

Revealed Comparative Advantage of Select Agricultural Products of Ethiopian States

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Abstract

The study is done to examine the revealed comparative advantages of Ethiopian States in nine select agricultural crops production using Balassa's index (1965). The analysis is done based on the 2017 raw data collected from Central Statistical Agency of Ethiopia. It is uncovered that Tigray State has the highest revealed comparative advantage in millet, barley, wheat, and teff; Amhara State also has the highest revealed comparative advantage in vetch/grass peas, lentils, chick peas, and horse beans. In addition, it is disclosed that Benshangul Gumuz has the highest revealed comparative advantage in maize production. Considering the RCA indices strength as proxies for a community's utilization of the crop linked with the community's cultural background and historical feeding habit, and if historical feeding habit is also considered as an indication of the origin from where the crop has evolved first in Ethiopia, the origin of barley, millet, teff, and wheat would be in Tigray; maize in Benshangul Gumuz; and chick peas, horse beans, vetch/grass peas and lentils would be in Amhara State.

Key words: *Revealed comparative advantage, competitiveness gap, Ethiopian States, Agricultural Products.*

JEL Classification: F10, F11, F14

Introduction

One of the useful tools of economics that helps to compare the relative costs of production and identify products, sectors, and markets that have greater opportunity of success is the comparative advantage analysis.

Even though the great contribution and influence of various trade theories, it has been a challenge to apply practically according to the theoretical concept in empirical studies. Despite these challenges, there are some methods considered and widely applied that attempt to examine the comparative advantages of nations. Of these, the revealed comparative advantage developed by

Balassa (1965) is one. The indices of revealed comparative advantage (RCA) basically use post-trade data for each of the relevant variables the model specifies. The concept of revealed comparative advantage is used to present the pattern of comparative advantage using the computed results over time.

The concept of revealed comparative advantage has been introduced by Liesner (1958). Later the concept is refined by Balassa (1965), which is widely used to examine and identify the export products of countries that have revealed comparative advantage. Balassa's index is further enhanced through conceptual framework developed by Hillman (1980), expressed in the form of necessary and sufficient conditions. It is stated that an increase in a country's exports of specified commodity results in an increase in the concomitant Balassa index, if and only if the Hillman condition is met (Hinloopena and Marrewijk, 2008).

Research findings and reports indicate that agriculture contributes significantly on African economies. It is uncovered that the 23 percent of the annual economic growth of Africa is attributed to farming (World Bank, 2013). Even in the case of export, significantly higher share of its earnings is from agricultural commodities.

The objective of this research paper is to determine the RCA of the agricultural products among the States of Ethiopia. The study aims to examine the advantages in the select agricultural products the States have using the RCA model developed by Balassa index (1965). The findings of this study will be of paramount importance for concerned States of the country, concerned authorities, investors, the public and scholars. Furthermore, it may contribute its part to the existing stock of knowledge and serve as a reference material for researchers in similar area.

Literature Review

Owing to the fact that developing countries have lower opportunity cost, they have revealed comparative advantage over developed countries in silk cotton, vegetable fibers and man-made fiber/filaments. Conversely, developed countries are found to have higher revealed comparative advantage over developing countries in wool, animal hair, horsehair, yarn and fabric thereof. Moreover, it is uncovered that the gap in the revealed comparative advantage between the two regions is expected to widen in the future. (Abteu et al., 2017)

It is revealed that Ethiopia ranks eighth in the world in terms of the size of livestock which amounts to a total of 102,000 followed by USA with a total of 101,082 livestock as per the data recorded for the year 2012. Specifically, Ethiopia ranks sixth in the world for cattle population, seventh for goats and tenth for sheep. The overall population of the livestock puts Ethiopia among the top ten producers of the specified animals in the world. In fact, the two largest livestock producers in Africa are Nigeria and Ethiopia (Coppeaux et al, 2016).

Besides, the study done by Coppeaux et al (2016) showed that despite the large quantity of livestock Ethiopia is endowed with, several factors have prevented Ethiopia from becoming competitive in the international leather and leather products market. Some of these barriers that prevented to use its natural comparative advantage towards competitiveness include lack of

institutional entity able and willing to modernize the agricultural organization, location of Ethiopia makes high the transport time and costs, and the relatively weak institutional situation of the country adds high transaction costs. The study also suggested that to make the Ethiopian leather industry competitive in the future it has to go through deeper transformations in the country, including a modernized agriculture.

Ndayitwayeko et al. (2014) disclosed that East African Community (EAC) countries had revealed comparative advantage in the export of coffee with Uganda and Kenya taking the lead during the period considered in their studies. In spite of this situation EAC countries have faced a decline in their global competitiveness. It is also suggested that to overcome the global competitiveness challenge EAC countries should strengthen their position that enables them defend the coffee price volatility.

A study is done on the revealed comparative advantage of the footwear sector in select African countries that include Ethiopia, Egypt, Kenya, Nigeria, Tanzania and Uganda during 2003-14 using Balassa's index. It is found that significant variation exists on the pattern of each country's revealed comparative advantage. It is revealed that Kenya stands stronger than Ethiopia and Uganda, while Egypt, Nigeria and Tanzania do not have revealed comparative advantage in footwear sector (Abteu, 2017).

Obadi (2016) has made a sectoral revealed comparative advantage and competitiveness analyses of EU-28 and the USA using Balassa's index. It is uncovered that in the global level USA has higher revealed comparative advantage in greater number of groups of commodities (40 groups of commodities in SITC two digits) than the EU-28 which has higher revealed comparative advantage in lesser number of groups of commodities (32 groups of commodities in SITC two digits).

Comparative advantage assessments are basically done to reveal the opportunities of a country or region on products, sectors, and markets that result due to various factors such as factor endowment, favourable trade policies, etc. One of these approaches that helps to examine comparative advantages is examination of the specialization of a country or a region. A country or region that specializes in a good or service implies that country or region is able to produce the good or service relatively efficiently and cheaply than others. Assessments on revealing comparative advantages can be done using either trade or production data as long as it has the ability to assess the specialization of the country/region. When we compare each approach, "trade data" based comparative advantage analysis is more straightforward than "production data" based comparative advantage. This is for the reason that countries face similar market condition in the case of international trade but the domestic market conditions could be significantly different among each country. Besides, while trade specialization reflects the export performance of the country on the specified products, production specialization reveals the general information on the relative importance of the products for growth and development of the country/region Leung and Cai (2005).

Methodology of the study

The study has adopted the concept of comparative advantage of Balassa as adapted to one country classified into States. In fact, the revealed comparative advantage is highly applied to examine and compare a country's commodity or sector's export advantage with other countries' exports. The concept of comparative advantage is applied for comparison of a country's performance vis-à-vis other countries as it has intrinsic assumption that a country's export is consistent and directly associated with an economy's relative factor endowment and productivity. However, it has an intrinsic limitation that it does not distinguish the changes in productivity are the results of factor endowments or changes in trade policies of a country.

In the absence of trade data to examine revealed comparative advantages of countries, researcher use production data as proxy data. Studies done by Cai et al. (2005) examined the RCAs of Asian, Latin American, and Sub-Saharan countries in the farming of three major freshwater aquaculture species (i.e., carp, catfish, and tilapia). Their study's main purpose was to systematically assess the specialization pattern of these regions on the select agricultural products.

