

Determining of Routes and Time of Biogenetic Resources Smuggling in Western Tigray, Ethiopia

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Abstract: This study was conducted in the western zone of Tigray regional state. It was covered revenue and custom branch checkpoints of Dima, Lugdi and Bereket and surrounding residents. The data was obtained from purposefully selected federal police, custom officers, local security forces, residents and secondary data from Humera revenue and custom branch office. The results indicated that smugglers were not active at all-time and season of a year in trafficking of genetic resources. It was indicated that peak time of the year for smuggling was winter, autumn and spring. The entire 24 hours of the day were not also suited for smuggling, but times of the day from 12-4:00 GMT in the sunny day and from 8:00 evening to 5:00 GMT in the morning were reported to be the peak time of smuggling. Twenty illegal exit routes were identified and these routes were located in roads access to humans and pack animals only. Traffickers were used human shoulder and animal pack as transport system for smuggling. It indicated that businessmen, small scale traders, unemployment youths and local communities were major actors of trafficking. The rank of severity of smuggling of crop genetic resources indicated that cereals, legumes and beverage crops respectively. The major limitations for deterring were presence of blood relations and neighborhood, indirect involvement/intervention of government authorities, existence of high unemployment rate, porous border area, e-crime, attractive income, lack of punitive measures, use of legal coverage, poor awareness of enforcements and smugglers, disregard and poor attention to smugglers and counter intelligence. Thus, awareness raising and creating job opportunities will be required and will not be a job left to be undone for tomorrow.

Key words: Agents • Checkpoints • Genetic Resources • Road Access

INTRODUCTION

Over centuries Ethiopian farmers developed a unique character and advanced crop production practices which obviously differ from the practices of the rest of the world. In a Sub-Saharan African region, it was believed that farming practices was originated in Ethiopia in between 4th and 6th millennia BC [1]. Free access of these diverse crop biogenetic resources in Ethiopia is a safeguard against recurring natural and anthropogenic induced disasters [2]. Plant biogenetic resources are fundamental for food production and assist in production of varied products derived from plants like pesticides, cosmetics and medications. Hence, conservation, searching and collection of genetic materials to be included in the system of production for meeting the upcoming demand

of human beings as a result of climate change, reduction in plot size, population pressure, urbanization and emergence of new pests quite crucial [3].

Innovative approach of farming system assists to conserve and sustain crop diversities. It is obvious that, sustainable development of agriculture strongly reliant on free access of crop genetic resources. Centuries long sustained crop local genetic resources are nowadays crossing national boundaries to be easily illegally accessed from other states employing the assistance of smugglers without the consent and knowledge of farmers and the Ethiopian government. Even though crops used for food were considered as a common heritage of humanity across the earth, nowadays the course has been altered since the inception of granting patent rights to newly improved varieties released via doing research [4].

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Therefore, nations started to realize the importance of conservation, sustainable use and legally accessing of crop genetic materials with binding agreements in order to share their benefit in a sustainable manner [5, 6].

Economic and technological progress around the world exacerbates strategic exploitation of the wealthy of biogenetic resources through determining the value that can be established over it. Ethiopia is owned and endowed with varieties of crop genetic resources, indigenous in origin and rich in diversity of introducing crops [2]. Illegal smuggling of biogenetic materials severely affected ownership of crop genetic resources and associated with traditional knowledge of management and production methods which were developed for centuries via trial and errors or learning by doing. Unauthorized movements of biogenetic resources in Ethiopia and in its neighboring countries are becoming prevalent now and need to be addressed physically and by law. Unless illicit access of crop genetic materials is not addressed properly, it will affect the benefits need to be shared in using the resources in the future.

