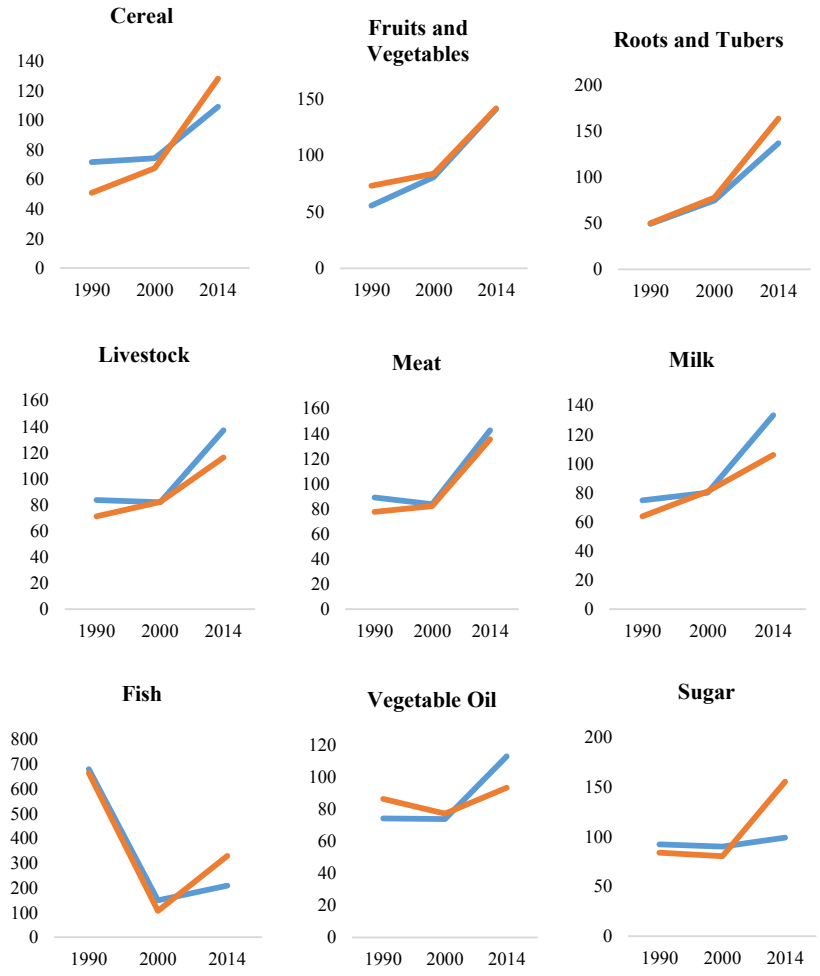
In terms of fruits and vegetable category, as per findings in figure 6b, we see positive trend in all ECO countries between 2000 to 2014 periods (Appendix Table A.3). However among countries that have clear advantage over others are Uzbekistan and Tajikistan and the one with slight advantage over others in sense of having production level marginally above the regional mean value in year 2014 of 141 is Kazakhstan with value 161 and the two countries which have values much closer to regional average namely Azerbaijan and Kyrgyzstan with values of 132 (Appendix Table A.3). The remaining countries have production index value for fruits and vegetable in range of 104 to 121 where lowest value stand for Pakistan (104) and highest for Turkey (121) (ibid).

- In case of roots and tubers, in light of patterns in figure 6a, the relatively higher growth plane for high food deficit region is primarily coming from substantial boost in production of roots and tubers (both in in terms of level of production and its growth) in Tajikistan and Pakistan (Appendix Table A.3). However the low food ECO deficit region though having slightly lower magnitude on average[15] has among its countries not only

[15]Low food deficit zone as per 2014 estimates is performing less than high food deficit zone in production of roots and tubers with average value of 136.8 for low and 163.6 for high food deficit zone (Appendix Table A.3).

Uzbekistan—the ECO country which has highest level of production in 2014 of roots and tubers[16] but also except for Turkey all other countries in this group are showing positive growth in production of this food item with some countries having production levels in 2014 very close to regional mean such as Turkmenistan, Kazakhstan and Iran (ibid).

Fig. 6a. Production Indices for Different Food Groups across Low and High Food Deficit ECO Regions

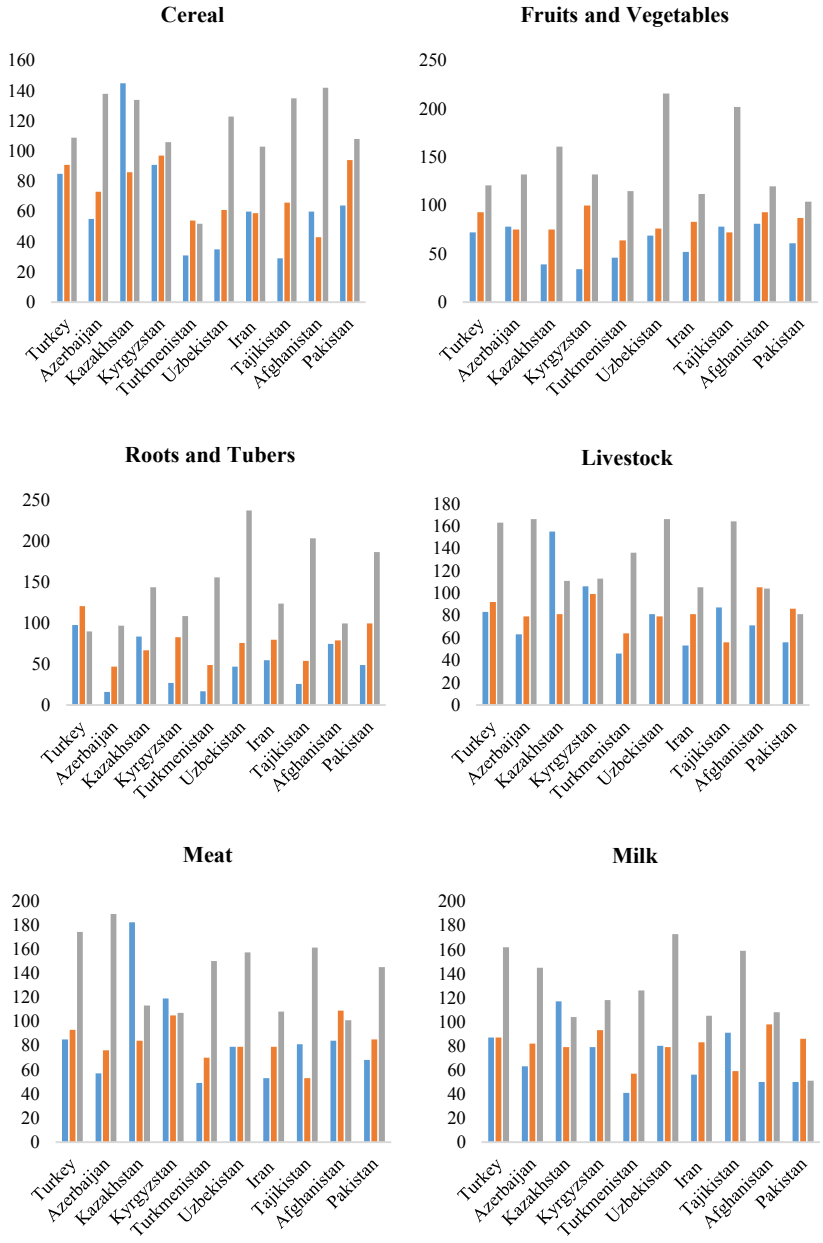


Source: FAO Yearbook 2015, FAOSTAT.

Note: Blue and Red lines indicate average for low and high food deficit regions respectively; These figure are based on production indices with base 2004-06 = 100.

[16]2014 values of production of roots and tubers for Uzbekistan come out to be 238 against a regional average of 144.9 (Appendix Table A.3).

