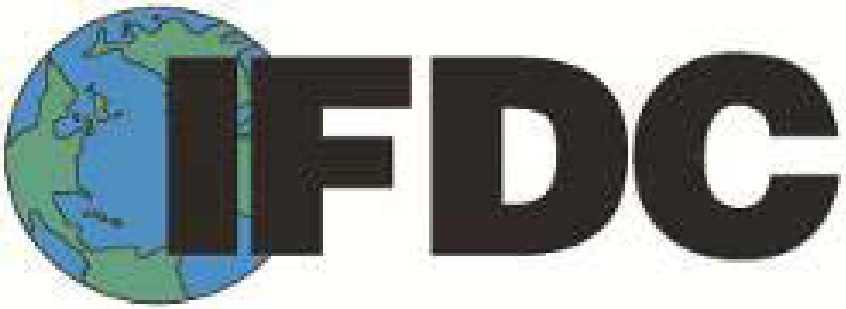
ASSESSMENT OF FERTILIZER CONSUMPTION AND USE BY CROP IN ETHIOPIA



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ASSESSMENT OF FERTILIZER CONSUMPTION AND USE BY CROP IN ETHIOPIA

1. Introduction

Agriculture, characterized mainly by smallholder farmers is the dominant economic activity of the country. The agricultural sector in Ethiopia is the principal engine of growth of the economy accounting for 83% of the labor force, 90% of exports and 45% of gross domestic product (GDP). Agriculture also provides about 70% of the country's raw material requirement for large-and medium scale industries (MoA, 2009). Ethiopia became one of the fastest growing economies in world over the past decade and agriculture has played a major role. Recognizing the immense growth potential of agriculture and its role in the transformation of the country's economy, the Government of Ethiopia set forth the Agricultural Development Led Industrialization (ADLI) strategy in 1993. The purpose of ADLI was to bring about a structural transformation in the productivity of smallholder farmers, in order to catalyze a robust industrial sector by maximizing the country's natural and human resources. The basis of the agricultural development strategy of the Government was therefore transforming the agriculture sector from subsistence, low input low output orientation into high input, high output, market orientated, production system.

Agricultural Development Led Industrialization (ADLI) being a central pillar of economic policy, different strategies, each having a five year lifetime, were implemented in the last 15 years. Between 2000/01 and 2004/05, the Sustainable Development and Poverty Reduction Program (SDPRP), 2005/06 - 2009/10 the Plan for Accelerated and Sustained Development to End Poverty (PASDEP) and the first Growth and Transformation Plan (GTP I) between 2010/11 to 2014/15. All of these strategies have had a set of clear objectives and targets and have recognized agriculture as the heart of the Ethiopian economy and set objectives that aim to boost agricultural production, strengthen agricultural research, and facilitate stronger market linkages. GTP I focused on accelerating growth in production of traditional crops through promoting the adoption of improved technologies by smallholder farmers and by increasing investment in rural infrastructure. The government has successfully achieved most of the GTPI targets in the sectors. Based on experience and lessons learned from the previous years, the second GTP period for the next five years started

this year and accelerated growth in agricultural productivity continues to be an important area of focus. More emphasis will be given to high-value crops and livestock production complemented by the establishment of a market system that benefits farmers and non-farm rural actors, maintaining environmental sustainability, promoting climate change adaptation and mitigation etc being an underlying principle.

The Ethiopian government considered the Agriculture sector as critical sector so as to realize growth in the other sectors such as industrial and manufacturing. As a result, the government has consistently invested at least 10% of government spending to agriculture since 2003. This strong support has resulted in an average growth rate of over 7% per year in the sector, which has contributed a lot to the double digit annual growth rate of the overall economy.

The agricultural sector in Ethiopia is currently composed of 12.6 million smallholder farmers (who operate on farms averaging 1.2 hectares each) and several hundred commercial farms. The combined annual crop production of these two groups of farms is 31 million tons, with 71% of this output comprised of grains (cereals, pulses, and oil crops); the remainder being vegetables, fruits, and cash crops (mainly coffee, sugarcane, chat, and *enset*). Growth in the sector has been near 8 percent in recent years and in value terms the combined output of the agricultural sector is now worth an estimated Birr 221 billion ($13 billion) according to the latest GDP statistics(Access Capital Research,2012).

There are many constraints that hamper agricultural productivity in Ethiopia. Among the key factors, soil fertility depletion is one. Ethiopian soils have been subjected to severe degradation caused by natural and man-made factors. The use of chemical fertilizer and improved seeds is quite limited despite Government efforts to encourage the adoption of modern, intensive agricultural practices. Smallholder farmers still use lower fertilizer application rates compared with their counterparts in east Africa. Urea and DAP (di-ammonium phosphate) are the only fertilizer sources that have been in use for the past four decades in Ethiopia. This is based on the fact that nitrogen and phosphorus, in that order, are the most limiting nutrients in its soils. Previous findings from FAO assisted fertilizer demonstration trials carried out in the country in the seventies through the Freedom from Hunger Campaign showed the importance of the two nutrients; at the time, results

from these trials showed that response to other nutrients was not consistent or significant. Thus, until recently, use of other nutrients was not practiced. On the other hand, there are reports that indicate sharp increases in yield due to application of potassium, Sulfur and Zinc in different parts of the country. As a result, the country has started using fertilizers which can supply the deficient nutrients and will continue to use in the form of blends.