The result obtained was estimated to assist for convincing decision makers to take precaution and necessary tight measures in strengthening monitoring and control of unauthorized movement of biogenetic resources in the future. Hence, this research has been done to determine routes, agents and type of biogenetic resources illegally trafficked in western Tigray. The objectives of this study were:

- To pinpoint illegal trafficked routes of crop genetic resources across national boundaries
- To enlighten peak season and time of smuggling in the study area

MATERIALS AND METHODS

This study was conducted in the western zone of Tigray regional state northwestern Ethiopia. It was covered Ethiopian revenue and custom authority checkpoints located in Dima, Lugdi and Bereket and residents in Kafta and Setit Humera district of western Tigray. Required information for this study was obtained via independent interviewing of members of purposefully selected federal police in border checkpoints, custom officers, local security forces, randomly selected local residents and secondary data from Humera revenue and custom branch office. The data were collected from 51 respondents and among these 49 were males and 2 were

females. The questionnaires were focusing on what type of biogenetic resources were trafficked, routes of trafficking, quantity of trafficking and major actors in trafficking and related characteristics of illegal systems in unauthorized movement of biogenetic resources in the study districts. In this article several words were used, namely illegal trafficking, smuggling, unauthorized movement, illegal trade and illicit trade to describe unofficial trade of crop and horticultural materials from Ethiopia. Data obtained from the survey was analyzed using descriptive statistics on qualitative and quantitative variables of illegal trafficking status using SAS, version 9.1.3, general linear model (GLM) procedures [7].

RESULTS AND DISCUSSION

The result indicated that 96.08% of respondents were males, whereas the remaining 3.92% were females (Table 1). The reason why female respondents were low in number is due to the fact that most of the respondents were law enforcements from checkpoints and local security forces (militia) and males are dominant members of local security forces. Local security forces safeguards the security of communities independent of national defense and police forces and traditionally most of the members were males headed households. It was not easy to find women in this section of communities noticeably emanated from unchanged social attitudes and nature of the job. Perception of satisfaction in job is not similar across individuals and affected by many factors, but mostly biased with attitude of gender. Even though women's are encouraged to serve as law enforcements (federal police and custom officer), their number was insignificant still now as compared to males because of the characteristics of the job, which is not much convenience for women. Therefore, the current study did not incorporate women's perception as equal as males' because of the above depicted shortcomings.

Average age of the respondents was summarized and older average age of 46.59 years was recorded from security forces (militia) whereas younger average age was 27 years obtained from checkpoint staffs. Length of residence was quite crucial to collect unbiased information on community perception of illicit cross border trade conducted in the area, detection of the main actors and identification of targeted genetic resources for trafficking that may have implications on analysis of unauthorized genetic resource movement. The result indicated that the average length of residence 18.64 years

Table 1: Detail of respondents' profile in study sites

Variables	Number of informants			Average age of respondents (in years)	Average length of residence (in years)
	Male	Female	Total		
Local residents	12	1	13	34.77	12.08
Local security forces	22	0	22	46.59	18.64
Checkpoint staffs	15	1	16	27.07	1.3
Total	49	2	51	G. Means = 36.14	G. Means = 10.67

Sources: Own Survey Result, 2017

Table 2: The peak season of a year preferred by smugglers for trafficking

Variable	Local security forces (militia) and residence	Checkpoint staffs
Peak time of the year for smuggling (frequency %)		
Summer	3 (18.75%)	0
Winter and autumn	2 (12.50%)	5 (31.25%)
Winter, autumn and spring	6 (37.50 %)	11 (68.75%)
Winter and spring	5 (31.25%)	0

Sources: Own Survey Result, 2017

was found from the local security force (militia) whereas shorter 1.3 years of residence was recorded from checkpoint law enforcements. But the second longer 12 years of residence was found from local community respondents. The lower in length of residence was due to most of the local communities were recently relocated from different part of the region to these areas of the resettlement program. Length of residence with checkpoint law enforcements was virtually one year because of their nature of job and training. The other reason related security forces were allowed to stay in one checkpoint for a quite short period of time due to fright of bribery when become more socialized with communities and smugglers. Thus, security forces were providing services for a short period of time in a given checkpoint and shifted with new staffs based on decision of top officials.