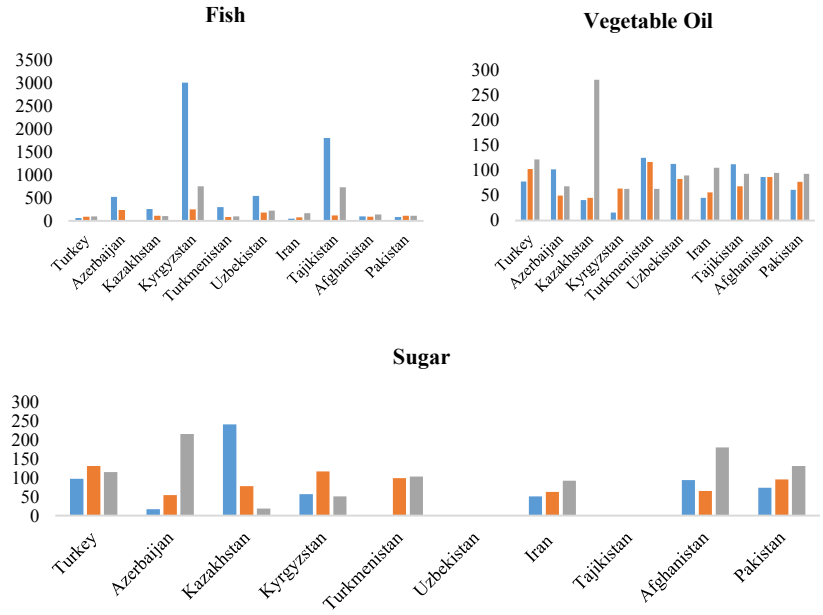
Fig. 6b. Production Indices for Different Food Groups in ECO Region (Country-wise)



Source: FAO Yearbook 2015, FAOSTAT.

Note: Blue, Red and Grey boxes represents estimates in years 1990, 2000 and 2014 respectively; These figure are based on production indices with base 2004-06 = 100

Fig. 6b. Production Indices for Different Food Groups in ECO Region (Country-wise)



Source: FAO Yearbook 2015, FAOSTAT.

Note: Blue, Red and Grey boxes represents estimates in years 1990, 2000 and 2014 respectively; These figure are based on production indices with base 2004-06 = 100

- In case of livestock production, as per 2014 estimates we see a prominent advantage of low food deficit zone with all seven countries having positive growth patterns post 2000, however the one with most substantial growth include Azerbaijan, Uzbekistan, Turkmenistan and Turkey (Appendix Table A.3). Among high food deficit zone, Tajikistan show bright avenues of livestock production both in terms of its level of production and sizable positive growth patterns within 2000-2014, however Pakistan and Afghanistan though having positive growth within 1990-2000 period has a slight declining trend post 2000 till 2014 (ibid). This is alarming not only in sense that they may lose their positive base in this area of production but also in face of how these countries will fill in the increasing local demand for meat based products with a shrinking local livestock base. However once we compare with the patterns in meat production, we find that though it shows decreasing trend in Afghanistan post 2000 but show substantial growth in Pakistan and hence Pakistan remain unaffected in context of meat production (Appendix Tables A.3). Further beside Afghanistan and Kyrgyzstan all other ECO countries exhibit positive growth

patterns in meat production since 2000 with prominent countries in this area of production being Azerbaijan, Tajikistan, Turkmenistan, Uzbekistan and Turkey. Hence ECO region is definitely responding to changing demand for animal protein, however what is the degree of self-sufficiency in this context in a country or a region will depend on the extent of their local demand and production patterns, a discussion that we will take up in coming section 2.2.

- In case of milk production, again we see production growth at positive rate overtime in all ECO countries except Pakistan where there is found a declining trend (Appendix Table A.3).
- Within ECO region the countries that take the lead over others in terms of fish production are Kyrgyzstan and Tajikistan, in terms of vegetable oil production is Kazakhstan and in terms of sugar production are Azerbaijan, Iran, Afghanistan and Pakistan (Appendix Tables A.3).

Hence looking at production patterns both at aggregate and disaggregated level with ECO region the key patterns that come out are that all ECO countries (except for few anomalies) are investing in their food base so as to secure the domestic food supply especially in terms of staple food and also non-staple food items like vegetables and fruits, roots and tubers, meat, livestock and milk products. This is evident not only in positive growth patterns post 2000 in all these food items within aggregation into low and high food deficit ECO zones and also in upward trend in these food groups within period 2000-14 for most ECO countries. However important question that need further attention is the degree of self-sufficiency in context of important food groups in face of changing demand preferences for food both internationally and domestically – a query that will be evaluated in next section.

4.2. Assessment of Extent of Self- Sufficiency and Diversification Policy Debate

In final analysis in his section, we will analyse extent of self-sufficiency in staple food production and a policy of diversification towards high value crops and food items like vegetables and fruits so as to assess which region is following food independence policy and which are not and how do the findings from previous analysis in this context hold in light of dis-aggregated analysis of food production by food items and their net-trade patterns. From patterns at aggregate level in Figure 7a, we find that low food ECO region is found to be on average following policy of food diversification by relying on global markets for their cereal requirements and developing themselves as supplier of fruits and vegetable, whereas reverse patterns is observed for high food deficit zones with constant decreasing trend in net trade for fruits and vegetable food group and positive for cereal (Appendix Table A.4). However once we look closely, as per country specific patterns in Figure 7b, we find food independence policy is clearly being followed only in Pakistan since 1990 whereby there is positive trade surplus in cereal production and negative in fruits and

vegetable (ibid).[17] In remaining two high deficit countries Tajikistan[18] and Afghanistan there is reliance on global markets as per 2014 estimates for securing cereal requirements of their populations along with marginal trade surplus and a marginal trade deficit in fruits and vegetable production within Tajikistan and Afghanistan[19] (ibid). These patterns are contrary to average behaviour for high food deficit group in context of food sufficiency or diversification debate whereby aggregation is prominently representing the patterns in Pakistan only. In case of low food deficit ECO zone, the countries which are showing clear policy of diversification in to fruits and vegetable are Turkey and Iran whereby Turkey is secure in terms of cereal production too with slight trade surplus in cereal in 2014 and Iran relying on cereal imports to fill in their staple food needs (Appendix Table A.4). However both these countries have positive trade surplus in fruits and vegetable with growth in this surplus post 2000 amounting to 253.1 percent in Turkey and 188.7 percent in Iran (ibid).In remaining low food deficit countries patterns in figure 7b tendencies for food diversification policy are evident in Azerbaijan, Kyrgyzstan,[20] and Uzbekistan[21] while in case of Kazakhstan[22] we find

[17]Our results support discussion in Qureshi, *et al.* (2007) which give a detailed analysis of policy inertia against the policy of diversification to high value crops within Pakistan.

[18]Discussion in Tajikistan food security policy documents: Food Security Program, doc. #72, 02.02.2009, The Law on Food Security Law on FS, # 192, 13.10.2012, The Concept on Agrarian Policy, 31.12.2008 as per FAO Regional Overview of Food Insecurity Europe and Central Asia (2015) show that traditionally Tajikistan's Government has supported policy idea of food independence , however our empirical estimates do not support above stated proposition whereby not only we find global reliance for cereal procurement but a trade surplus in high valued fruits and vegetable item.

[19]Traditionally Afghanistan has always supported food independence policy by encouraging agricultural production of staple food and trying to be self-sufficient in its production as per Afghanistan Food Security policy documents: Asian Development Bank: "Rebuilding Afghanistan's Agriculture Sector" (2003) and Pain, A. and S. M. Shah (2009). However over few decades in face of security and political instability Afghanistan is relying on cereal imports, however this does not mean that there may not exist policy inertia against policy of diversification into high valued agricultural items. Trade deficit in fruits and vegetable production within Afghanistan in our estimates indicative of policy inertia against diversification.