Given due consideration to the intrinsic advantages and limitations of the concept of comparative advantage, this study has applied it as adapted to the production of select agricultural products across Ethiopia in general and in the States in particular. Therefore, the comparison is analogous to the comparison actually done when Balassa's concept is used to compare comparative advantage of a country with other countries in the world.

As discussed in above, as long as the method expresses the relative specialization, a country's comparative advantage can be examined using either trade data or production data. In this particular study the focus is not to examine the trade specialization of the States of Ethiopia but to examine the specialization they have which can serve as a base for trade among each States of the country or highlights for policy intervention on the bases of specialization.

Production data is the base for this assessment; hence the "production" comparative advantage would be different from the conventional "trade" comparative advantage revealed by trade specialization patterns. Obviously, the main difference between the production data and trade data based analysis is that a country's production serves both domestic and foreign markets.

Here, in this study by applying the formula adapted to the Ethiopian context, comparison on the revealed comparative advantage of the States of Ethiopia on select agricultural products is done accordingly. The formula used to undergo the comparative analysis defined and described as shown below.

Conceptual Framework of the Study

The commonly used tool of measuring suggested by Balassa (1965), revealed comparative index, is adopted in this study to investigate the revealed comparative advantage of Ethiopian States. Basically, the model is constructed to enable examine the status of these States with respect to their comparative advantage in relation to the production of select agricultural products. The RCA method adopted in this particular study enabled the examination of the magnitude of each State's comparative advantage on the select agricultural products. The results of the analyses indicate the

potential for economic integration among Ethiopian States and a base for future emphasis for policy makers.

In addition, a benefit can be drawn from the model as it indicates the potential for trading, complementarity and competitiveness among the Ethiopian States on select agricultural products and for export of these items. The production of these select agricultural products include various factors intensities that include land intensity, labour intensity, capital and technology intensity and knowledge intensity. The formula adopted, based on Balassa's definition, to compute the respective RCA of the Ethiopian States, specifically used for this study is defined as given below.

$$RCA = \left[\frac{\left(\frac{X_{ij}}{\sum_i X_{ij}} \right)}{\left(\frac{\sum_j X_{ij}}{\sum_j \sum_i X_{ij}} \right)} \right]$$

Where,

- X_{ij} denotes production of select agricultural product "i" of a State (Ethiopian State) "j",
- $\sum_i X_{ij}$ denotes total production of State "j",
- $\sum_j X_{ij}$ denotes "Ethiopia's production of select agricultural product "i", (sum of Ethiopian States production of select agricultural product "i"),
- $\sum_j \sum_i X_{ij}$ denotes total "Ethiopia's production" of all select agricultural products.

To evaluate the gap of competitiveness among the Ethiopian States, the difference of the RCAs of the State which scored highest and the rest of Ethiopian States is considered. This enables to evaluate the magnitude of the strength of each of the State's revealed comparative advantage when compared against the State that scored highest in RCA values in each of the select agricultural products. To capture the differential values the following equation is specified.

$$RDRCA (\text{SSH and OES}) = RCA_{\text{SSH}} - RCA_{\text{OES}}$$

Where,

- RDRCA refers to the revealed difference in the RCA of the State that scored highest in RCA values and each of the other Ethiopian States
- SSH refers to State that scored highest in RCA values, and
- OES refers to each of the other Ethiopian States that scored lower than the State that scored highest

The expanded form of the equation specified above is shown as given below.

$$RDRCA = \left[\frac{\left(\frac{X_{ij}}{\sum_i X_{ij}} \right)}{\left(\frac{\sum_j X_{ij}}{\sum_j \sum_i X_{ij}} \right)} \right]_{\text{SSH}} - \left[\frac{\left(\frac{X_{ij}}{\sum_i X_{ij}} \right)}{\left(\frac{\sum_j X_{ij}}{\sum_j \sum_i X_{ij}} \right)} \right]_{\text{OES}}$$

Revealed comparative advantage is widely applied concept as it focuses determining the relative productivity differences among countries of internationally traded goods. As described in above,

in this study, the revealed comparative advantage is considered to describe the relative productivity differences among Ethiopian States in the select agricultural products. The larger the relative productivity differences, the higher the gains from trade could happen among the States. Despite undisputable advantages the theory of comparative advantage have, it is not free of limitations. The theory of comparative advantage does not account changes that result from suitable agricultural policy implementation, upgrading of factor endowments in the regions/countries considered, and historical background and attachment of the community towards each of the select agricultural products. Thus the established production and productivity pattern of Ethiopian States can change whenever significant changes happen on agricultural policies, community's historical attachment towards the select agricultural products and others that affect the sources of comparative advantage. Kowalski (2011) identifies physical capital, quality of education and average time to complete, energy supply, availability of finance and credit, and governance quality as determinants of a country's comparative advantage. Similarly, such factors can have significant impact on the State's future comparative advantages on the select agricultural product.

Finding and Analysis

The computed revealed comparative advantages of Ethiopian States is shown in the table given below.

Table-1: Revealed Comparative Advantage (RCA) of the Production of Barley of Ethiopian States in 2017.

Rank	Ethiopian States	RCA index
1	Tigray	3.0278
2	Amhara	1.7772
3	Oromia	0.9524
4	S.N.N.P.	0.5635
5	Somale	0.1365
6	Benshangul Gumuz	0.0949
7	Dire Dawa	0.0251
8	Addis Ababa	0.0068
9	Harari	0.0046
10	Afar	0.0000

Source: Author's computation (2017) based on Central Statistical Agency's (CSA) raw data

Notes: Scores greater than unity ($RCA > 1$) reveal a comparative advantage, while scores less than unity ($0 \leq RCA < 1$) reveal a comparative disadvantage.

As can be seen from the above Table-1, only two Ethiopian States (Tigray and Amhara) have revealed comparative advantage in the production of barley as evidenced by the RCA index values which are greater than one. However, all the other Ethiopian States have revealed disadvantage in the production of barley. The study revealed that Tigray has the greatest comparative advantage followed by Amhara State which implies that in relative terms significantly larger part of the available hectares of land are used for the production of barley than is the case in other States of the country. The finding that Tigray's highest revealed comparative advantage is in support of the

idea that barley has been one of the crops that has been utilized in Tigray since ancient times. This finding is in support of the hypothesis that the origin of barley could be attributed to Tigray from Ethiopia.

With regard to the analysis on the gap of competitiveness in barley as compared to the State that scored highest in RCA in barley production in 2017 (Tigray) is shown in Table-2 given below.

Table-2: The Revealed Difference in the RCA (RDRCA) of the State that scored highest in RCA (Tigray) values and each of the other Ethiopian States on the Production of Barley in 2017.