2. Sources of Data

Data on fertilizer consumption and use can be obtained from different sources. The following are some of the potential data sources.

Table 1: Institutions used as data source and the type of data obtained

Source Institution	Data type	Methods used to collect data
MoANR	Agricultural policies, Fertilizer consumption trend	• Experts interview • Reports
CSA	Fertilizer utilization, Area and production	• Annual reports • Website
ATA	Soil information and fertilizer type recommendations	• Annual reports • Website
AISE	Fertilizer imports, distributions, carryovers	• Experts interview
Research	Fertilizer rate recommendations by locations	• Experts interview • Reports
FCUs	Annual sale of fertilizer to member farmers and carryovers	• Annual reports
Farmers	Actual fertilizer use by crop, rate applied per crop, reasons for applying or not applying, problems related to fertilizer access etc,	• Interviews

3. SWOT Analysis

Data on type of crops cultivated, area planted, amount of different inputs used etc are collected and compiled by the Central Statistics Agency (CSA) and by the Ministry of Agriculture and Natural Resources (MoANR) annually. The following SWOT analysis is based on the data obtained from these sources.

Table 2: SWOT analysis based on the data obtained from different sources

Data Source	**Strength**	**Weakness**	**Opportunity**	**Treat**
CSA	Data is updated annually	Sample size is not good enough to portray the true picture of events on the ground	Partner with MoA extension agents to collect better data	High costs associated with improving data collection processes.
	Reliable compared to other sources	Some data lack important details like amount per nutrient bases,	Better communication and road infrastructures to collect data timely	
MoANR	Data is updated annually	The capacity of DAs are not up to the standard the work requires	Presence of 60,000+ DAs to collect data	Collection and compilation is time taking
	Data collected from grass root level		Better communication and road infrastructures to collect data timely	

Data Source	Strength	Weakness	Opportunity	Treat
			Partner with CSA and other organizations to collect data	
ATA	Data helps to know soil fertility status and fertilizer needs of different woredas	Institutional survey is not sufficient enough to indicate the exact story on the ground	Partner with MoA , Research and CSA for a better data collection , compilation and analysis	Long chain of bureaucracy in MoA and CSA make the data collection time consuming
	Fertilizer recommendation by type could be available			
Research	Data is updated annually based on research findings	Sample size is not good enough to address the issue on the ground	Partner with ATA, MoA and CSA for a better data collection , compilation and analysis	Lack of well trained personnel on the ground makes the timely data collection difficult
	Data available from representative agro ecologies	Recommendations are not location, soil and crop specific and relatively older	Government focus	
AISE	Data on fertilizer importation is readily available	Doesn't have its own data collection channel	Partners with MoA, CSA and FCUs to access data	Cooperatives do not provide data timely

4. Estimates of Real Fertilizer Consumption (RFC) and Fertilizer Use by Crop (FUBC) data

4.1 Trends on Fertilizer import and distribution system

The entire required fertilizer amount is imported annually. The Agricultural Inputs Supply Enterprise (AISE) is responsible for the import and distribution of fertilizers to farmers directly and through primary farmers' cooperatives and cooperative unions. AISE imports the fertilizer through Djibouti port, discharges the cargo at the port, and delivers the product directly to the cooperative union warehouses if they are ready or stores in its 33 warehouses located in different parts of the country to be transferred later to the cooperatives.

The quantity of fertilizer to be distributed to woredas is pre-determined according to a plan aggregated from woreda to Federal level. Farmers, or the cooperatives on their behalf, take delivery from AISE warehouses. Cooperatives' role in most cases is limited to physical facilitation involving no advance purchase, storage and working capital investment. The 10,000+ primary cooperatives and 180+ farmers' cooperative unions (Bezabih and Mengistu ,2011) in the country play an important part in facilitating the redistribution of fertilizers from AISE to farmer members. Farmers wishing to purchase fertilizer on cash or credit terms go to the nearby cooperatives and buy the quantity of fertilizer they need.

Ethiopia has moved from partial liberalization in 1990s, to exclusive marketing through farmers' organizations, since 2008. As a result, private sectors, endowments and farmers' cooperative unions (FCUs) have been involved in the fertilizer import between 1996 and 2007. Private sectors were the first sectors engaged in fertilizer import in 1996 followed by holdings that involved a year later. Farmers' cooperative unions joined the import business in 2005/06 and stayed for three years. The 2007/08 season then became the end of the involvement of other sectors and AISE became the sole importer again. North Africa, East Europe and Russia are the main sources of fertilizers imported which offer advantages of short voyage time and distributed deliveries in lots of 12,500 - 60,000 tones. There is no major constraint of truck availability from the port to the central warehouse (AISE, 2014). This will be facilitated further when the Ethio-Djibouti railway

starts in a year time, which is expected to shorten the 4-5 days transportation by trucks to about 10 hours.

Concerning the adoption and use of new fertilizers, the MoANR and the Agricultural Transformation Agency have jointly introduced new fertilizer sources through demonstrations on farmers' fields with the aim of testing their performance as well as creating awareness to farmers. By doing so, they were able to demonstrate new fertilizer sources that has nutrients in addition to N and P to more than 40, 000 farmers plots in four major crops(maize, tef, wheat and barley) and in four major regions (Amhara, Oromiya, Tigray and SNNPR) where the majority of the fertilizer is consumed in Ethiopia. As a result, the DAP is gradually being replaced by NPS (sulfur containing DAP) for the time being and tailored blends will be produced based on the soil fertility condition of the different woredas using the already established and the to be established fertilizer blending facilities, which are owned and run by the FCUs. The FCUs receive the ingredients for the blends from AISE as they used to for the straight fertilizers.