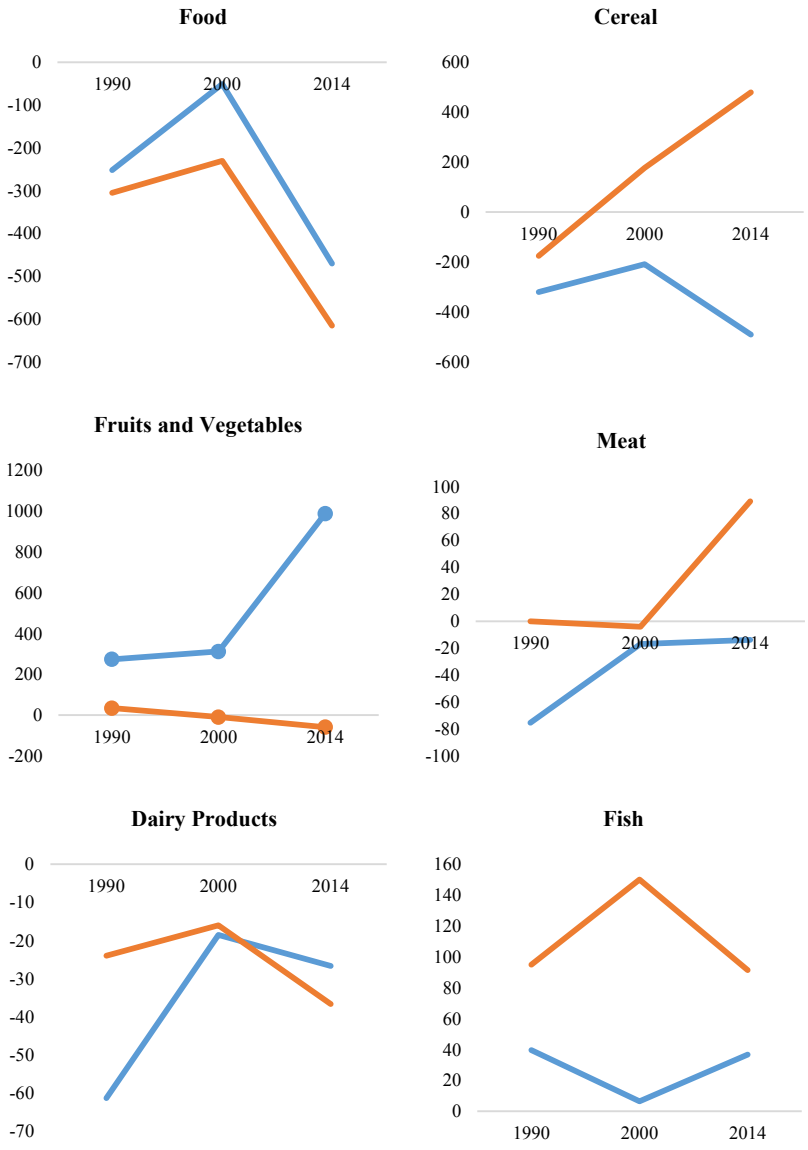
[20]Even though are estimates show support for diversification policy in Kyrgyzstan, however discussion within policy documents such as Kyrgyzstan: Food Security Law, No 175, 30.07.2009; National Strategy of Kyrgyzstan on Sustainable Development up to 2017, Food Security Strategy of Kyrgyzstan up to 2017 as per Food Insecurity Europe and Central Asia (2015) show that traditionally there had been support for sef-sufficiency in staple food production within Kyrgyzstan.

[21]As per Food Insecurity Europe and Central Asia (2015) report Uzbekistan is following a policy of food independence whereby under policy of self-sufficiency Uzbekistan increased its wheat cultivation area by 196 percent between 1991 and 2006, even the moving most of irrigated land resources away from high value crops such as fruits and vegetable to wheat cultivation [FAO: Food Security in Central Asia (2015)].

[22] Our finding match with documented policy stance in various food policy documents in case of Kaxakhstan such as Kazakhstan's Food Security Law, 2005; Grain Law 2009, Strategy KZ-2050, address by the President, 14.12.2012 as per FAO: Regional Overview of Food Insecurity Europe and Central Asia (2015) whereby path of food indepenedence within Kazakhstan is strengthened through various legislation and implementation of laws and also by supporting food producers interests through providing subsidies for inputs like seed, fertiliser, machinery etc and by offering limited support to food net buyers

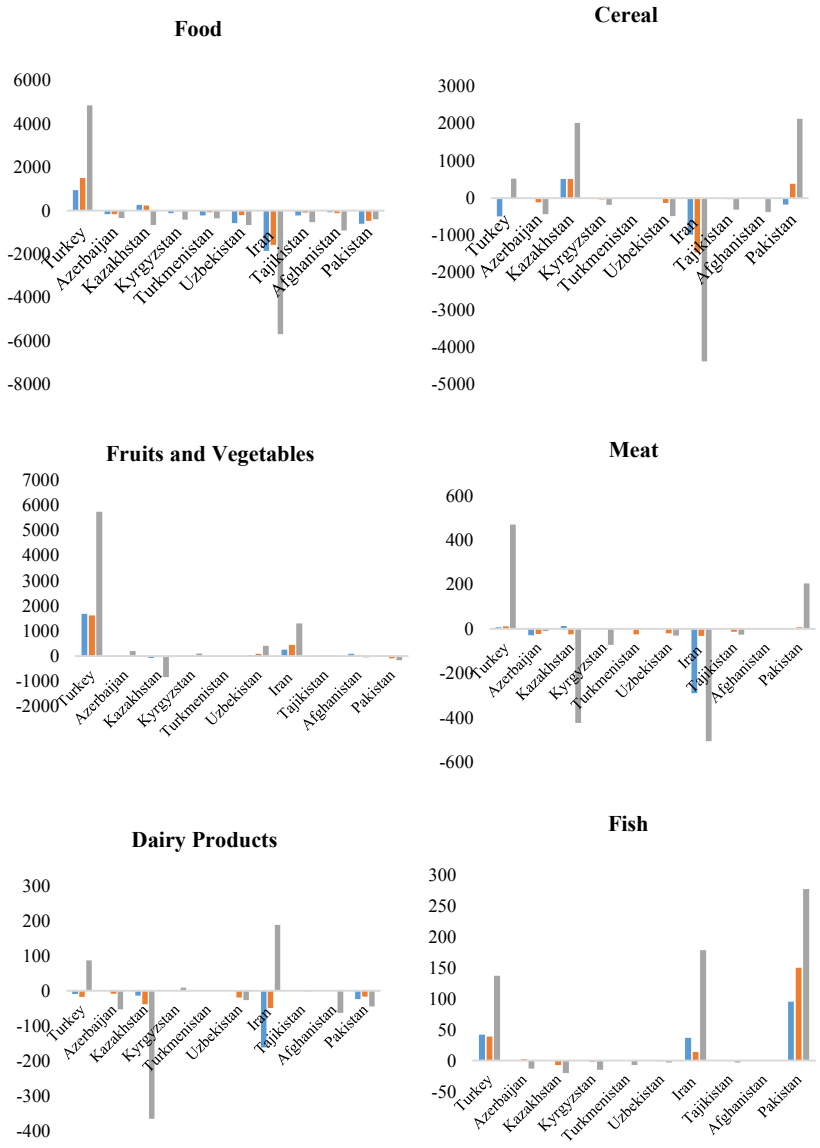
clear evidence of food independence and self-sufficiency policy with positive growth in cereal trade surplus and negative net trade in fruits and vegetable in Kazakhstan (Appendix Table A.4)

Fig. 7a. Net Trade (mln US$) for Different Food Groups across Low and High Food Deficit ECO Regions



Source: FAO Yearbook 2015, FAOSTAT.
Note: Blue and Red lines indicate average for low and high food deficit regions respectively.

Fig. 7b. Net Trade (mln US$) for Different Food Groups in ECO Regions (Country-wise)



Source: FAO Yearbook 2015, FAOSTAT.
Note: Blue, Red and Grey boxes represents estimates in years 1990, 2000 and 2014 respectively.