Time of Smuggling: Based on perception of respondents' smugglers were not usually active at all-time and season of a year in trafficking of these resources. There were peak times of days and seasons in a year that illicit trade becomes more serious with higher smugglers in the study area. Identifying peak season of smuggling was quite important for decision makers to sort out why traffickers preferred that particular season of a year for smuggling. Checkpoint respondents were asked about which season of a year become peak time of smuggling and the result was summarized in table 2. The majority of the respondents, 37.50% of them mentioned that the peak time of a year for smuggling was winter, autumn and spring, whereas 31.25% of respondents mentioned that winter and spring were peak seasons of a year for smuggling.

Western Tigray is well-known with production of sesame (sometimes called as white gold) most exportable commodity in Ethiopia and the area became crowded with hundreds of thousands of workers coming from overall the country during weeding, harvesting and threshing time. Most of local farmers engaged in smuggling in the area were diverted their attention to farming business during the summer season and the summer season becomes unsuited for smuggling because most of the smuggling routes were crowded with farmers and daily laborers. In addition, crossing Tekeze River was unthinkable during the summer season because of the increasing water volume of the river due to high floods coming from the highlands. It poses difficulty and natural barrier to traffickers attempted to cross in swimming. Hence, it was not pertinent for smuggling of illegal agricultural goods to desired destinations, whereas the remaining seasons were an active season of smuggling because most farms were bare of crops and public mobility was also reduced significantly. The entire dry season was considered as peak time of smuggling with active involvement of local residents, small scale traders, investors and unemployed youths. Similarly, the whole 24 hours of the day were not also suited for smuggling rather there are times that movement of peoples and security forces ceased. These times of the day was from 12-4:00 GMT in the hot sun day and from 8:00 in the evening up to 5:00 GMT in the morning have been perceived at the peak time of smuggling.

Identified Routes of Smuggling: A field survey was conducted to determine different unknown routes utilized by illegal traffickers for unauthorized movement of

biogenetic resources. It was also conducted to identify the type and quantity of genetic resources together with main actors responsible in trafficking of genetic materials in these unspecified routes. The required information for determining unknown routes was obtained using structured and semi-structure questionnaires administrated to local residents, local security forces, custom officers and federal police. Group discussion also held with local security forces and independent interview with custom officers, federal police, local security forces and residents helps in identifying of twenty illegal exit routes in surveyed districts. The discussion made with local security forces (militia) was quite supportive in pinpointing of main actors and routes in biogenetic resources trafficking in the respective districts.

Respondents were asked which routes located in the border were targeted by illegal traffickers and view of respondents was summarized in Table 3. Majority of the respondents about (62.86%) mentioned that access roads to humans and pack animals only were favored routes of smugglers for trafficking. However, second highest number of the respondents (17.14%) mentioned that access roads to humans only were major routes of smuggling and this was comparable with the perception of (17.14%) of respondents who noted access roads to animals only were ideal routes of smuggling. Thus, this result indicated that ideal routes for smuggling were routes have access to humans and pack animals only which posed more difficulty to pursued traffickers by car. Traffickers used the advantage of routes found in undulated areas covered with densely thickened bushes/trees pose challenges to watchdog/ security forces in the distance.

The reason why traffickers preferred to use these routes was the chosen routes were ideal for trafficking, due to having access roads to human only and difficult to pursue by law enforcements. These routes have much alternative paves access both for easily exit and entry to reach at the required destination without many difficulties. Areas around routes were covered with congealed trees, undulated plains and galleys that hide smugglers from watchdog/security forces. Trafficking also requires wider paved roads of exit and these routes have wider human roads which were suitable to move without any problem. It was also because of the availability of porous border and weak border protection particularly in borderlines of northern Sudan and easily access of swimmers who assists in crossing of Tekeze River to reach Sudan. Routes used by traffickers were ideal to reach in nearby towns of Sudan and meeting Sudanese illegal trader

without much difficulty and suited to covertly move with no traced by Ethiopian security forces. Traffickers usually collects counter intelligent information on where law enforcements from community and choses ideal routes free from overseer of security forces. The other reason was perception of Ethiopian security forces that significant number of exit routes were found in enemy frontline of Eritrean government and disregard with the idea of no one is dare to attempt to cross and smuggled genetic resources through that particular routes. Traffickers paid bribe usually to obtain full collaboration of Sudanese security forces to cross the border and access border market.