4.2 Demand assessment

An important decision that AISE must make every year is to make demand forecasts in order to meet the anticipated demand from farmers. These estimates begin at the kebele level by development agents (DAs), then aggregated to woreda, zonal, regional and national levels in order for AISE to initiate procurement(Fig 1). This process is coordinated and aggregated nationally by the Input Supply and Marketing Directorate of MoANR. This demand assessment is very rigid in that it does not consider changes in conditions during the planting season. For instance, the farmer who planned to plant maize will shift it to other crops either because there is not enough rain, fertilizer or improved seed is not supplied timely etc.

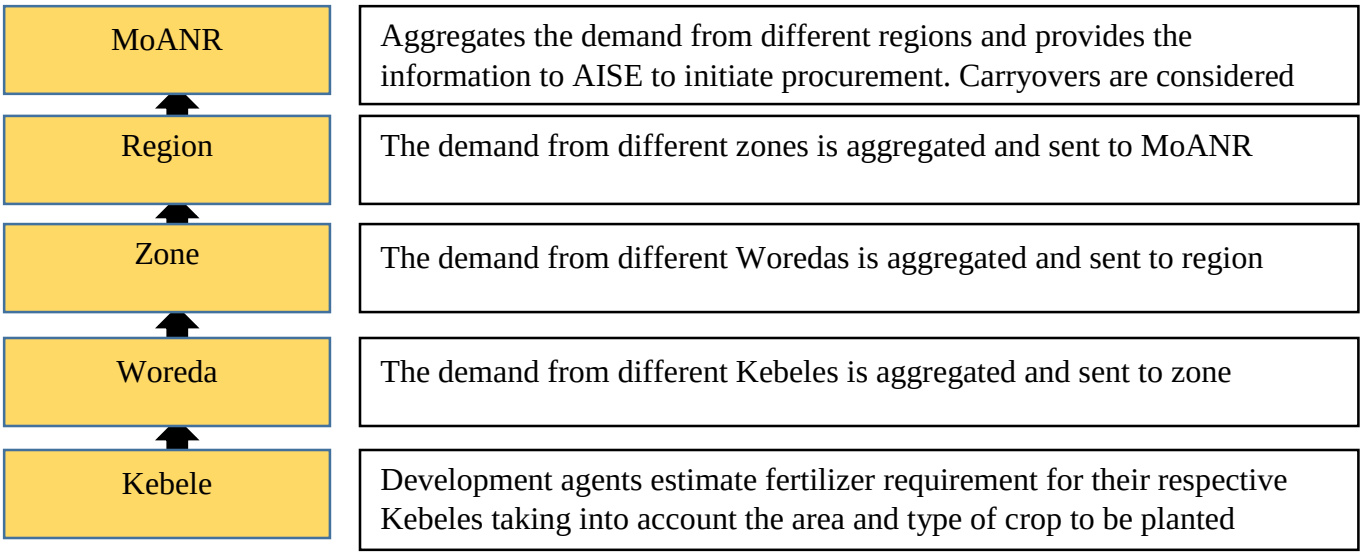

Figure 1 : The Process (steps) of fertilizer demand estimation in Ethiopia

Source: Author, based on information collected from MoANR.

Actors	Demand Assessment	Procurement	Import and Transportation	Marketing and Distribution
Governmental	Kebele, Woreda, Zone, RBoAs & MoANR	MoANR, MoFED & National Bank of Ethiopia		Regional Governments
Parastatals		AISE *(Supplier)*	Ethiopian Shipping & Logistics Services Enterprise	
Financial Institutions		Commercial Bank of Ethiopia *(Financier)*		
Cooperatives				FCUs and primary coops (Last mile distributors)

Figure 2: diagram showing the different actors and their roles in the fertilizer value chain from demand assessment to distribution

Source: Author, based on information from MoANR and AISE

4.3 The Fertilizer Consumption

Until 2013, urea and DAP (di-ammonium phosphate) fertilizers have been the only fertilizer sources that have been in use in the Ethiopian agriculture for more than four decades. None of these are locally produced and should be supplied by imports to meet the demand. From Figure 1 it can be seen that N and P consumption steadily increased from 1980 /81 to 2014/15. Mean fertilizer consumption in Ethiopia has risen from 132,522 MT (1995/96) to 858,825 MT (2014/15) period. Even though the amount of fertilizer imported increases every year, Ethiopian farmers still lag far behind other developing countries in fertilizer use. The average intensity of fertilizer use in the country (which is roughly less than 40 kilograms per hectare) remains much lower than elsewhere (e.g., 54 kg/ha in Latin America, 80 kg/ha in South Asia, and 87 kg/ha in Southeast Asia). Going by the recommended usage dosages of N, and P for different crops, tef, wheat, maize and barley are the main consumers of fertilizers.