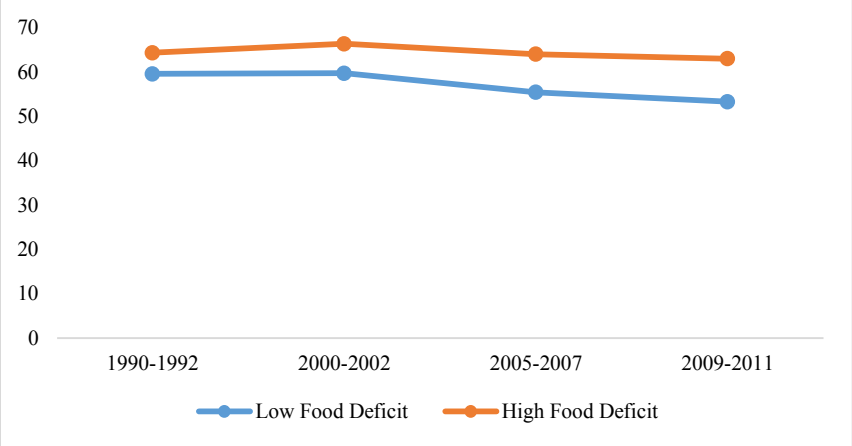
To sum-up overall in five low food deficit countries namely Turkey, Iran, Azerbaijan, Kyrgyzstan, and Uzbekistan we are seeing implementation of policy of diversification in fruits and vegetables and reliance on international markets

for cereal requirements and in one country that is Kazakhstan we are seeing a policy of self-sufficiency in cereal requirements. For Turkmenistan we do not have a clear patterns (Appendix Table A.4). While in high food deficit zone in Pakistan we see policy of self-sufficiency, while in Afghanistan contrary to their traditional focus of food independence policy we are finding evidence of dependence on global markets of cereal needs and similarly in Tajikistan.

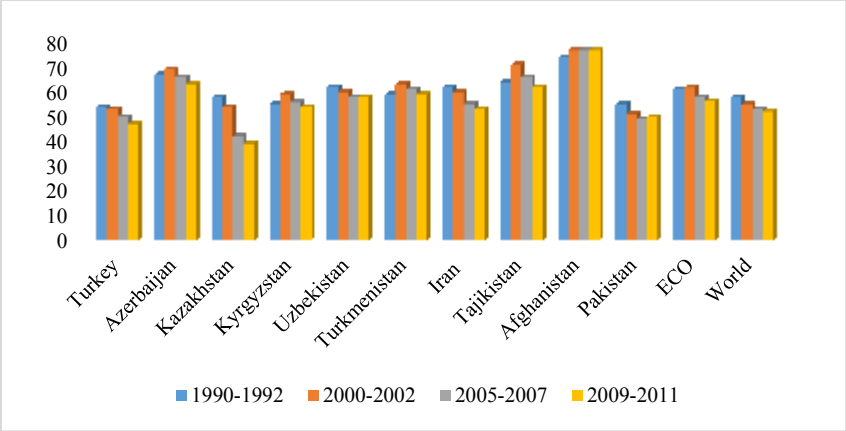
4.3. Assessment of Potential of ECO Region in Reaping Benefits Out of Increased Demand (both Local and Global) for Animal Protein

Now let us come to final point of discussion that how ECO countries are responding to changing diet preference for animal protein. Before we go into discussion of how ECO countries are responding in terms of production to higher consumer demand for animal protein products, let us briefly overview the context of diversification away from cereal, roots and tubers towards food that are rich in protein within ECO region whereby except for Afghanistan we see this pattern taking place in all ECO countries; rate of decline being much higher in countries that have met the MDG 1C (low food deficit ECO sub-region) (Figure 8). Further within ECO region, there is clear increase in supply of protein products (both animal origin or otherwise) and this increase is at much faster rate among countries which have met hunger target MDG 1c (Figure 9, figure 10).[23] This shift in demand patterns away from cereal, roots and tubers and towards protein-rich foods especially those of animal origin indicate at one level sign of growing purchasing power of customers in such economies and at other may indicative of impact of increased global demand for these products.

Fig. 8. Share of Dietary Energy Supply Derived from Cereals, Roots and Tubers in ECO Region, by Country, 1990/92-2009/11(%)

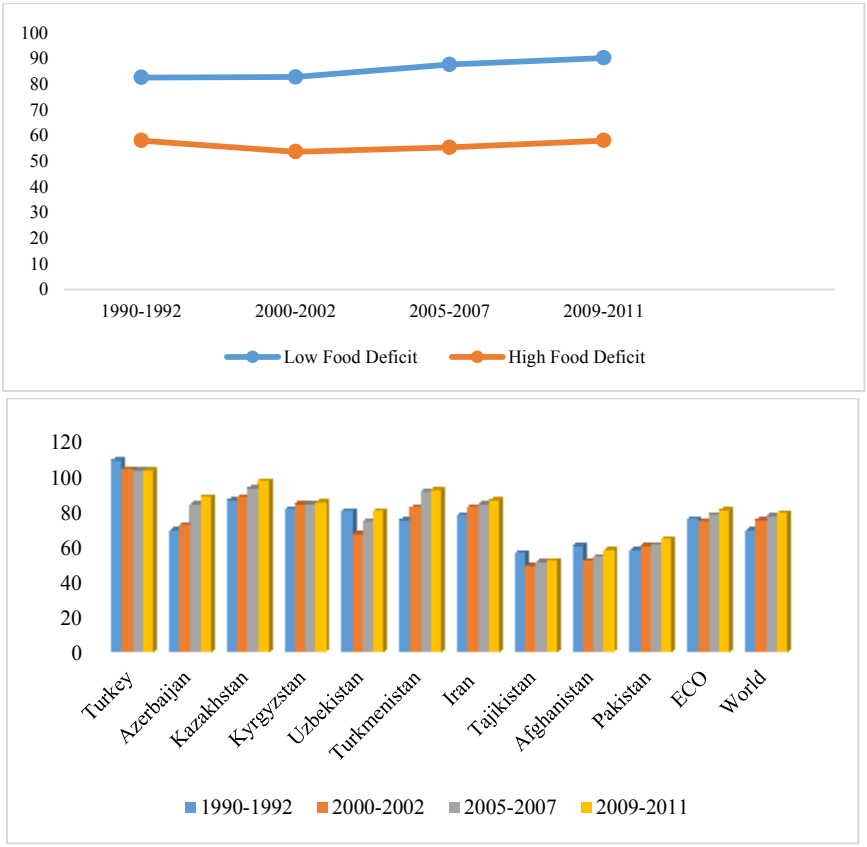


[23]Please refer to Appendix Table A.5 to find detailed estimates.



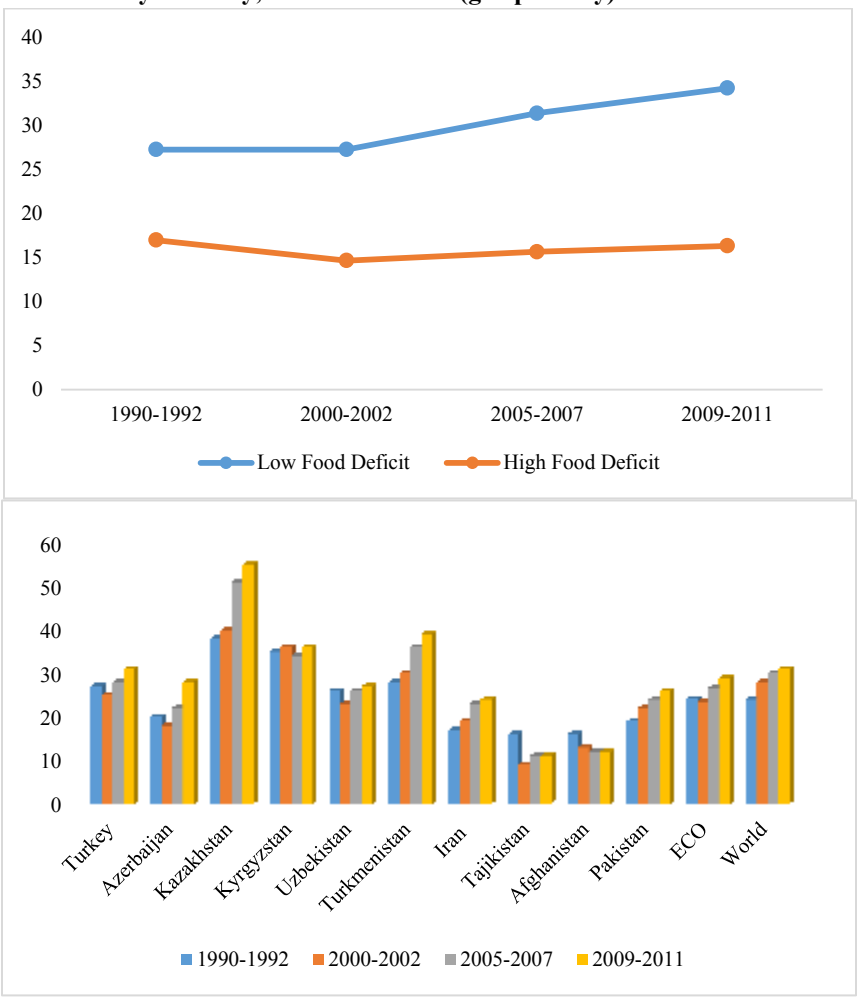
Data Source: FAOSTAT.