To identify the type of transport systems utilized for smuggling, respondents were asked to share their ideas on this and the result was summarized in the Table 3. From the entire respondents, 34.29% of them mentioned that traffickers were used their shoulder as a transport system for smuggling while 20.00% of respondents indicated that traffickers were used pack of camel and their shoulder for smuggling. The third higher numbers of respondents, 14.29% were noted that Equines, camel and human shoulder were major transport systems of trafficking. Accordingly, this result indicated that mostly traffickers used both shoulder and pack animals as a transport system of trafficking of small quantity of biogenetic resources. Traffickers must cross Tekeze River to reach in their destination by swimming and hence, the quantity of smuggling was not more than 50 kg per individual. This is because road infrastructure was too poor to control illegal traders using vehicles by security forces. On the other hand, the existence of poor infrastructural development was also convince to the illegal traders to escape from security forces. Therefore, the existence of poor infrastructural development has contributed in increasing the quantity of biogenetic resources illegal smuggling though largely such illegal practices has been done by those exporters have license without holding pass-permit from the concerned body (in this case the Ethiopia biodiversity institute).

Respondents in the study districts indicated that people's participated in the smuggling of biogenetic resources across revenue and custom checkpoints and/ other undefined routes were categorized into different wealth and age groups. Human settlement is very rare proximate to Lugdi and most of the people found in areas where investors. Major actors in trafficking of unauthorized agricultural products either own production or collecting from another part of the country where adult age investors and fewest number of youths.

Table 3: Exit routes in border and transport systems used for trafficked

Variable	Local security force (militia) and residence
Routes in border preferred for trafficking (frequency %)	
Access roads to humans only	6 (17.14%)
Access roads to humans, vehicles and to pack animals	1 (2.86%)
Access roads to humans and to pack animals	22 (62.86%)
Access roads to pack animals only	6 (17.14%)
Transport system utilized for smuggling (frequency %)	
Equines, camel and human shoulder	5 (14.29%)
Equines, camel, human shoulder and vehicle	2 (5.71%)
Equines, camel and vehicle	1 (2.86%)
Camel	4 (11.43%)
Camel and human shoulder	7 (20.00%)
Camel, human shoulder and vehicle	1 (2.86%)
Human shoulder	12 (34.29%)
Human shoulder and vehicle	2 (5.71%)
Vehicle	1 (2.86%)

Sources: Own Survey Result, 2017



Fig. 1: Illegal routes of smugglers found in the border of Eritrea

These investors involves indirectly usually used unemployed youths in their illicit trade activities and youths engaged in leading roads, carrying packages for smuggling, chasing livestock for smuggling and assisting in crossing of Tekeze Rivervia swimming. Bereket is characterized by sparse settlements with plain landscape until fast approaching to Tekeze River bank west of Ethio-Sudan border. Based on the information received from respondents major actors encompass in trafficking were businessmen, small scale traders and local communities with different age groups. The other checkpoint considering for assessment was Dima and smugglers in this area were mostly unemployed youths.

Dima is located in Rawyan Kebelle of Kafta Humera district of western Tigray. Ethiopian revenue

and customs authority has a checkpoint in the area for hastening process of export and delimiting unauthorized cross border trade. According to respondents, the area was a hotspot of biogenetic resources trafficking, taking as an advantage of the undulated nature of the landscape. Entirely around eight illegal routes were identified in Raywanand among these seven of them were major routes of crop genetic resources trafficking. Based on respondents' perception these seven identified routes were included *May Tselot*, *Menqerqer* (*Nieshtay and Abiy*), *Abezruf*, *Shiwshiwit*, *Manta*, *Ziban Midmar Tekeze* and *Rawyan Midmar Tekeze*. These were major routes utilized for crop and horticulture smuggling to both Eritrea and Sudan as depicted in Figure 1.