As the above data suggest, the major source of fertilizer sales in Ethiopia are urea and DAP since 1960s and there has been no change in composition of the use of fertilizers in Ethiopian agriculture until 2014/15 cropping season. The average share of urea in total use of fertilizers remains much lower than DAP; accounting for 15% of the total use of fertilizer in 1980-1999 while it was 35% between 2000-2015. The scenario fairly suggests that there was no much effort to improve the fertilizer use in the country that has a variable agro-ecology and soil conditions. The unbalanced use of fertilizer in the sense of soil fertility (which is assessed according to the gap between recommended dose and type of fertilizer and its actual use in fields) became evident in recent years. The significant gap between the recommended dose and actual amount of fertilizer given to land is very high in case of urea. Due to unbalanced use of fertilizer; the loss in soil fertility is also significant in Ethiopia.

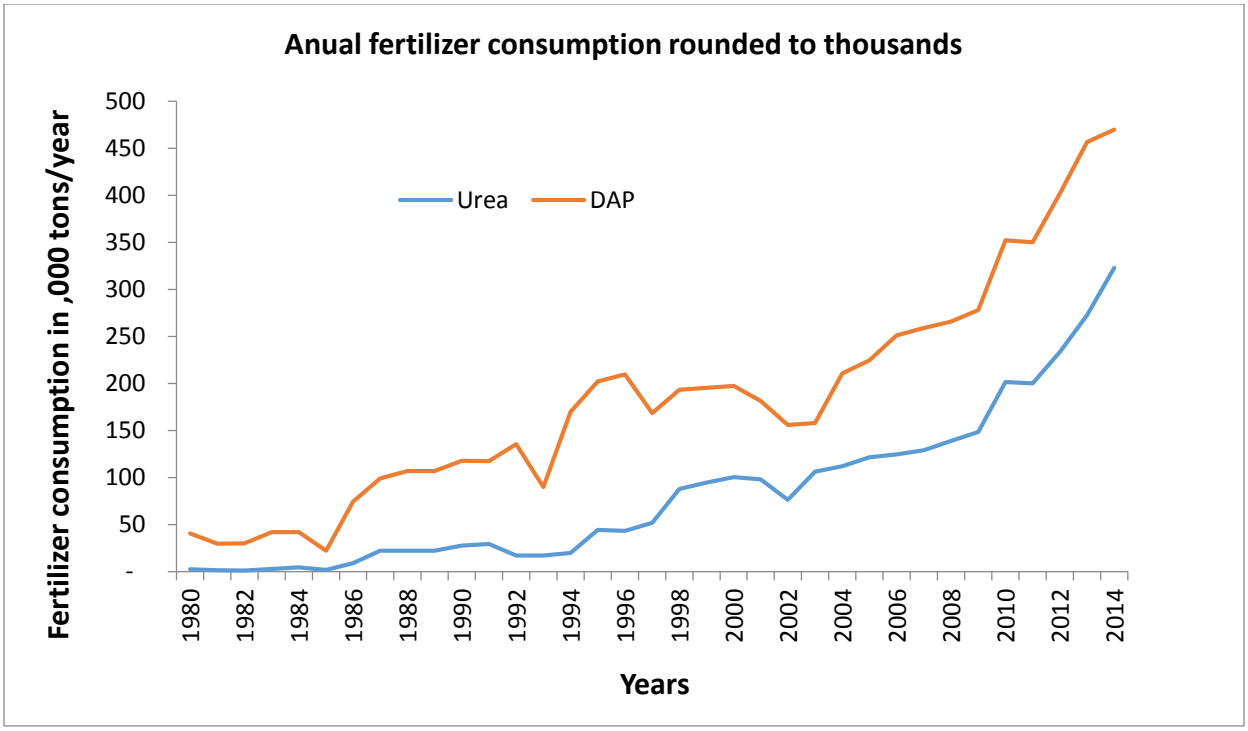

Figure 3: Fertilizer consumption in the last 34 years– amount rounded to thousand tones

These aggregate trends mask great variability in fertilizer use trends across the different regions of Ethiopia. Table 3 shows fertilizer use trends for the 10 regions in Ethiopia broken down for three periods from 2010 to 2015.

Table 3: National Fertilizer consumption (MT) trends during the past five years aggregated by type

Fertilizer type	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2014/15**	**2015/16**
Urea	201,576	200,345	233,526	272,625	322,930	290,080
DAP	352,309	350,234	401,817	456,618	469,793	64,440
NPS(19-38-0+7S)	-	-	-	-	66,102	194,172
NPS (17.7- 35.5-0 + 7.6S + 2.2Zn	-	-	-	-	-	50,000
NPS (18.9- 37.7-0 + 6.95S+ 0.1B	-	-	-	-	-	200,000
Total	**553,885**	**550,579**	**635,343**	**729,244**	**858,825**	**798,691**