Fig. 9. Average Protein Supply in ECO Region, by Country, 1990/92–2009/11 (g/capita/day)



Data Source: FAOSTAT.

Fig. 10. Average Supply of Protein of Animal Origin in ECO Region, by Country, 1990/92-2009/11 (g/capita/day)



Data Source: FAOSTAT.

At aggregate level we are seeing a clear advantage of high food deficit region in meat and fish production with positive and substantial higher trade surplus in these products at all-time divisions 1990, 2000 and 2014 (Appendix Table A.4), while in trade in dairy products though both region have trade deficit but low food deficit region is documenting less in 2014 (Appendix A.4). However looking at disaggregated level, we see that among ECO region the only country that is secure is Turkey in this aspect which has trade surplus in all three categories of meat, fish and dairy products so not only it is meeting its national requirements but is also exporting to other

regions (Appendix Table A.4). After Turkey Pakistan show positive trade surplus in both fish and meat and Iran in dairy products and fish production, besides these countries all other ECO countries are dependent on food imports in these categories to meet their animal protein requirement in spite of having positive growth in their local production of meat, livestock and milk (ibid). Hence overall we can say from analysis of previous section 3.1 and patterns relating to net trade indicator that there is definitely a focus in providing more animal protein products in response to changing diet patterns, however ECO countries except for Turkey and Pakistan is yet not secure even in meeting their own local demand and hence leaving aside Turkey and Pakistan question of being a caterer to international demand for animal protein is a far-off question for remaining ECO countries.

5. CONCLUSION AND POLICY MESSAGES

As a prime policy target of how a country can be protected from plausible international price shock as that have happened in recent past in 2007-08 and 2010-11, within our discussion through evaluation of food prices (actual and forecasted values), extent of cereal important dependency and status of stock of foreign reserves we have tried to find out which countries are at risk in their food security post a price hike emerging from changes in international markets (global shocks such as due evolving global demand of cereal food and/or non-cereal food or changes in oil prices). Let us highlight key insights in this context as follows:

- *ECO Countries at Extreme Risk in Face of International Price Shock:* Within ECO region the four countries that are found to be at risk of being affected greatly by international price shocks are Tajikistan, Kyrgyzstan, Afghanistan and Pakistan.
- *ECO Countries at No Risk in Face of International Price Shock:* The two ECO countries which seem quite secure in all dimensions and not responsive to price shocks from international food are Turkey and Iran.
- *ECO Countries at Moderate Risk in Face of International Price Shock:* Remaining four ECO countries Azerbaijan, Kazakhstan, Turkmenistan, and Uzbekistan there is found evidence for some plausible risks but the extent of such possibility is observed to be much lower than that for Tajikistan, Kyrgyzstan, Afghanistan and Pakistan.

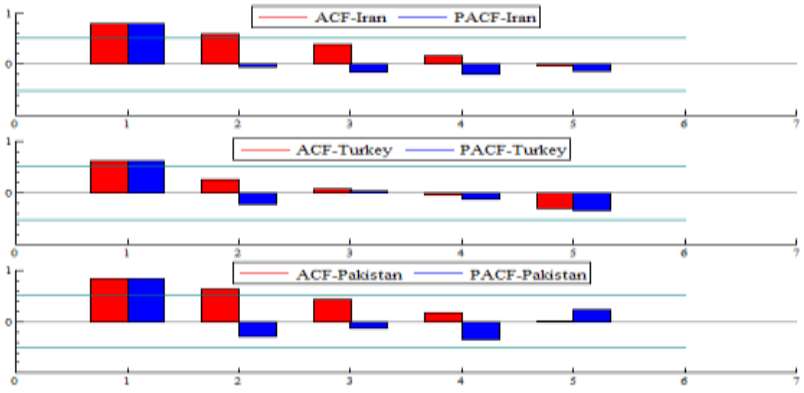
Further within our research not only an effort was made to identify in which food group an ECO country has an advantage in terms of production but through matching each country's production patterns in food groups with trade patterns for these categories, an attempt was also done so as to settle on which side of policy debate these ECO countries or ECO food groups (low or high food deficit zones) rest in terms of policy prescription of food independence

through self-sufficiency and what potential these countries have in meeting increased domestic and international demand for animal protein. Let us bring forth key policy finding from these analysis as below:

- **Snapshot of Productive Capacity of Food within ECO Region:** All ECO countries (except for few anomalies) are investing in their food base so as to secure the domestic food supply especially in terms of staple food and also non-staple food items like vegetables and fruits, roots and tubers, meat, livestock and milk products. This is evident not only in positive growth patterns post 2000 in all these food items within aggregation into low and high food deficit ECO zones and also in upward trend in these food groups within period 2000-14 for most ECO countries. Hence overall food production is growing within ECO region. However irrespective of increasing domestic productive base within each ECO country over time we find increasing trend of dependence on global markets for food items given overall trade deficits in food items are increasing overtime in most ECO countries except Pakistan where it is decreasing and Turkey where there are trade surplus in food categorisation.
- **Self-Sufficiency in Staple Food versus Diversification Policy into High-Priced Non-Staple Food Groups:** Overall in five low food deficit countries namely Turkey, Iran, Azerbaijan, Kyrgyzstan, and Uzbekistan we are seeing implementation of policy of diversification in fruits and vegetables and reliance on international markets for cereal requirements and in one country that is Kazakhstan we are seeing a policy of self-sufficiency in cereal requirements whereas for Turkmenistan we do not have a clear patterns in context of diversification and/ or food independence policy debate. While in high food deficit zone in Pakistan we see policy of self-sufficiency, while in Afghanistan contrary to their traditional focus of food independence policy we are finding evidence of dependence on global markets of cereal needs and similarly in Tajikistan.
- **Response to Increase in Domestic and International Demand for Animal Protein:** From patterns relating to production and net trade indicator for meat, fish and dairy products for each ECO country it has been found that there is definitely a focus in providing more animal protein products in response to changing diet patterns. However ECO countries except for Turkey and Pakistan are yet not secure even in meeting their own local demand and hence leaving aside Turkey and Pakistan question of being a caterer to international demand for animal protein is a far-off question for remaining ECO countries.

APPENDIX

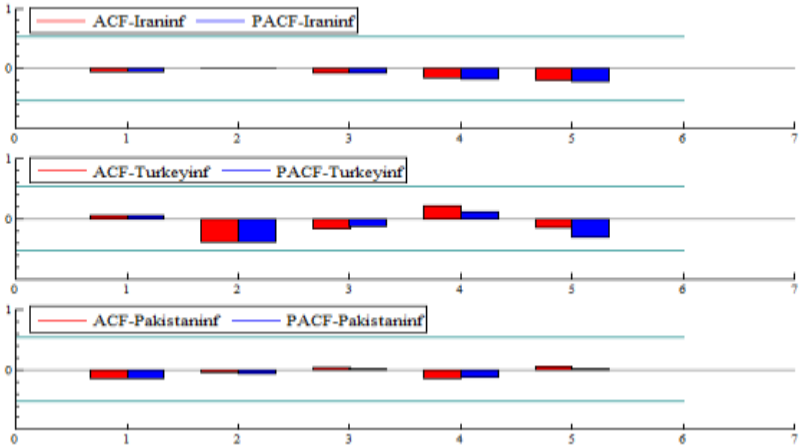
Figure A. 1 ACF and PAC for Food Price Data for Iran, Turkey and Pakistan



Source: FAOSTAT.

Note: Figure above indicates ARMA (1,1) structure for food prices of all three countries. Utilising this time series structure of ARMA (1,1) not only we were able to produce forecast for next five years 2015-2019 for Iran, Pakistan and Turkey as documented in figures 2, 3 and 4 but that of fairly good quality as indicated from close match of in sample forecast with that of patterns in actual data (Figures 2,3 and 4).