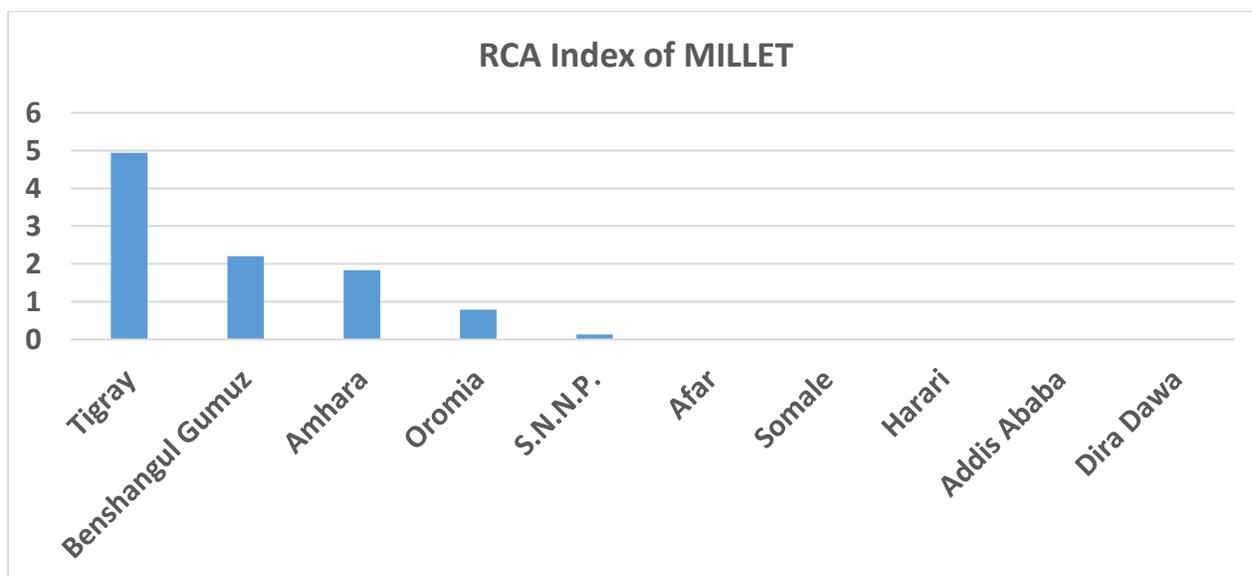
Rank	Ethiopian States	RDRCA index
1	Tigray	0.0000*
2	Amhara	1.2506
3	Oromia	2.0754
4	S.N.N.P.	2.4643
5	Somale	2.8913
6	Benshangul Gumuz	2.9329
7	Dire Dawa	3.0027
8	Addis Ababa	3.0210
9	Harari	3.0232
10	Afar	3.0278

Source: Author's computation (2017) based on Central Statistical Agency's (CSA) raw data

* Refers that the specified State (Tigray in this case) has the highest revealed comparative advantage score from Ethiopia in the specified product (barley in this case). When the RDRCA is computed using the formula $RDRCA (SSH \text{ and } OES) = RCA_{SSH} - RCA_{OES}$, it will be zero.

As can be seen from Table 2, Tigray's competitiveness vis a vis other States of Ethiopia shows that the gap in competitiveness is wider as compared to Afar, Harari, Addis Ababa, and Diredawa. Moreover, there is significant gap with the rest of the other Ethiopian States: Somale Ethiopian State, S.N.N.P, Oromia, and Amhra States in decsnding order of the magnitude of the gap of competitiveness.

Similarly, the revealed comparative advantage of millet in all Ethiopian States of the year 2017 is shown in the graph shown below.



Source: Author's computation (2017) based on Central Statistical Agency's (CSA) raw data

Notes: Scores greater than unity ($RCA > 1$) reveal a comparative advantage, while scores less than unity ($0 \leq RCA < 1$) reveal a comparative disadvantage.

Figure-1: Revealed Comparative Advantage (RCA) of the Production of Millet of Ethiopian States in 2017.

It can be seen from the above Figure-1 that three Ethiopian States (Tigray, Benshangul Gumuz and Amhara) have revealed comparative advantage in the production of millet as evidenced by the RCA index values which are greater than one. However, all the other Ethiopian States have revealed disadvantage in the production of millet. As shown in the case of barley, the study revealed that Tigray has the greatest comparative advantage followed by Benshangul Gumuz and the Amhara State. This also implies that in relative terms, significantly larger part of the available hectares of land are used for the production of millet in the specified three States than is the case in other States of the country. The highest score in RCA of Tigray's can have the implication that millet is one of the indigenous crops that could have strong association with its ancient agricultural practices and feeding habits. This finding is also in support of the hypothesis that millet is an indigenous crop that could be attributed to Tigray State.

With regard to the analysis on the gap of competitiveness as compared to the State that scored highest in RCA in millet production in 2017 (Tigray) is shown in Table-3 given below.

Table-3: The Revealed Difference in the RCA (RDRCA) of the State that scored highest in RCA (Tigray) values and each of the other Ethiopian States on the Production of Millet in 2017.

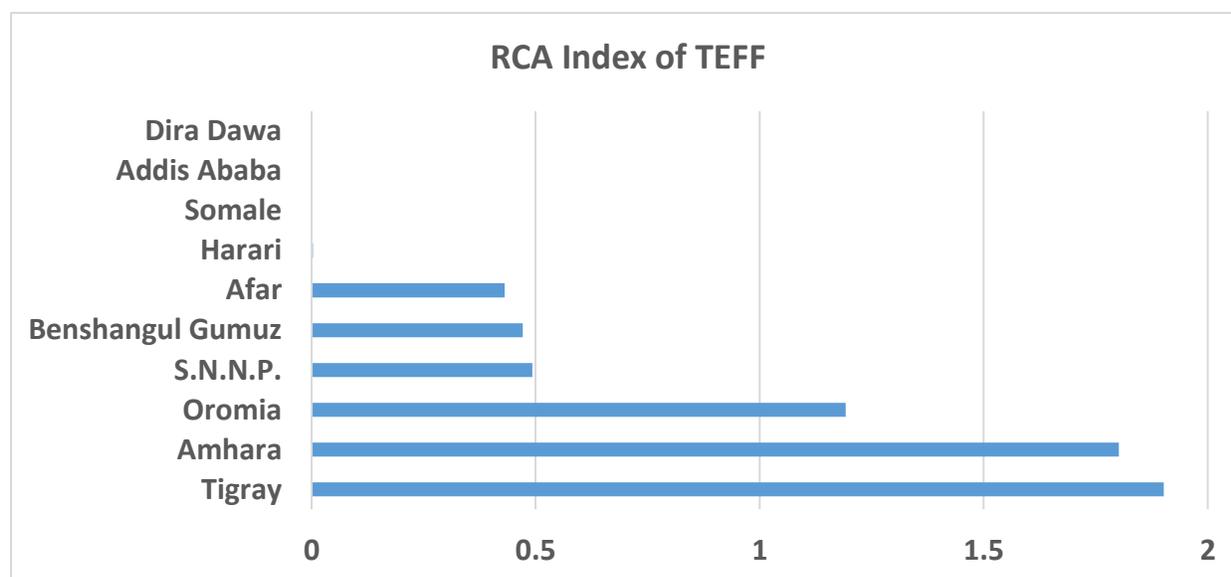
Rank	Ethiopian States	RDRCA index
1	Tigray	0.0000*
2	Benshangul Gumuz	2.7354
3	Amhara	3.1069
4	Oromia	4.1493
5	S.N.N.P.	4.8094
6	Afar	4.9389
7	Somale	4.9389
8	Harari	4.9389
9	Addis Ababa	4.9389
10	Dira Dawa	4.9389

Source: Author's computation (2017) based on Central Statistical Agency's (CSA) raw data

* Refers that the specified State (Tigray in this case) has the highest revealed comparative advantage score from Ethiopia in the specified product (millet in this case). When the RDRCA is computed using the formula $RDRCA (SSH \text{ and } OES) = RCA_{SSH} - RCA_{OES}$, it will be zero.