Confiscated plant and horticultural genetic material during the survey



Lugdi Check Point: Is located in the Mykadra kebele of Kafta Humera district and fourteen of new identified illegal smuggling routes were found in this area. Entirely the eight identified routes for smuggling were major illicit trade points of crop genetic resources and unrevealed quantity of genetic resources was crossing the border via this route. These routes include *deguara, banate, yemane camp, Abraha Rama, BahreSelam, Mechach, Enda Tsegay Girmay, Enda Beshir, Enda G/Mesqel Egela, Salo Bata, Enda Guesh, Jemam (kunama) and Enda Tesfay Medhaniye.*



Bahre Selam Mechach Endatsegaygirmaycambo

Fig. 2: Illegal routes of smugglers Identified in Lugdi areas border to Ethio-Sudan

Bereket: Is located in bereket kebele of Kafta Humera district and the three unknown illegal routes were identified in this kebele. Among the identified unfamiliar routes two of them were detected as major routes of crop and horticultural genetic resource smuggling points and these comprised of *jerdinAboy Haji and EndaAboyTewelde Haile.*



Enda Aboy Haji

Enda Aboy Tewelde Haile

Fig. 3: Identified smuggling routes of biogenetic resources in Bereket kebele

Target Level of Law Enforcements and Severity of Smuggling:

Crop genetic resources trafficking were critical sources of subsistence life in western Tigray and all portions of the communities' resides in the districts were involved in this business directly or indirectly. Conducting an assessment on the severity level of crop genetic resources targeted for smuggling were essential to established early warning systems for further detection and monitoring of illegal accessing of biogenetic materials without signed access and benefit sharing binding agreements for improvement, multiplication and value addition of the resources using. It is important to establish target priorities for monitoring and convincing decision makers to exert the required attention in this regard. The more the target of crop genetic resources for trafficking are the more the susceptibility in full accessing of all diversities at species level. Thus, severity assessment of crop genetic resources targeted for trafficking is assisted to obtained information that guides future attention and monitoring. Respondents were asked about their perception on the severity level of crop genetic resources targeted for trafficking and their views were summarized in Table 4.

The analysis on the severity level of crop genetic resources for trafficking indicated that cereal crops (0.26) were major target of traffickers followed by legumes (0.25) for trafficking. According to severity index, the remaining crops like beverage, fruit and vegetable crops were also important targets for traffickers in western Tigray Table 4. Thus, this result showed that most staple crops such as cereals followed by legumes were major targets of smugglers and clearly demonstrated that undermining influence of smugglers on illegal access of valuable biogenetic resources. It requires reforms in the structure of checkpoints and bolster law enforced security personal's to threatened and destabilized groups and individuals involved in such illegal business. The exercising of sovereign authority on crop species and traditional knowledge of production that has been developed via trial and errors to maintain the rights and safety of Ethiopia farmers is urgently required. The government must build and put facility in place for actual protection and promotion of citizens for combating smugglers as well as illegal traders.

Nature of smuggling of crop genetic resources is challenging to determine its size because of corruption, covertly conducted and incompetence. Respondents in checkpoints, local security forces and residents were also asked about which crop types were preferred for smuggling (Table 5). The analysis index result indicated

that cereals and legumes (0.22) were given top priority by traffickers, whereas the second highest (0.20) preference was given to beverage crops. Vegetables, fruits and other plants were also trafficking in a considerable amount. The result indicated that top preference for smuggling was given to staple crops. Unauthorized cross border trade is governed by demand and supply of required genetic resources. Cereals and legumes were trafficking in larger quantities because there is enough market at their final destinations. It also depicted that traffickers were obtained substantial profits in smuggling of cereals and legumes compared to other type of crops.