Fig. A.2. ACF and PAC for Food Inflation Data for Iran, Turkey and Pakistan



Source: FAOSTAT.

Note: Figure above indicates ARMA(0,0) structure for food Inflation of all three countries namely Iran, Turkey and Pakistan and with ACF and PAC plots that lie within 95 percent band and with indication of no serial correlation and no deviation from mean value of inflation leads to forecast out of such data structure with a constant trend for all three ECO countries (Figure 2, 3 , 4).

Table A.1: Domestic Food Prices, Annual Food Inflation and Domestic Food Price Volatility									
	Domestic Food Price index*			Annual Food Inflation (%)**			Domestic Food Price Volatility (index)*		
Year	Iran	Turkey	Pakistan	Iran	Turkey	Pakistan	Iran	Turkey	Pakistan
2000	9.44	4	6.25				15.9	19.8	8.5
2001	9.02	3.89	6.14	-4.4492	-2.75	-1.76	14.9	15.4	7.9
2002	9.15	4.01	6.13	1.44124	3.084832905	-0.16287	15.2	25.2	9.5
2003	9.26	4.13	6.12	1.20219	2.992518703	-0.16313	13.9	19.1	8.9
2004	9.05	4.04	6.26	-2.2678	-2.17917676	2.287582	9.7	15.1	6.9
2005	9.1	3.46	6.36	0.55249	-14.3564356	1.597444	23.7	33.5	13.8
2006	9.04	3.49	6.45	-0.6593	0.867052023	1.415094	13.9	13.9	8.8
2007	3.82	3.57	6.57	-57.743	2.29226361	1.860465	210.4	14.4	9.5
2008	3.92	3.59	6.86	2.6178	0.56022409	4.414003	16.8	14.4	11.5
2009	3.78	3.57	6.7	-3.5714	-0.55710306	-2.33236	18.9	13	12
2010	3.9	3.67	6.92	3.1746	2.801120448	3.283582	12.1	19	9.3
2011	4.05	3.64	7.38	3.84615	-0.81743869	6.647399	11.4	23	16
2012	4.31	3.61	7.28	6.41975	-0.82417582	-1.35501	14.1	16	9.3
2013	4.7	3.68	7.37	9.04872	1.939058172	1.236264	19.9	14.8	6.8
2014	4.47	3.79	7.14	-4.8936	2.989130435	-3.12076	13	12.9	13.2
Data Source:* FAOSTATISTICS; **Author's Calculation from Domestic Price Index									

Appendix Table A.2 : Vulnerability to International Price Shocks - Indirect Approach													
Year	Turkey	Azerbaijan	Kazakhstan	Kyrgyzstan	Turkmenistan	Uzbekistan	Iran	Tajikistan	Afghanistan	Pakistan	High Deficit	Low Deficit	ECO
	Net Food Production index (2004-06 =100)*												
1990	80	66	128	75	48	72	54	81	69	60	70	74.714286	73.3
2000	94	76	79	95	66	79	78	72	86	88	82	81	81.3
2014	130	140	125	112	124	163	113	156	120	94	123.333333	129.57143	127.7
	Growth in Net Food Production index (2004-06 =100) (%)***												
1990-00	17.5	15.151515	-38.28125	26.6666667	37.5	9.72222222	44.44	-11.11111	24.6376812	46.66667	17.1428571	8.4130019	17.2897
2000-14	38.298	84.210526	58.2278481	17.8947368	87.87878788	106.329114	44.87	116.6667	39.5348837	6.818182	50.4065041	59.964727	60.073
	Net Trade in Food (mln US $)****												
1990	938	-166	263	-129	-229	-578	-1866	-226	-75	-615	-305.33333	-252.4286	-268.3
2000	1499	-169	226	-38	-76	-218	-1580	-98	-121	-472	-230.33333	-50.85714	-104.7
2014	4854	-339	-673	-411	-364	-663	-5698	-531	-920	-397	-616	-470.5714	-514.2
	Growth in Net Trade in Food (%)****												
1990-00	59.808	1.8072289	-14.068441	-70.542636	-66.81222707	-62.283737	-15.3	-56.63717	61.3333333	-23.252	-24.563319	-79.85286	-18.597
2000-14	223.82	100.59172	-397.78761	981.578947	378.9473684	204.12844	260.6	441.8367	660.330579	-15.8898	167.438495	825.2809	283.819
	Cereal Import Dependency Ratio (%)**												
1990	-7.4	42	-17.1	32.6		63.2	22	85.4	5.7	5	32.0333333	22.55	25.7111
2000	-0.2	33.1	-48.3	8.2		15.7	40.8	45.4	29.6	-3.5	23.8333333	8.2166667	13.4222
2014	0.8	37.7	-50.6	23.4		18.2	28.7	43.7	22.1	-12.2	17.8666667	9.7	12.4222
	Growth in Cereal Import Dependency Ratio (%)****												
1990-00	-97.3	-21.19048	182.45614	-74.846626		-75.158228	85.45	-46.83841	419.298246	-170	-25.598335	-63.56245	22.4309
2000-14	-500	13.897281	4.76190476	185.365854		15.9235669	-29.7	-3.744493	-25.337838	248.5714	-25.034965	18.052738	-10.024
	Gross International Reserves (Million US$)***												
1990	13891	121	1660	134						2528	2528	3951.5	3666.8
2000	23515	680	2099	262				94		2087	1090.5	6639	4789.5
2014	127422	15549	29209	1958	32400	24140	1E+05	511	7248	9098	5619	49198.857	36124.9
*****	252.73	-56.95767	-19.144413	-94.579916	-10.31117041	-33.176286	214.8	-98.58546	-79.936277	-74.8152	-84.445632	36.190985	
	Growth in Gross International Reserves (Million US$) (%)****												
1990-00	69.282	461.98347	26.4457831	95.5223881						-17.4446	-56.863133	68.012147	127.158
2000-14	441.88	2186.6176	1291.56741	647.328244				443.617		335.9368	415.268226	641.05825	891.157
	Value of food imports over total merchandise exports (%) (3-year average)**												
1990	7	35	38	379	26	73	11	225	59	15	99.6666667	81.285714	86.8
2000	4	11	4	10	4	10	10	15	121	15	50.3333333	7.5714286	20.4
2014	6	3	4	33	2	9	9	43	296	16	118.333333	9.4285714	42.1
*****	-85.75	-92.87411	-90.498812	-21.615202	-95.24940618	-78.622328	-78.6	2.137767	603.087886	-61.9952	181.076801	-77.60434	
	Growth in Food Imports over total Merchandise Exports (%)****												
1990-00	-42.86	-68.57143	-89.473684	-97.361478	-84.61538462	-86.30137	-9.09	-93.33333	105.084746	0	-49.498328	-90.68541	-46.652
2000-14	50	-72.72727	0	230	-50	-10	-10	186.6667	144.628099	6.666667	135.099338	24.528302	47.5234
Data Source:*FAO Statistical Pocketbook World FAO 2015;*FAOSTAT;*** IMF, ADB, WDI ;****Author's cal. ;*****Proportion from regional Mean (2014 Est.)													