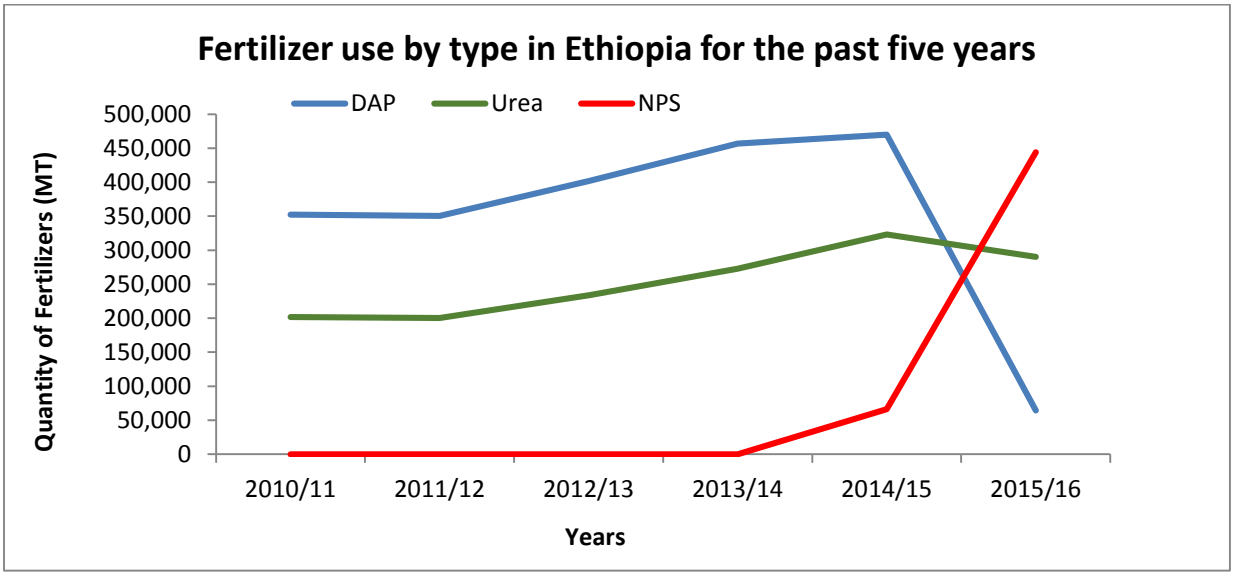

Figure 4: Type and amount of fertilizers used from 2010/11- 2015/16

The above data shows that DAP is being gradually substituted by NPS in the past two years to meet the sulfur demand of most of Ethiopian soils. The future direction of the country is to locally produce tailored blends recommended based on soil fertility mapping and crop response information that are being generated through collaborative efforts among regional and federal research, Ministry of Agriculture , the Agricultural Transformation Agency and other partners.

Table 4: Average fertilizer consumption trends by regions during the past five years

Region	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	% share
Oromiya	205,874	188,666	255,136	279,300	291,368.2	289,423	36.59
Amhara	198,535	201,570	228,226	244,181	296,756.7	308,343	35.81
SNNP	81,376	96,077	66,065	114,901	166,413.1	116,548	15.54
Tigray	29,270	35,226	51,620	58,014	61,373.9	47,670	6.86
Hareri	0	0	0	0	0	0	0.00
B/Gumuz	393	0	0	0	0	0	0.01
Gambella	400	0	0	0	0	0	0.01
Somali	443	0	0	0	0	0	0.01
Others	37,594	29,040	34,297	32,848	42,913	36,707	5.17
Total	**553,885**	**550,579**	**635,343**	**729,244**	**858,825**	**798,691**	**100.00**

***SNNP**: Southern Nations, Nationalities and Peoples

Given the large variability of the size and the farming system of the different regions of Ethiopia, different regions have different consumption trend. Of the 11 regions including city administrations, the four major regions (Oromiya, Amhara, SNNP and Tigray) consumed on average more than 94.80% of the fertilizer in Ethiopia. From the four regions again, consumption is in the order of Oromiya > Amhara > SNNP > Tigray and the percentage share of these regions is 36.6%, 35.8%, 15.5% and 6.9 % respectively.