There is worldwide recognition that illicit trade is a menace to public health, national economy, peace and stability of countries. Determine primary focus of law enforcements in checkpoints (federal police and custom officers) on fighting of illegal movement of agricultural products would crucial. Respondents in checkpoint were asked on what is their primary target as law enforcements in custom checkpoints (Tble 6). Law enforcements in checkpoint were given top priority in combating of trafficking of illegal industrial good (0.24) followed by smuggling of drugs, animals and illegal trade of crop genetic resources (0.19) in in the study area. Thirdly, the major focus of law enforcements (0.18) was dedicated to monitoring of illegal money circulation. Thus, the result indicated that the major focus of law enforcements was dedicated to industrial goods rather than monitoring sovereign rights of crop genetic resources. It indicated that the demand and the direction of law enforcements in checkpoints were addressing interconnected threat of industrial goods smuggling and utmost efforts were exerted on it. This implied that there is a knowledge gap among implementers in checkpoints and it requires awareness creation and training for them. The training will enhance capacity and aware the basic rules for conducting counter biogenetic resource trafficking in cooperation with communities.

Volume of Illicit Biogenetic Trade in Western Tigray, Ethiopia:

The cross border trade of Ethiopia and Northern Sudan is unattractive particularly to petty and small scale traders located around the border because of unclear police directions and structural problems. In line with this perception Habiba [8] reported that formal trade among African countries is constrained by several factors mostly coming from supply demand side (border tax adjustments and subsidies, import quotas, countervailing duties...) and technical barriers (phytosanitary measures, rules of origin and standards...). Respondents claimed that since recent

Table 4: Severity Level of Crop Genetic Resources Targeted for Trafficking

Severity level	Variables				
	Cereal Crops	Legume Crops	Beverage Crops	Fruit Crops	Vegetable Crops
Don't Know	-	-	1	4	-
Low	-	1	2	2	1
Medium	2	2	4	1	2
High	1	5	1	-	2
Very Serious	13	7	5	2	3
Index	0.26 (1)	0.25 (2)	0.21 (3)	0.15 (4)	0.13 (5)

Sources: Own Survey Result, 2017

Table 5: Perception of Local Security Forces (Militia) and Residents on Smugglers Preference of Various Crops for Trafficking

Ranking	Variables					
	Cereals	Legumes	Vegetables	Fruits	Beverage	Others Specify
R1	22	9	-	-	12	-
R2	6	16	7	7	-	0
R3	1	9	9	6	13	8
R4	-	9	9	4	1	2
R5	6	1	-	5	7	1
R6	-	-	-	-	-	-
Index	0.22 (1)	0.22 (1)	0.16 (3)	0.14 (4)	0.20 (2)	0.07 (5)

Sources: Own Survey Result:2017

Table 6: Priority Target for Law Enforcements and custom officers in Custom Checkpoints

Ranking	Variables					
	Trafficking of illegal industrial goods	Smuggling of drugs	Smuggling of animals	Illegal currency circulation	Illegal trade of crop genetic materials	Others specify
R1	14	9	11	10	11	2
R2	-	3	2	1	2	-
R3	2	3	1	-	2	-
R4	1	-	3	2	-	-
R5	5	2	-	2	2	-
R6	-	-	-	1	-	-
Index	0.24 (1)	0.19 (2)	0.19 (2)	0.18 (3)	0.19 (2)	0.02 (4)

Sources; Own Survey Result: 2017

past small scale traders in the area were abandoned by law not to take part in cross-border trade and only guaranteed to large scale exporters. The intervention of government in cross-border trade has created many bureaucracies on issuances of visa, export clearance, taxation and restrictions on vehicles packed with goods to be exported were the rationales in growing unauthorized cross-border trade [9]. In addition, lack of road and financial infrastructure exacerbates the illicit trade in the border areas and poses difficulties in its management. Especially when illicit trade is taking as a means of livelihood among communities, unemployed youths, traders, middlemen, farmers, ordinary residents and market service providers directly or indirectly challenging to retrieve into normality. All the above depicted factors pushed local communities to engage in

illicit cross border trade, which currently observed beyond the control of the government and affected the economy of the country.