As can be seen from Table 3, Tigray's competitiveness vis a vis other States of Ethiopia shows that the gap in competitiveness is greater as compared to all States. In fact, the competitiveness gap is a little bit narrower as compared to Benshangul Gumuz. This implies, Tigray has an outshining competitiveness in production of millet in the country.

One of the select agricultural products considered in this study is *teff*. The respective revealed comparative advantages of the Ethiopian States in the production of *teff* is also portrayed in Figure-2 as shown below.



Source: Author's computation (2017) based on Central Statistical Agency's (CSA) raw data

Notes: Scores greater than unity ($RCA > 1$) reveal a comparative advantage, while scores less than unity ($0 \leq RCA < 1$) reveal a comparative disadvantage.

Figure-2: Revealed Comparative Advantage (RCA) of the Production of Teff of Ethiopian States in 2017.

The study disclosed that only three of the Ethiopian States, namely Tigray, Amhara and Oromia have revealed comparative advantage in the production of *teff*, while the rest all the States in Ethiopia have revealed comparative disadvantage in the production of *teff*. Even though the score is less than the previous scores shown in the cases of barley and millet, still Tigray has the highest revealed comparative advantage in *teff* production followed by Amhara and Oromia States. In the same token, this fact implies in relative terms that significantly larger part of the land available for agricultural crops is used for *teff* production in each of the three States, Tigray, Amhara and Oromia, than is the case in other States of the country. It is also known that *teff* is one of the indigenous crops of Ethiopia. Considering the magnitude of the RCA indices, the origin of *teff* would cast to be in Tigray, as evidenced by the highest score as shown in the Figure-2 shown in above.

In similar analysis, with regard to the gap of competitiveness as compared to the State that scored highest in RCA in *teff* production in 2017 (Tigray) is shown in Table-4 given below.

Table-4: The Revealed Difference in the RCA (RDRCA) of the State that scored highest in RCA (Tigray) values and each of the other Ethiopian States on the Production of *Teff* in 2017.

Rank	Ethiopian States	RDRCA index
1	Tigray	0.0000*
2	Amhara	0.1000
3	Oromia	0.7102
4	S.N.N.P.	1.4092
5	Benshangul Gumuz	1.4305
6	Afar	1.4709
7	Harari	1.8992
8	Somale	1.9018
9	Addis Ababa	1.9018
10	Dira Dawa	1.9018

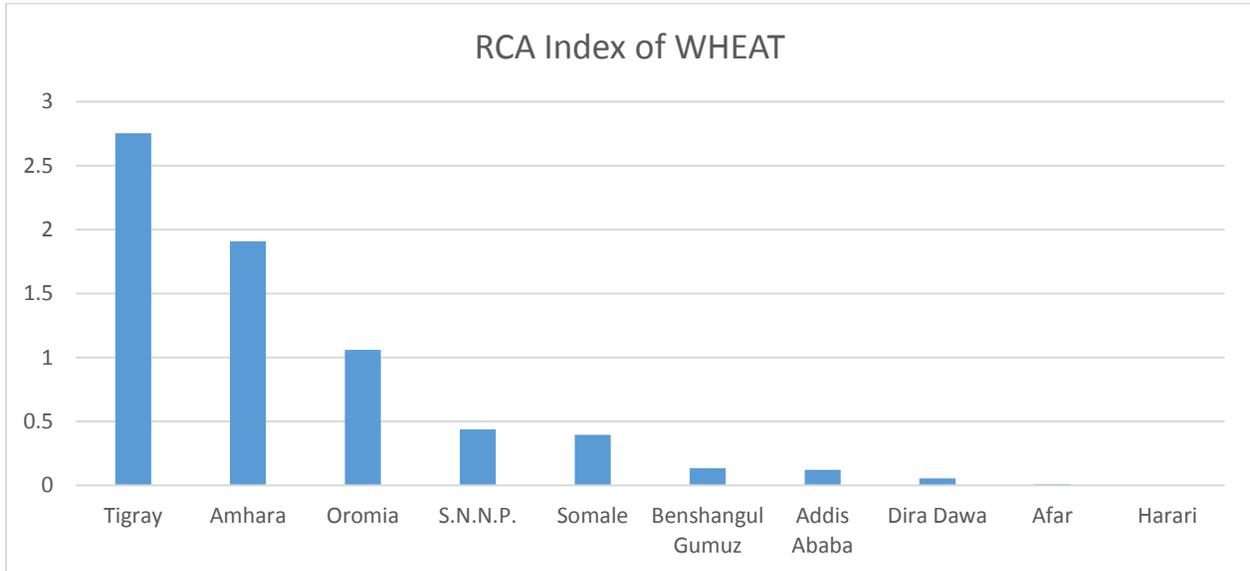
Source: Author's computation (2017) based on Central Statistical Agency's (CSA) raw data

* Refers that the specified State (Tigray in this case) has the highest revealed comparative advantage score from Ethiopia in the specified product (*teff* in this case). When the RDRCA is computed using the formula $RDRCA (SSH \text{ and OES}) = RCA_{SSH} - RCA_{OES}$, it will be zero.

As can be seen from Table-4, Tigray's competitiveness vis a vis other States of Ethiopia shows that the gap in competitiveness is higher as compared to all States. In fact, the competitiveness gap is a little bit narrower as compared to Oromia and Amhara States. This implies, Tigray has higher

competitiveness in *teff* production, but it is less as compared to the competitiveness it has on barley and millet.

Similar computations have been done on the revealed comparative advantages of Ethiopian States in the production of wheat. The results of the computation is depicted as given in Figure-3 below.



Source: Author's computation (2017) based on Central Statistical Agency's (CSA) raw data
 Notes: Scores greater than unity ($RCA > 1$) reveal a comparative advantage, while scores less than unity ($0 \leq RCA < 1$) reveal a comparative disadvantage.

Figure-3: Revealed Comparative Advantage (RCA) of the Production of Wheat of Ethiopian States in 2017.

Figure-3 shows that Tigray and Amhara States of Ethiopia have revealed comparative advantage in the production of wheat while Oromia State has somehow neither comparative advantage nor disadvantage in the production of wheat as evidenced by the RCA score. The finding disclosed that in relative terms, higher proportion of the available agricultural land in Tigray and Amhara regions is used for production of wheat than the rest of States in Ethiopia. In fact, significantly large part of the available land in Oromia is also used for production of wheat, while the other States of Ethiopia assumed comparative disadvantage. In terms of the strength of the revealed comparative advantage Tigray stands first followed by Amhara State. Under the assumption that the significantly larger part of the agricultural land is covered with wheat the more the people who live in that area have the practice of using wheat as their major crop in their feeding habit than others. Under this premise, considering the strength of the revealed comparative advantage given in RCA indices, the production and consumption of wheat for longer period can be attributed to Tigray as compared to other States of Ethiopia.

In similar analysis, with regard to the gap of competitiveness as compared to the State that scored highest in RCA in wheat production in 2017 (Tigray) is shown in Table-5 given below.

Table-5: The Revealed Difference in the RCA (RDRCA) of the State that scored highest in RCA (Tigray) values and each of the other Ethiopian States on the Production of Wheat in 2017.