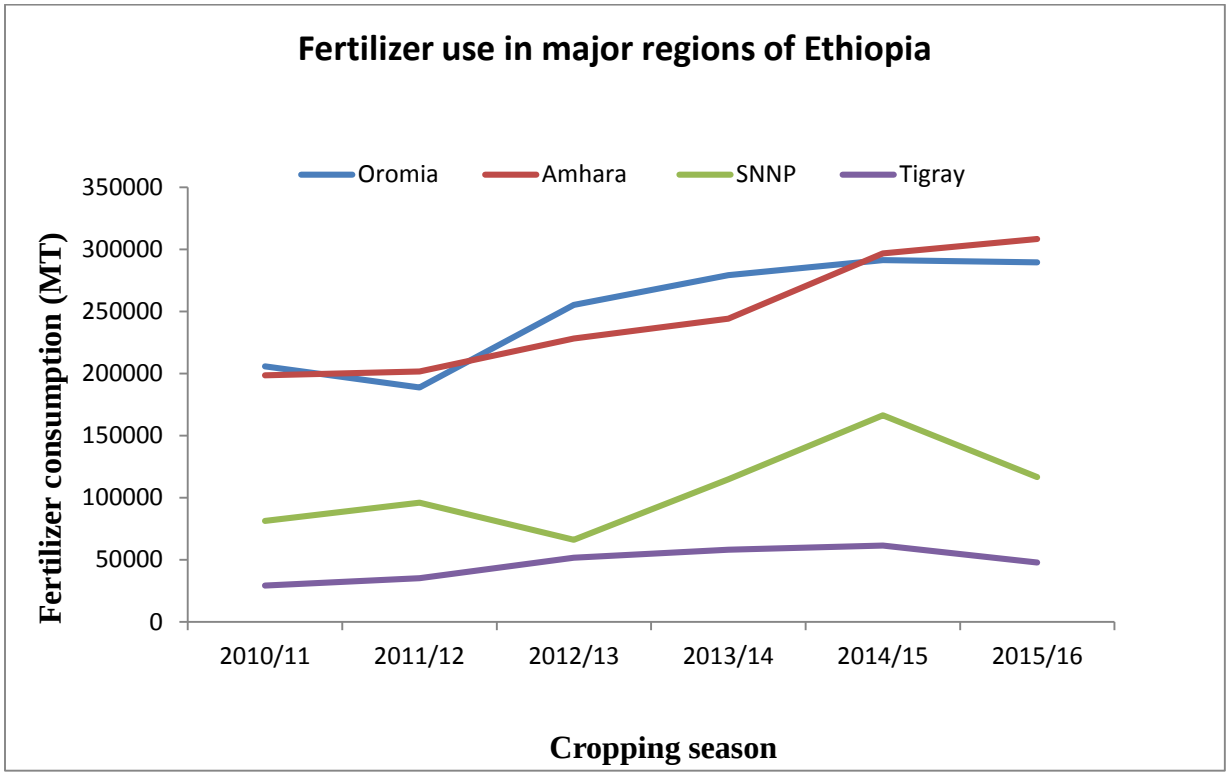

Figure 5: Fertilizer use in major regions of Ethiopia from 2010-2015 cropping seasons

4.4 Fertilizer use by crop

The majority of the fertilizer is used for production of cereals, mainly applied to tef, maize, wheat, barley and sorghum in that order. According to CSA estimates, about 90 percent of fertilizers are applied to these three major cereal crops (CSA, various years). Fertilizer use is concentrated on cereals followed by pulses and oil seeds respectively (CSA various years). During 2014/15 cropping seasons the national level amount of both urea and DAP fertilizers applied in cereals, pulses and oil seeds were 769,940.9, 29,555.5 and11,371.1 tons, respectively (CSA 2014). Tef is

the crop with the largest share in fertilizer use among the cereals (32 %), followed by maize and wheat with respective shares of 29% and 25% in the period 2010/11 and 2014/15 (Table 6). The application rate for fertilizers is increasing from year to year. For instance, in 2014/15, the application rate per hectare of cultivated land was 177 kg/ha for maize, 147 kg/ha for wheat and 110 kg/ha for tef (Table 6). These statistics indicate that the national level intensity of fertilizer use is still lower than the blanket recommended rate of 200 kg per ha (100 kg of each urea and DAP for small cereals) and 200 kg urea and 100 Kg DAP for maize, which in itself is also small. Besides this, farmers tend to use more DAP than urea (Fig.4) when they apply them alone. This indicates that farmers are not applying both the right type and right amount of fertilizers.

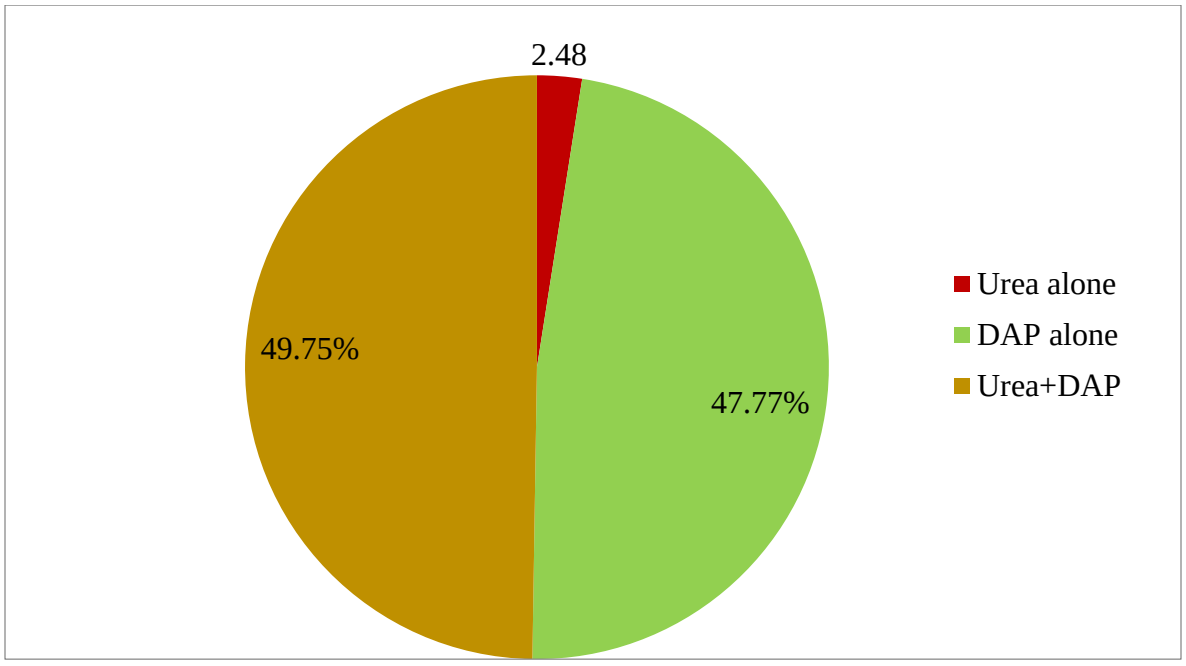

Figure 6: percentage share of urea and DAP fertilizers applied alone and combined

Table 5: Area planted (ha) , production and yield in quintals for major crops in Ethiopia from 2010/11-2014/15 cropping seasons*