Table A.3: Production Indices for Different Food Groups

Year	Turkey	Azerbaijan	Kazakhstan	Kyrgyzstan	Turkmenistan	Uzbekistan	Iran	Tajikistan	Afghanistan	Pakistan	High-Deficit	Low-Deficit	ECO
	Cereal Production Index (2004-06 = 100)*												
1990	85	55	145	91	31	35	60	29	60	64	51	71.714286	65.5
2000	91	73	86	97	54	61	59	66	43	94	67.666667	74.428571	72.4
2014	109	138	134	106	52	123	103	135	142	108	128.33333	109.28571	115
	Growth in Cereal Production Index (2004-06 = 100) (%)**												
1990-00	7.0588	32.727273	-40.689655	6.593407	74.19354839	74.285714	-1.7	127.5862	-28.333333	46.875	32.679739	3.7848606	29.86
2000-14	19.78	89.041096	55.813953	9.278351	-3.703703704		74.6	104.5455	230.232558	14.8936	89.655172	46.833013	66.05
	Fruits and Vegetables Production Index (2004-06 = 100)*												
1990	72	78	39	34	46	69	52	78	81	61	73.333333	55.714286	61
2000	93	75	75	100	64	76	83	72	93	87	84	80.857143	81.8
2014	121	132	161	132	115	216	112	202	120	104	142	141.28571	141.5
	Growth in Fruits and Vegetable Production Index (2004-06 = 100) (%)**												
1990-00	29.167	-3.846154	92.307692	194.1176	39.13043478	10.144928	59.6	-7.69231	14.8148148	42.623	14.545455	45.128205	47.04
2000-14	30.108	76	114.66667	32	79.6875	184.21053	34.9	180.5556	29.0322581	19.5402	69.047619	74.734982	78.07
	Roots and Tubers Production Index (2004-06 = 100)*												
1990	98	16	84	27	17	47	55	26	75	49	50	49.142857	49.4
2000	121	47	67	83	49	76	80	54	79	100	77.666667	74.714286	75.6
2014	90	97	144	109	156	238	124	204	100	187	163.66667	136.85714	144.9
	Growth in Roots and Tubers Production Index (2004-06 = 100) (%)**												
1990-00	23.469	193.75	-20.238095	207.4074	188.2352941	61.702128	45.5	107.6923	5.33333333	104.082	55.333333	52.034884	91.69
2000-14	-25.62	106.38298	114.92537	31.3253	218.3673469	213.15789	55	277.7778	26.5822785	87	110.72961	83.173996	110.5
	Livestock Production Index (2004-06 = 100)*												
1990	83	63	155	106	46	81	53	87	71	56	71.333333	83.857143	80.1
2000	92	79	81	99	64	79	81	56	105	86	82.333333	82.142857	82.2
2014	163	166	111	113	136	166	105	164	104	81	116.33333	137.14286	130.9
	Growth in Livestock Production Index (2004-06 = 100) (%)**												
1990-00	10.843	25.396825	-47.741935	-6.603774	39.13043478	-2.469136	52.8	-35.6322	47.8873239	53.5714	15.420561	-2.044293	13.72
2000-14	77.174	110.12658	37.037037	14.14141	112.5	110.12658	29.6	192.8571	-0.952381	-5.81395	41.295547	66.956522	67.68
	Meat Production Index (2004-06 = 100)*												
1990	85	57	182	119	49	79	53	81	84	68	77.666667	89.142857	85.7
2000	93	76	84	105	70	79	79	53	109	85	82.333333	83.714286	83.3
2014	174	189	113	107	150	157	108	161	101	145	135.66667	142.57143	140.5
	Growth in Meat Production Index (2004-06 = 100) (%)**												
1990-00	9.4118	33.333333	-53.846154	-11.76471	42.85714286	0	49.1	-34.5679	29.7619048	25	6.0085837	-6.089744	8.924
2000-14	87.097	148.68421	34.52381	1.904762	114.2857143	98.734177	36.7	203.7736	-7.3394495	70.5882	64.777328	70.307167	78.9
	Milk Production Index (2004-06 = 100)*												
1990	87	63	117	79	41	80	56	91	50	50	63.666667	74.714286	71.4
2000	87	82	79	93	57	79	83	59	98	86	81	80	80.3
2014	162	145	104	118	126	173	105	159	108	51	106	133.28571	125.1
	Growth in Milk Production Index (2004-06 = 100) (%)**												
1990-00	0	30.15873	-32.478632	17.72152	39.02439024	-1.25	48.2	-35.1648	96	72	27.225131	7.0745698	23.42
2000-14	86.207	76.829268	31.64557	26.88172	121.0526316	118.98734	26.5	169.4915	10.2040816	-40.6977	30.864198	66.607143	62.71
	Fish Production Index (2004-06 = 100)*												
1990	62	526	257	3021	299	547	51	1811	97	85	664.33333	680.42857	675.6
2000	94	239	111	254	82	183	81	118	90	112	106.66667	149.14286	136.4
2014	98	14	105	755	100	223	169	737	141	111	329.66667	209.14286	245.3
	Growth in Fish Production Index (2004-06 = 100) (%)**												
1990-00	51.613	-54.56274	-56.809339	-91.59219	-72.57525084	-66.54479	58.8	-93.4843	-7.2164948	31.7647	-83.943803	-78.08104	-30.1
2000-14	4.2553	-94.14226	-5.4054054	197.2441	21.95121951	21.857923	109	524.5763	56.6666667	-0.89286	209.0625	40.229885	83.48
	Vegetable Oil Production Index (2004-06 = 100)*												
1990	78	102	41	16	125	113	45	112	87	61	86.666667	74.285714	78
2000	103	50	45	64	117	83	56	68	87	77	77.333333	74	75
2014	122	68	281	63	63	90	105	93	95	93	93.666667	113.14286	107.3
	Growth in Vegetable oil Production Index (2004-06 = 100) (%)**												
1990-00	32.051	-50.98039	9.7560976	300	-6.4	-26.54867	24.4	-39.2857	0	26.2295	-10.769231	-0.384615	26.93
2000-14	18.447	36	524.44444	-1.5625	-46.15384615	8.4337349	87.5	36.76471	9.1954023	20.7792	21.12069	52.895753	69.38
	Sugar Production Index (2004-06 = 100)*												
1990	97	17	241	57			51		94	74	84	92.6	90.14
2000	131	54	78	117	99		63		65	96	80.5	90.333333	87.88
2014	115	216	19	51	103		92		180	131	155.5	99.333333	113.4
	Growth in Sugar Production Index (2004-06 = 100) (%)**												
1990-00	35.052	217.64706	-67.634855	105.2632			23.5		-30.851064	29.7297	-4.1666667	-2.447804	44.68
2000-14	-12.21	300	-75.641026	-56.41026	4.04040404		46		176.923077	36.4583	93.167702	9.9630996	52.4

Data Source: *FAO Statistical Pocketbook World food and agriculture 2015; **Author's Calculation

Table A.4: Net Trade (mln US$) for Different Food Groups in ECO Regions

	Turkey	Azerbaijan	Kazakhstan	Kyrgyzstan	Turkmenistan	Uzbekistan	Iran	Tajikistan	Afghanistan	Pakistan	High-Deficit	Low-Deficit	ECO
Cereal Net Trade (mln US$)*													
1990	-497		514				-981			-176	-176	-321.33333	-285
2000	-17	-116	511	-35		-135	-1465	-33		385	176	-209.5	-113.1
2014	519	-432	2019	-185		-483	-4387	-316	-372	2125	479	-491.5	-168
Growth in Cereal Net Trade (mln US$) (%)**													
	Turkey	Azerbaijan	Kazakhstan	Kyrgyzstan	Turkmenistan	Uzbekistan	Iran	Tajikistan	Afghanistan	Pakistan	ood Deficit	ood Deficit (	ECO
1990-00	-96.58		-0.583658				49.34			-318.75	-200	-34.802905	-91.64
2000-14	-3153	272.4138	295.10763	428.5714		257.77778	199.5	857.5758		451.948	172.15909	134.606205	-65.02
Fruits and Vegetables Net Trade (mln US$)*													
1990	1682	13	-70	1	-15	38	262	7	89	4	33.333333	273	201.1
2000	1625	14	-9	7	-5	96	452	25	31	-86	-10	311.428571	215
2014	5738	206	-840	106	-13	412	1305	26	-42	-163	-59.66667	987.714286	673.5
Growth in Fruits and Vegetables Net Trade (mln US$) (%)**													
1990-00	-3.389	7.692308	-87.14286	600	-66.6666667	152.63158	72.52	257.1429	-65.168539	-2250	-130	14.0763998	-138.2
2000-14	253.1	1371.429	9233.3333	1414.286	160	329.16667	188.7	4	-235.48387	89.5349	496.66667	217.155963	1280.8
Meat Net Trade (mln US$)*													
1990	7	-30	12				-290			0	0	-75.25	-60.2
2000	11	-24	-25	-2	-25	-21	-33	-14		6	-4	-17	-14.11
2014	469	-10	-424	-73		-31	-506	-26		204	89	-13.8	-49.63
Growth in Meat Net Trade (mln US$) (%)**													
1990-00	57.14	-20	-308.3333				-88.6					-77.408638	-89.95
2000-14	4164	-58.33333	1596	3550	-100	47.619048	1433	85.71429		3300	-2325	-18.823529	1557.6
Fish Net Trade (mln US$)*													
1990	42						37			95	39.5	95	58
2000	39	2	-7	-2	0	-1	14	0		150	6.4285714	150	21.667
2014	137	-13	-20	-15	-7	-3	178	-3	0	277	36.714286	91.3333333	53.1
Growth in Fish Net Trade (mln US$) (%)**													
1990-00	-7.143						-62.2			57.8947	0.5025126	-83.725136	-1.268
2000-14	251.3	-750	185.71429	650		200	1171			84.6667	0.7	471.111111	256.16
Dairy Products Net Trade (mln US$)*													
1990	-9		-14				-161			-24	-24	-61.333333	-52
2000	-17	-8	-38	1	0	-19	-49			-16	-16	-18.571429	-18.25
2014	87	-53	-365	9		-26	188	-2	-63	-45	-36.66667	-26.666667	-30
Growth in Dairy Products Net Trade (mln US$)(%)**													
1990-00	88.89		171.42857				-69.6			-33.333	-33.33333	-69.720497	39.355
2000-14	-611.8	562.5	860.52632	800		36.842105	-484			181.25	129.16667	43.5897436	192.24