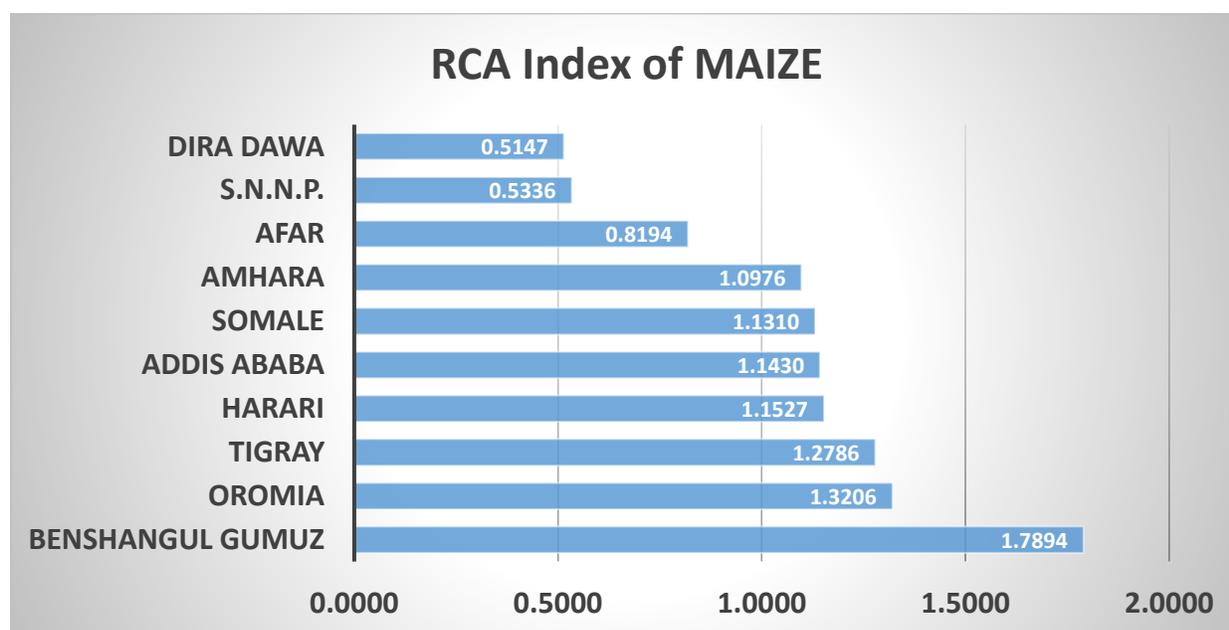
Rank	Ethiopian States	RDRCA index
1	Tigray	0.0000*
2	Amhara	0.8465
3	Oromia	1.6941
4	S.N.N.P.	2.3164
5	Somale	2.3602
6	Benshangul Gumuz	2.6198
7	Addis Ababa	2.6327
8	Dira Dawa	2.6995
9	Afar	2.7447
10	Harari	2.7541

Source: Author's computation (2017) based on Central Statistical Agency's (CSA) raw data

* Refers that the specified State (Tigray in this case) has the highest revealed comparative advantage score from Ethiopia in the specified product (wheat in this case). When the RDRCA is computed using the formula $RDRCA = \frac{SSH}{OES} - RCA_{SSH} - RCA_{OES}$, it will be zero.

It is evident from Table-5, Tigray's competitiveness vis a vis other States of Ethiopia shows that the gap in competitiveness is higher as compared to all States. In fact, the competitiveness gap is a little bit narrower as compared to Oromia and Amhara States. This implies, Tigray has significantly higher competitiveness in wheat production, but still in terms of the magnitude of its strength in RDRCA, its competitiveness is higher in barley and millet than is in wheat.

With regard to the computation made on maize, the results are as shown in Figure-4.



Source: Author's computation (2017) based on Central Statistical Agency's (CSA) raw data

Notes: Scores greater than unity ($RCA > 1$) reveal a comparative advantage, while scores less than unity ($0 \leq RCA < 1$) reveal a comparative disadvantage.

Figure-4: Revealed Comparative Advantage (RCA) of the Production of Maize of Ethiopian States in 2017.

As can be seen from Figure-4 shown in above, most of Ethiopian States, namely, Benshangul Gumuz, Oromia, Tigray Hariri, Addis Ababa, Somale, and Amhara have revealed comparative advantage in order of the strength of the RCA indices. However, Afar, S.N.N.P and Diredawa have revealed comparative disadvantage in the production of maize. In relative terms Benshangul Gumuz has the highest revealed comparative advantage than other regions followed by Oromia and Tigray States. Under the assumption that the significantly larger part of the agricultural land is covered with maize the more the people who live in that area have the practice of using maize as their major crop in their feeding habit than others. Under this premise, considering the strength of the revealed comparative advantage given in RCA indices, the production and consumption of maize for longer period can be attributed to Benshangul Gumuz as compared to other States of Ethiopia.

In similar analysis, with regard to the gap of competitiveness as compared to the State that scored highest in RCA in maize production in 2017 (Benshangul Gumuz) is shown in Table-6 given below.

Table-6: The Revealed Difference in the RCA (RDRCA) of the State that scored highest in RCA (Benshangul Gumuz) values and each of the other Ethiopian States on the Production of Maize in 2017.

Rank	Ethiopian States	RDRCA index
1	Benshangul Gumuz	0.0000*
2	Oromia	0.4688
3	Tigray	0.5109
4	Harari	0.6368
5	Addis Ababa	0.6464
6	Somale	0.6584
7	Amhara	0.6918
8	Afar	0.9700
9	S.N.N.P.	1.2559
10	Dira Dawa	1.2747

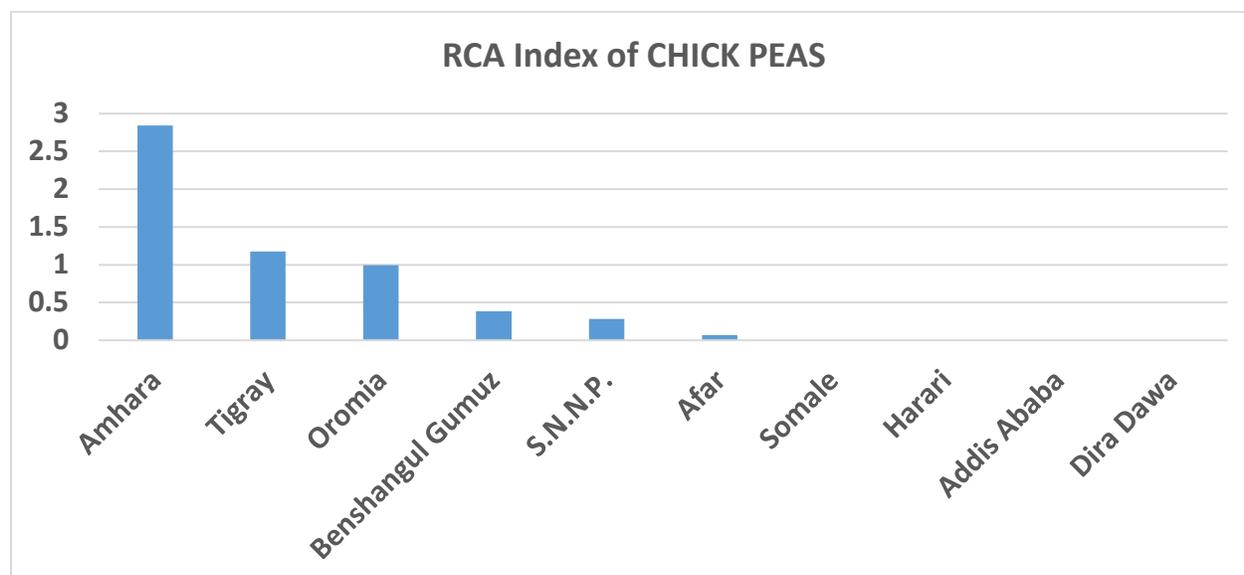
Source: Author's computation (2017) based on Central Statistical Agency's (CSA) raw data