Crop	Area in 000, Ha					Production in 000, Quintals**					Productivity(quintals/ha)		
	2010/11	2011/12	2012/13	2013/14	2014/15	2010/11	2011/12	2012/13	2013/14	2014/15	2012/13	2013/14	2014/15
Cereals	9691	9589	9,601.04	9,848.75	10152.02	177613	188100	196511.5	215835.2	236076.6			
Tef	2,761	2,731	2,730.27	3,016.52	3,016.063	34835	34977	37652.41	44186.42	47506.57	13.79	14.65	15.75
Barley	1,047	948	1,018.75	1,019.48	993.9387	17033	15853	17816.52	19082.62	19533.85	17.49	18.72	19.65
Wheat	1,553	1,437	1,627.65	1,605.65	1,663.846	28557	29163	34347.06	39251.74	42315.89	21.1	24.45	25.43
Maize	1,963	2,055	2,013.04	1,994.81	2,114.876	49861	60694	61583.18	64915.4	72349.55	30.59	32.54	34.31
Sorghum	1,898	1,924	1,711.49	1,677.49	1,834.651	39599	39513	36042.62	38288.7	43391.34	21.06	22.83	23.69
Finger millet	408	433	431.51	454.66	453.9094	6348	6519	7422.971	8489.564	9153.145	17.2	18.67	20.17
Oats	31	31	26.51	35.62	27.89964	476	495	436.3378	616.5026	508.0593	16.46	17.31	18.21
Rice	30	31	41.81	33.82	46.83221	904	886	1210.416	923.6273	1318.219	28.95	27.31	28.16
Pulses	1358	1617	1,863.45	1,742.60	1558.422	19532	23162	27510.31	28588.81	26718.34			
Faba beans	459	458	574.06	538.46	443.1079	6978	7148	9439.642	9917.003	8389.439	16.44	18.42	18.93
Field peas	204	213	255.97	275.39	230.6672	2570	2633	3273.775	3798.131	3426.368	12.79	13.79	14.85
Haricot beans	237	332	559.97	2719.71	323.3273	3403	3878	4630.085	1987.778	5137.249	12.62	14.15	15.92
Chick-peas	208	231	239.51	229.72	239.7553	3228	4002	4097.332	4238.148	4586.823	17.11	18.45	19.13
Lentils	77	110	123.72	125.83	98.86915	810	1280	1514.999	1591.212	1373.542	12.25	12.65	13.89
Oilseeds	775	881	818.45	816.13	855.7629	6340	7309	7266.644	7112.592	7600.993			
Vegetables	127	160	192.56	161.49	139.7172	6756	7557	8523.083	7228.937	5954.004			
Fruit Crops	55	61	61.97	71.51	90.07083	4863	5393	4793.361	4991.838	7066.486			
Chat	205	180	173.84	222.08	249.358	2031	1807	1830.613	2450.629	2758.345			
Coffee	499	516	528.75	538.47	561.7618	3706	3768	3739.406	3920.062	4199.802			
Hops	22	23	22.94	24.73	28.38697	281	289	289.5303	305.8763	372.7314			
Sugar Cane	23	22	22.39	29.10	30.17697	11878	10336	10398.66	14034.44	15612.35			

*Season refers to the major crop producing months starting from May – December each year. Crops like maize are planted on May while other cereals, pulses and oilseeds on June and July depending on the location.

**1 quintal= 100 Kg; 10 quintals= 1 ton

Table 6: Amount of area Fertilized in thousand hectares

Crop	Total Area cultivated in 000, Ha					Area fertilized in 000, Ha				
	2010/11	2011/12	2012/13	2013/14	2014/15	2010/11	2011/12	2012/13	2013/14	2014/15
Cereals	**9691**	**9589**	**9,601.04**	**9,848.75**	**10152.02**	**4464.5**	**4465.9**	**5133.6**	**8085.3**	**5923.2**
Tef	2761	2731	2,730.27	3,016.52	3016.063	1754.4	1781.2	1946.3	3240.4	2,278.1
Barley	1047	948	1,018.75	1,019.48	993.9387	404.6	368.4	440.0	588.1	472.0
Wheat	1553	1437	1,627.65	1,605.65	1663.846	1074.9	1024.3	1228.0	1886.9	1,299.6
Maize	1963	2055	2,013.04	1,994.81	2114.876	849.8	869.4	975.6	1704.5	1,256.8
Sorghum	1898	1924	1,711.49	1,677.49	1834.651	158.9	172.6	262.2	310.6	292.5
Finger millet	408	433	431.51	454.66	453.9094	206.7	232.3	262.0	320.9	288.4
Oats	31	31	26.51	35.62	27.89964	10.7	10.6	10.4	20.3	9.8
Rice	30	31	41.81	33.82	46.83221	3.1	3.9	4.6	11.7	25.1
Pulses	**1358**	**1617**	**1,863.45**	**1,742.60**	**1558.422**	**170.9**	**216.7**	**275.4**	**310.9**	**290.0**
Faba beans	459	458	574.06	538.46	443.1079	65.3	74.3	106.6	121.2	94.0
Field peas	204	213	255.97	275.39	230.6672	37.7	42.4	53.9	69.9	58.8
Haricot beans	237	332	559.97	2719.71	323.3273	54.5	73.7	78.2	79.8	98.1
Chick-peas	208	231	239.51	229.72	239.7553	3.3	4.7	5.8	10.3	8.3
Lentils	77	110	123.72	125.83	98.86915	6.3	8.7	13.4	15.8	14.6
Oilseeds	**775**	**881**	**818.45**	**816.13**	**855.7629**	**35.3**	**72.2**	**101.4**	**112.4**	**126.6**
Vegetables	**127**	**160**	**192.56**	**161.49**	**139.7172**	**51.8**	**67.7**	**98.3**	**109.7**	**74.9**
Root Crops	**55**	**61**	**61.97**	**71.51**	**90.07083**	**46.3**	**56.6**	**66.8**	**91.1**	**71.1**