Data Source: *FAO Statistical Pocketbook World food and agriculture 2015; **Author's Calculation

Table A.5: Diversification away from Cereal, Roots and Tubers towards Food Rich in Protein

	Turkey	Azerbaija	Kazakhsta	Kyrgyzsta	Uzbekista	Turkmeni	Tajikistan	Afghanist	Pakistan	Iran	Low Food	High Food	ECO	World
Share of dietary energy supply derived from cereals, roots and tubers (%) (3-year average)*														
1990-1992	54	67	58	55	62	59	64	74	55	62	59.57143	64.33333	61	58
2000-2002	53	69	54	59	60	63	71	77	51	60	59.71429	66.33333	61.7	55
2005-2007	50	66	42	56	58	61	66	77	49	55	55.42857	64	58	53
2009-2011	47	63	39	54	58	59	62	77	50	53	53.28571	63	56.2	52
Growth in Share of dietary energy supply derived from cereals, roots and tubers (%)**														
1991 to 20	-1.85185	2.985075	-6.89655	7.272727	-3.22581	6.779661	10.9375	4.054054	-7.27273	-3.22581	0.239808	3.108808	1.147541	-5.17241
2001 to 20	-11.3208	-8.69565	-27.7778	-8.47458	-3.33333	-6.34921	-12.6761	0	-1.96078	-11.6667	-10.7656	-5.02513	-8.9141	-5.45455
Average protein supply (g/capita/day) (3-year average)*														
		Azerbaija	Kazakhsta	Kyrgyzsta	Uzebekist	Turkmeni	Tajikistan	Afghanist	Pakistan	Iran	Low Food	High Food	ECO	World
1990-1992	109	69	86	81	80	75	56	60	58	78	82.57143	58	75.2	69
2000-2002	104	72	88	84	67	82	49	52	60	82	82.71429	53.66667	74	75
2005-2007	103	84	93	84	74	91	51	54	61	84	87.57143	55.33333	77.9	77
2009-2011	103	88	97	85	80	92	52	58	64	86	90.14286	58	80.5	79
Growth in Average protein supply (%)**														
1991 to 20	-4.58716	4.347826	2.325581	3.703704	-16.25	9.333333	-12.5	-13.3333	3.448276	5.128205	0.17301	-7.47126	-1.59574	8.695652
2001 to 20	-0.96154	22.22222	10.22727	1.190476	19.40299	12.19512	6.122449	11.53846	6.666667	4.878049	8.981002	8.074534	8.783784	5.333333
Average supply of protein of animal origin (g/capita/day) (3-year average)*														
1990-1992	27	20	38	35	26	28	16	16	19	17	27.28571	17	24.2	24
2000-2002	25	18	40	36	23	30	9	13	22	19	27.28571	14.66667	23.5	28
2005-2007	28	22	51	34	26	36	11	12	24	23	31.42857	15.66667	26.7	30
2009-2011	31	28	55	36	27	39	11	12	26	24	34.28571	16.33333	28.9	31
Growth in Average supply of protein of animal origin (%)**														
1991 to 20	-7.40741	-10	5.263158	2.857143	-11.5385	7.142857	-43.75	-18.75	15.78947	11.76471	0	-13.7255	-2.89256	16.66667
2001 to 20	24	55.55556	37.5	0	17.3913	30	22.22222	-7.69231	18.18182	26.31579	25.65445	11.36364	22.97872	10.71429

Data Source: *FAOSTAT;Author's Calculation; 1991 to 2001 refers to time period 1990-02 to 2000-02 and 2001-2019 refers to time period 2000-02 to 2009-11**

REFERENCES

Akramov, Kamiljon T. and Ganga Shreedhar (2012) Economic Development, External Shocks, and Food Security in Tajikistan. Washington, D.C.: International Food Policy Research Institute (IFPRI). (IFPRI Discussion Paper 1163). http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/126810

Asian Development Bank (2003) *Rebuilding Afghanistan's Agriculture Sector*. Manila: ADB.

Food and Agriculture Organisation of the United Nations (FAO) (2015) *The State of Food Insecurity in the World*. Rome. Retrieved from http://www.fao.org/3/a-i4646e.pdf

Food and Agriculture Organisation of the United Nations (FAO) (2015) *Regional Overview of Food Insecurity Europe and Central Asia*. Retrieved from http://www.fao.org/3/a-i4649e.pdf

International Monetary Fund (2012) *Global Food Price Inflation and Policy Responses in Central Asia*. Retrieved from http://www.elibrary.imf.org/abstract/IMF001/12703-9781475502497/12703-9781475502497/12703-9781475502497.xml?rskey=lIn6zd&result=1

Harris, R. Lee (2001) A Computable General Equilibrium Analysis of Mexico's Agricultural Policy Reforms. International Food Policy Research Institute (IFPRI), Washington, DC, USA. (Trade and Macroeconomics Discussion Paper No. 65).

Joshi, P. K. A. Gulati and R. Cummings Jr. (eds.) (2007) *Agricultural Diversification and Smallholders in South Asia*. Academic Foundation.

Kazakhstan's Food Security Law (2005) Grain Law 2009, Strategy KZ-2050, address by the President, 14.12.2012.

Kyrgyzstan: Food Security Law, No 175, 30.07.2009; National Strategy of Kyrgyzstan on Sustainable Development up to 2017, Food Security Strategy of Kyrgyzstan up to 2017.

Löfgren, H., O. Chulu, O. Sichinga, F. Simtowe, H. Tchale, R. Tseka, and P. Wobst (2001) External Shocks and Domestic Poverty Alleviation: Simulations with a CGE Model of Malawi. International Food Policy Research Institute (IFPRI), Washington, DC, USA. (Trade and Macroeconomics Discussion Paper No. 71).

Löfgren, H., M. El-Said, and S. Robinson (2002) Trade Liberalisation and the Poor: A Dynamic Rural-Urban General Equilibrium Analysis of Morocco. pp. 129-146 in eds. Sébastien Dessus, Raed Safadi, and Julia Devlin. Towards Arab and Euro-Med Regional Integration. Paris. OECD.

Pain, A. and S. M. Shah (2009) *Policymaking in Agriculture and Rural Development in Afghanistan*. Retrieved from https://areu.org.af/wp-content/uploads/2016/01/912E-ARD-Policy-Process-CS-print.pdf.pdf

Qureshi, S. K., M. G. Qureshi, and E. Ghani (2007) Agricultural Diversification in Pakistan: Status and Opportunities. In P. K. Joshi, Ashok Gulati, and Ralph Cummings Jr. (eds.) *Agricultural Diversification and Smallholders in South Asia, Academic Foundation* (2007) pp. 297-31.

Tajikistan: Food Security Program, doc. #72, 02.02.2009, The Law on Food Security Law on FS, # 192, 13.10.2012, The Concept On Agrarian Policy, 31.12.2008.