* Refers that the specified State (Benshangul Gumuz in this case) has the highest revealed comparative advantage score from Ethiopia in the specified product (maize in this case). When the RDRCA is computed using the formula $RDRCA (SSH \text{ and } OES) = RCA_{SSH} - RCA_{OES}$, it will be zero.

It is evident from Table-6, Benshangul Gumuz's competitiveness vis a vis other States of Ethiopia shows that the gap in competitiveness is higher as compared to all States. In fact, the competitiveness gap is a little bit narrower as compared to all States except in the case of S,N,N,P

and Diredawa States. This implies, Benshangul Gumuz has higher competitiveness in maize production.

The RCA analysis on one of the select agricultural products chick pea is shown in Figure-5.



Source: Author's computation (2017) based on Central Statistical Agency's (CSA) raw data

Notes: Scores greater than unity ($RCA > 1$) reveal a comparative advantage, while scores less than unity ($0 \leq RCA < 1$) reveal a comparative disadvantage.

Figure-5: Revealed Comparative Advantage (RCA) of the Production of Chick Peas of Ethiopian States in 2017.

Figure-5 shows that in the production of chick pea only three States have revealed comparative advantage while the remaining States have revealed comparative disadvantage. Amhara State has the highest revealed comparative advantage followed by Tigray and Oromia. This implies in relative terms that significantly large part of the agricultural area is used for the production of chick pea in Amhara State than is the case in other States of the country. In the case of Tigray, even though the RCA index value is a little bit higher than the benchmark, it is higher than Oromia State. Oromia State is in a situation that it neither has revealed comparative advantage nor disadvantage in the production of chick pea. This also implies that if the RCA index is used as a proxy to the feeding habit of the States of Ethiopia, Amhara State has greater experience followed by Tigray and Oromia. If historical feeding habit is considered as an indication of the origin from where the crops have evolved first in Ethiopia, it will be attributed to Amhara State.

In similar analysis, with regard to the gap of competitiveness as compared to the State that scored highest in RCA in chick pea production in 2017 (Amhara) is shown in Table-7 given below.

Table-7: The Revealed Difference in the RCA (RDRCA) of the State that scored highest in RCA (Amhara) values and each of the other Ethiopian States on the Production of Chick Peas in 2017.

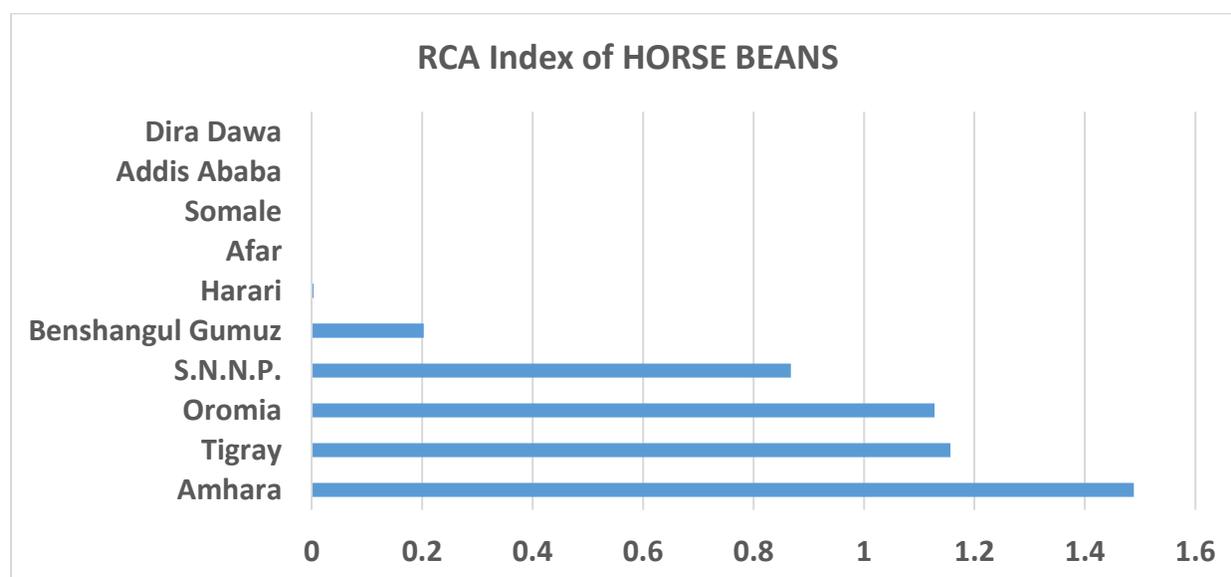
Rank	Ethiopian States	RDRCA index
1	Amhara	0.0000*
2	Tigray	1.6672
3	Oromia	1.8497
4	Benshangul Gumuz	2.4593
5	S.N.N.P.	2.5598
6	Afar	2.7749
7	Somale	2.8439
8	Harari	2.8439
9	Addis Ababa	2.8439
10	Dira Dawa	2.8439

Source: Author's computation (2017) based on Central Statistical Agency's (CSA) raw data

* Refers that the specified State (Amhara in this case) has the highest revealed comparative advantage score from Ethiopia in the specified product (chick pea in this case). When the RDRCA is computed using the formula $RDRCA = (SSH - OES) / (SSH + OES)$, it will be zero.

It is evident from Table-7, Amhara's competitiveness vis a vis other States of Ethiopia shows that the gap in competitiveness is higher as compared to all States. In fact, the competitiveness gap is higher in relation to other States though it is a little bit narrower as compared to Tigray and Oromia States. This implies, Amhara has higher competitiveness in chick pea production.

With regard to the production of horse bean, the revealed comparative advantage of Ethiopian States is as shown in Figure-6 below.



Source: Author's computation (2017) based on Central Statistical Agency's (CSA) raw data

Notes: Scores greater than unity ($RCA > 1$) reveal a comparative advantage, while scores less than unity ($0 \leq RCA < 1$) reveal a comparative disadvantage.

Figure-6: Revealed Comparative Advantage (RCA) of the Production of Horse Beans of Ethiopian States in 2017.

According to the computation done to determine the respective revealed comparative advantage of horse bean disclosed that Amhara State has the highest RCA index value followed Tigray and Oromia with marginal differences. The other States S.N.N.P. AND Benishangul Gumuz have revealed comparative disadvantage. In similar analysis done earlier, the three regions Amhara, Tigray and Oromia used to utilise significantly large part of their respective agricultural land for the production of horse beans than other States of the country. Hence, in terms of the historical feeding habit of using horse bean as one of the important crops, using the strength of RCA index as a proxy variable, Amhara State stands to be the highest followed by Tigray and Oromia States. If historical feeding habit is considered as an indication of the origin from where the crops have evolved first in Ethiopia, it will be attributed to Amhara State.