4.5 Shift from NP to Multi- nutrient application

One major problem that Ethiopia faced pertinent to the agricultural soils was the lack of soil fertility database and absence of area and crop specific fertilizer recommendation. It has not been possible to delineate the key soil fertility limitations and nutrient shortages that impact on crop yield in the country. Lack of such knowledge was taken as a key obstacle in realizing the first Growth and Transformation Plan of doubling agricultural production by the end of the five-year plan period (2015). In order to tackle this problem, the Ministry of Agriculture has designed a two-way approach. The first one was conducting soil and plant nutrient survey in prioritized areas in order to determine the key soil nutrient limitations. The other approach was to import different blended fertilizers and micro-nutrients from abroad and test them against the two commonly used fertilizers (Urea and DAP) for their impact on crop yield in different areas and crops. The results from both of these initiatives showed deficiency of 3- 6 nutrients in most parts of the country and crops responded to the application of additional nutrient. As a result, in 2013/14 cropping season about 142,000 mt of new fertilizer sources were imported and distributed to farmers in woredas where both soil test results and fertilizer demonstration results proved their importance. These two initiatives lead to the development of local fertilizer blending facilities that produce blended fertilizers so as to provide the appropriate fertilizer sources to the different soils and crops of the country. Five blending facilities are built and Ethiopian farmers have therefore started use of tailored fertilizer sources since 2015.

The Ethiopian Soil information system (EthioSIS) has completed soil fertility mapping for Tigray region and is due to complete for the other three major regions by June 2016. When this work is completed, it will show what nutrients are lacking from Ethiopian soils and also develop a fertilizer recommendations for the different woredas based on the soil fertility mapping results. The already established fertilizer blending facilities will therefore produce tailored blends(NPSB, NPSZnB, NPKSZnB etc) for the different woredas based on demand/requests from woredas or from member cooperatives. Currently there are five fertilizer blending facilities in the four major regions, 2 in Oromiya and 1 each in Tigray, Amhara and SNNPR. Each facility has a capacity of producing at least 100,000 MT per season but there is a possibility of producing more if need arises. Some areas will also be addressed by NPS compound fertilizer.

5. How to deal with gaps/missing data

As mentioned above, the development agents (DAs) are responsible for assessing demand of fertilizer each year at Kebele level. But their involvement during actual fertilizer use assessment is limited. Mostly it is not easy to know how much of the fertilizers a farmer buys are used to each crop? Which crop is a priority for the farmer to receive the fertilizer if the farmer is to choose etc? Besides, the same farmer may not apply similar amounts of fertilizers per hectare every year based on the price of the fertilizers, types of crops he is planting etc. Demands of farmers often change over the changing condition that calls for demand re-vision during planning phase based on the dynamic condition of farmers‟ situation. Establishing a system that (i) ensures quality, (ii) is cost-effective, (iii) is understood by farmers, and (iv) is sufficiently flexible to support and accommodate a growing and diversifying fertilizer sector is required. The change in demand has also implication on fertilizer use. Therefore developing a clear model and involving the existing more than 60,000 field level Development Agents (DAs) and cooperatives on assessing consumption data and use it as complement to data collected from around 2200 CSA enumeration sites could help to get close to accurate data about fertilizer use in the country.

6. Cost effective ways to collecting RFC & FUBC data in the context of Ethiopia.

As mentioned above, demand assessment is made by DAs at Kebele level. This assessment is based on area of land and interviewing the farmer on the type of crop he plans to grow. On the contrary, consumption is estimated by calculating the fertilizer sold by the area planted. The consumption data is collected by the CSA mainly from around 2200 enumeration sites.

There are different models that can be used to estimate consumption of fertilizers. But they are mostly “theoretical” for small holder farmers like Ethiopia whose fertilizer use is affected by different factors, both internal and external. Therefore, consumption shall best be estimated through expert judgment taking the average (medium case) scenarios on potential demand i.e. targeted demand (e.g. GTP targets and regional production targets), previous consumptions, timely

distribution of fertilizer and seed inputs and the weather condition in the areas. Therefore, it is worth considering the following points to make estimation:

- Fertilizer consumption is increasing every year,
- The GoE has already set the ambitious GTP2 targets and there will not be any major policy change in the next five years,
- There will not be much change in cultivated area
- Road infrastructures are improved,
- Farmers' awareness about fertilizer use is increasing. So they will tend to use more rates of fertilizers in the coming years
- Soil test based recommendations are being developed and used,
- Local fertilizer blending plants have already been functional
- Use of mobile input tracking systems and agro dealers are being tried in selected areas. These systems are expected to play a major role when they are fully functional soon.

Table 7: Estimated fertilizer amount in the next five years

	Year				
Fertilizer type	**2016/17**	**2017/18**	**2018/19**	**2019/20**	**2020/21**
Urea	319,088	333,592	348,096	362,600	377,104
Blends	559,473	584,904	610,334	635,765	661,196
Total	878,561	918,496	958,430	998,365	1,038,300

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Appendices

Actors and their share in fertilizer import during 1989-2015