In similar analysis, with regard to the gap of competitiveness as compared to the State that scored highest in RCA in horse beans production in 2017 (Amhara) is shown in Table-8 given below.

Table-8: The Revealed Difference in the RCA (RDRCA) of the State that scored highest in RCA (Amhara) values and each of the other Ethiopian States on the Production of Horse Beans in 2017.

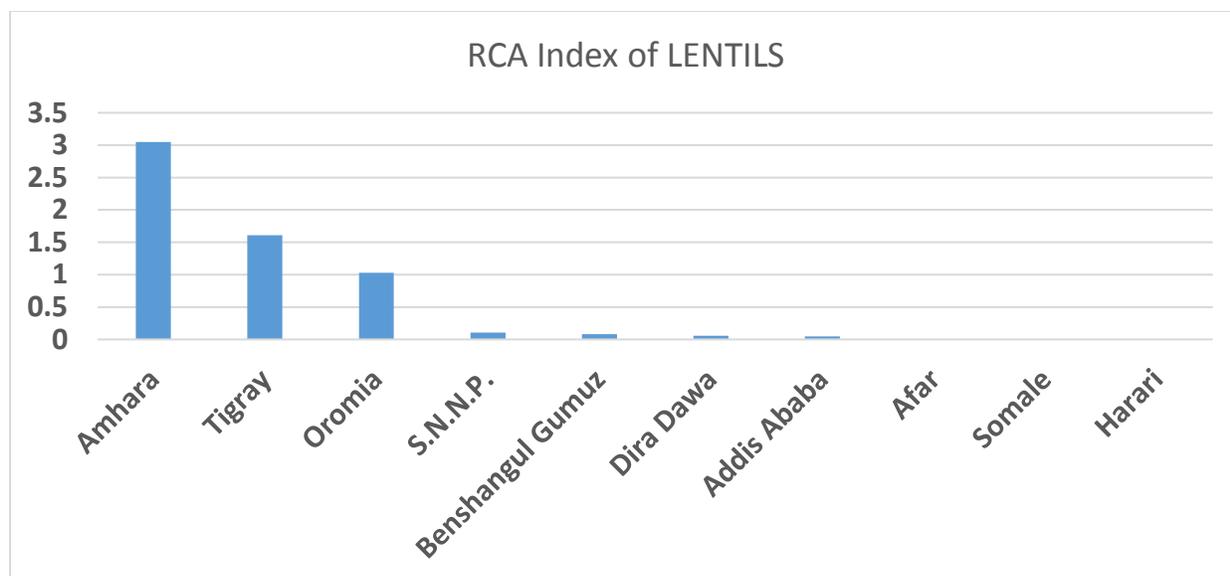
Rank	Ethiopian States	RDRCA index
1	Amhara	0.0000*
2	Tigray	0.3320
3	Oromia	0.3610
4	S.N.N.P.	0.6208
5	Benshangul Gumuz	1.2860
6	Harari	1.4853
7	Afar	1.4888
8	Somale	1.4888
9	Addis Ababa	1.4888
10	Dira Dawa	1.4888

Source: Author's computation (2017) based on Central Statistical Agency's (CSA) raw data

* Refers that the specified State (Amhara in this case) has the highest revealed comparative advantage score from Ethiopia in the specified product (horse beans in this case). When the RDRCA is computed using the formula $RDRCA (SSH \text{ and } OES) = RCA_{SSH} - RCA_{OES}$, it will be zero.

It is evident from Table-8, Amhara's competitiveness vis a vis other States of Ethiopia shows that the gap in competitiveness is higher as compared to all States. Similarly, the competitiveness gap is higher in relation to other States though it is a little bit narrower as compared to Tigray, Oromia, and S.N.N.P States. This implies, Amhara has higher competitiveness in horse beans production.

As far as the computations on the revealed comparative advantage of the production of lentils in Ethiopia is concerned, it is depicted in Figure-7.



Source: Author's computation (2017) based on Central Statistical Agency's (CSA) raw data

Notes: Scores greater than unity ($RCA > 1$) reveal a comparative advantage, while scores less than unity ($0 \leq RCA < 1$) reveal a comparative disadvantage.

Figure-7: Revealed Comparative Advantage (RCA) of the Production of Lentils of Ethiopian States in 2017.

Figure-7 shows that in the production of lentils only three States, Amhara, Tigray and Oromia have revealed comparative advantage while the remaining States found having revealed comparative disadvantage. Amhara State has the highest revealed comparative advantage followed by Tigray and Oromia. This implies in relative terms that significantly large part of the agricultural area is used for the production of lentils in Amhara State than is the case in other States of the country. In the case of Tigray, even though the RCA index value is a little bit higher than the benchmark, it is higher than Oromia State. Oromia State is in a situation that it neither has revealed comparative advantage nor disadvantage in the production of lentils. This also implies that if the RCA index is used as a proxy to the feeding habit of the States of Ethiopia, Amhara State has greater experience followed by Tigray and Oromia. If historical feeding habit is considered as an indication of the origin from where the crops have evolved first in Ethiopia, it will be attributed to Amhara State.

In similar analysis, with regard to the gap of competitiveness as compared to the State that scored highest in RCA in horse beans production in 2017 (Amhara) is shown in Table-9 given below.

Table-9: The Revealed Difference in the RCA (RDRCA) of the State that scored highest in RCA (Amhara) values and each of the other Ethiopian States on the Production of Lentils in 2017.

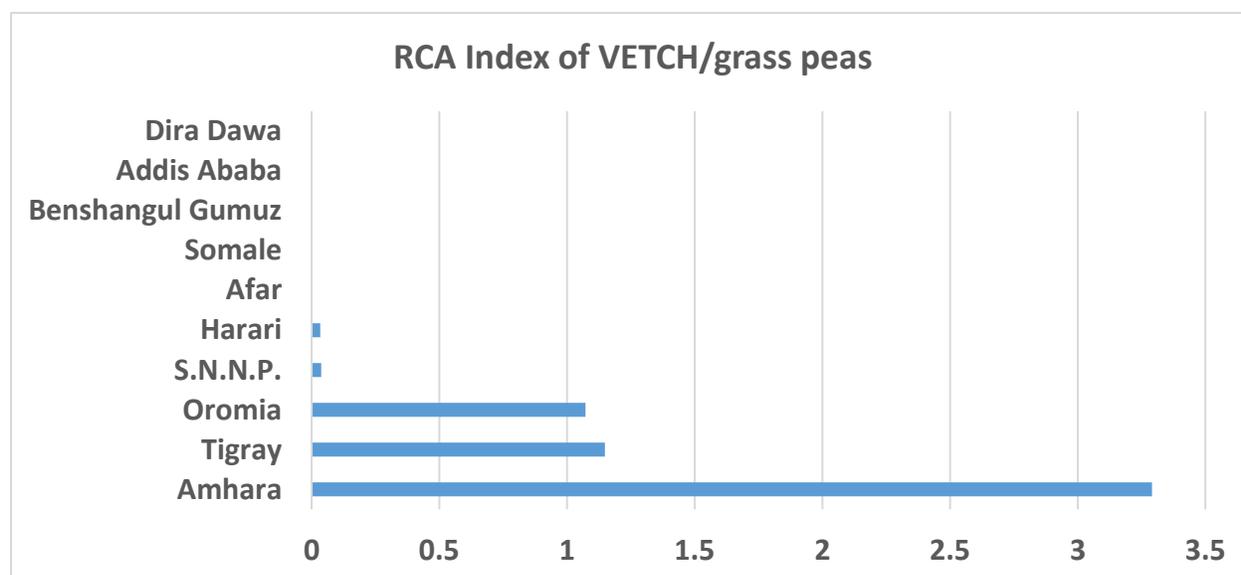
Rank	Ethiopian States	RDRCA index
1	Amhara	0.0000*
2	Tigray	1.4394
3	Oromia	2.0200
4	S.N.N.P.	2.9417
5	Benshangul Gumuz	2.9672
6	Dira Dawa	2.9914
7	Addis Ababa	3.0025
8	Afar	3.0492
9	Somale	3.0492
10	Harari	3.0492

Source: Author's computation (2017) based on Central Statistical Agency's (CSA) raw data

* Refers that the specified State (Amhara in this case) has the highest revealed comparative advantage score from Ethiopia in the specified product (lentils in this case). When the RDRCA is computed using the formula $RDRCA = RCA_{SSH} - RCA_{OES}$, it will be zero.

It is evident from Table-9, Amhara's competitiveness vis a vis other States of Ethiopia shows that the gap in competitiveness is higher as compared to all States. The competitiveness gap is significantly higher in relation to other States though it is a little bit narrower as compared to Tigray State. This implies, Amhara has significantly higher competitiveness in lentils production in the whole country.

With regard to the analysis and the computations on the revealed comparative advantage of the production of vetch or grass peas in Ethiopia is concerned, it is depicted in Figure-8.



Source: Author's computation (2017) based on Central Statistical Agency's (CSA) raw data

Notes: Scores greater than unity ($RCA > 1$) reveal a comparative advantage, while scores less than unity ($0 \leq RCA < 1$) reveal a comparative disadvantage.

Figure-8: Revealed Comparative Advantage (RCA) of the Production of Vetch/grass peas of Ethiopian States in 2017.

Similar to that cases of horse bean and lentils, Figure-8 shows that in the production of vetch/grass peas only three States, Amhara, Tigray and Oromia have revealed comparative advantage while the remaining States found having revealed comparative disadvantage. Amhara State has the highest revealed comparative advantage followed by Tigray and Oromia. This implies in relative terms that significantly large part of the agricultural area is used for the production of vetch/grass peas in Amhara State than is the case in other States of the country. Similar as it was the case in lentils, chick peas, and horse beans, though Tigray has scored an RCA index value which is a little bit higher than the benchmark RCA value, it has higher RCA than Oromia State. Even though Oromia State has a little bit lower RCA index value than Tigray, it has revealed comparative advantage in the production of lentils. This also implies that if the RCA index is used as a proxy to the feeding habit of the States of Ethiopia, Amhara State has greater experience followed by Tigray and Oromia. If historical feeding habit is also considered as an indication of the origin from where the crops have evolved first in Ethiopia, it will be attributed to Amhara State.

In similar analysis, with regard to the gap of competitiveness as compared to the State that scored highest in RCA in horse beans production in 2017 (Amhara) is shown in Table-10 given below.

Table-10: The Revealed Difference in the RCA (RDRCA) of the State that scored highest in RCA (Amhara) values and each of the other Ethiopian States on the Production of Vetch/grass peas in 2017.

Rank	Ethiopian States	RDRCA index
1	Amhara	0.0000*
2	Tigray	2.1435
3	Oromia	2.2195
4	S.N.N.P.	3.2545
5	Harari	3.2581
6	Afar	3.2915
7	Somale	3.2915
8	Benshangul Gumuz	3.2915
9	Addis Ababa	3.2915
10	Dira Dawa	3.2915

Source: Author's computation (2017) based on Central Statistical Agency's (CSA) raw data

* Refers that the specified State (Amhara in this case) has the highest revealed comparative advantage score from Ethiopia in the specified product (vetch/grass peas in this case). When the RDRCA is computed using the formula $RDRCA (SSH \text{ and } OES) = RCA_{SSH} - RCA_{OES}$, it will be zero.

It is evident from Table-10, Amhara's competitiveness vis a vis other States of Ethiopia shows that the gap in competitiveness is higher as compared to all States. The competitiveness gap in vetch/grass peas as expressed in RDRCA index is much stronger than other crops where Amhara

State has comparative advantage. This implies, Amhara has significantly higher competitiveness in vetch/grass pea production in the country.

Conclusion

The study has done an analysis on the revealed comparative advantage of Ethiopian States on nine select agricultural crops based on the production raw data collected for Central Statistical Agency of Ethiopia. The study uncovered that two States, namely, Tigray State, scoring the highest, followed by Amhara State have revealed comparative advantage in the production of barley while the other Ethiopian States have revealed comparative disadvantage. In the case of wheat production, three States Tigray, Amhara, and Oromia have revealed comparative advantage in order of their strength of competitiveness while the other Ethiopian States have revealed comparative disadvantage. In the case of millet as well only two States, Tigray and Benshangul Gumuz, in order of their strengths of competitiveness have revealed comparative advantage while the other Ethiopian States have revealed comparative disadvantage. With regard to the production of *teff* and wheat three States Tigray, Amhara, and Oromia have revealed comparative advantage in order of their strength of competitiveness while the other Ethiopian States have revealed comparative disadvantage. Interestingly, this study uncovered that Tigray State has the highest revealed comparative advantage in the production of *teff* and wheat followed by Amhara and Oromia States.

As far as the production of maize is concerned, eight Ethiopian States have revealed comparative advantage in which Benshangul Gumuz stood the highest followed by Oromia, Tigray, Harari, Addis Ababa, Ethiopian Somalia State, and Amhara States in order of their strengths of competitiveness. In addition, the study uncovered that only three regions, Amhara, Tigray, and Oromia in order of their competitiveness strength are found to have revealed comparative advantage in the production of chick peas, horse beans, vetch/grass peas and lentils. In these four crops Amhara region is found to have the highest score on competitiveness based on RCA indices. In fact, Oromia is in a neutral position which has neither advantage nor disadvantage in the production of chick pea and lentils.

The competitiveness gap between Tigray State and other Ethiopian States is high in millet, barley, wheat, and *teff*, in descending order of the size of gap of competitiveness. The competitiveness gap between Amhara State and other Ethiopian States is high in vetch/grass peas, lentils, chick peas, and horse beans in descending order of the size of gap of competitiveness. It is uncovered that Benshangul Gumuz State has higher competitiveness gap in maize production as compared to other States of the country

Considering the RCA indices strength as proxies for a community's utilization of the crop linked with the community's cultural background and historical feeding habit, and if historical feeding habit is also considered as an indication of the origin from where the crop has evolved first in Ethiopia, the origin of barley, millet, *teff*, and wheat would be in Tigray; maize in Benshangul Gumuz; and chick peas, horse beans, vetch/grass peas and lentils would be in Amhara State.

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