Even though the secondary data obtained from Humera revenue and custom branch office serves to show severity of illegal business deals and consequently drown socio-economic impacts in the Ethiopian; this only cannot magnifies amount of smuggled within the confined timescale. The table 7 though it is not taken as an entire representation of quantity of smuggling; part of the data which was seized when tried illegally crossed into neighboring countries without the consent and knowledge of the Ethiopian government. Level of smuggling in study areas was found worst and needs to pay due attention by the government and other stakeholders to address such critical problem.

Table 7: Trends and level of biogenetic resource confiscated in Humera custom branch office while attempted to smuggling

Crop type	Quantity of confiscated in Kg for last 5 Years in Humera custom branch office									
	2012/2013		2013/2014		2014/2015		2015/2016		2016 six months	
	Kg	Birr	Kg	Birr	Kg	Birr	Kg	Birr	Kg	Birr
Tef	16	160	11,740.0	120,300	36,260	362,600	62,345	752,830	1,100	15,400
Sesame	24	624	115	2,300.0						
Faba Bean	90	900	23	115.0	3,186	19,396	518	5,403.60		
Field pea	30	450								
Chickpea	376	4,120	90	1,350.0	630	6,300	95	1,420.25		
Grass pea	0	0	1382	7,519.0						
Lentil							265	15,694.62		
Fendisha							15	172.5	20	200
Coffee	128	7,840	353	13,376.0			1344	96,055.01	629	29,245
Pepper	5074	87,180	46	460.0			90	4,140.0		
Potato	0	0	03	6						
Black Cumin	45	1,350	15	450			290	14,500		
Sorghum							25	70		
Ginger	1596	27,865	42	840.0	400	12,000				

Sources; Ethiopian Custom and Revenue Authority Humera Custom Branch Office Accessed, 2017

Based on secondary recorded information obtained from the Ethiopian revenue and customs authorities report from 2012/2013 to 2016 Humera branch, proportions of these genetic resources were significantly varied and greater than 93.93% of seized commodities were raw tef whereas second largest recorded 3.92% was raw pepper. Other raw crops such as faba bean, coffee and ginger were having a percentage share of 2.87, 1.85 and 1.53% respectively. In 2012/2013, illegally smuggled biogenetic resources worth of 130,489 Ethiopian Birr was seized and in the remaining four years the value was increased by 582.3% and reached around 890,286 Birr (Table 7). Only 1,567,787 worth of Ethiopian birr contraband biogenetic resources were confiscated, sold and deposited into the government bill.

It is obvious that accurate quantification of the magnitude of illicit biogenetic trade in Kafta and Setit Humera districts were quite difficult due to its covert nature of smuggling. But considering the quantity of confiscating in custom checkpoints, it is simple to estimate that the extent of illegally crossed biogenetic resources assumed to be comparably greater than the quantities seized by the authorities. Bulks of crop biogenetic resources confiscated in Humera custom branch office, which indicated as major indicators of severity of illegal trading in the study area. In accessing point of view, does not matter only with the quantity of each crop resource smuggled but also highly concerned with the fraction of biogenetic resources crossed without binding agreements and mutual cooperation of neighboring countries/or traded countries. Generally,

illegally crossing crop biogenetic resources in neighboring countries had been by far greater than the report of seized by Humera revenue and custom branch office. Large scale trafficking of crop genetic resources impedes final productivity, brought income inequality and limits expansion of agro-processing industries in Ethiopia.

Limitations in Deterring of Smuggling: Ethiopia is among few biologically diverse and genetically rich countries of the globe. A substantial number of food crops, beverage crops, medicinal plants, live animals and other living organisms profoundly found in this country that retains desirable characteristics of high yielding, drought and disease resistance, early maturity, strengthen and curative quality which have a potential to provide high profits. But unauthorized crossing of biogenetic resources to neighboring countries of Eritrea and Sudan is obviously affecting the national interest in access and sharing benefits obtained via using our biogenetic resources. Even though a lot of endeavors were exerted in controlling and monitoring illegal biogenetic resources trafficking across national border of Ethiopia; still a substantial quantity of biogenetic resources was crossed unauthorized to these neighboring nations. Presently deterring unauthorized movement of biogenetic resources in western Tigray had a number of limitations and the major ones are:

Presence of Blood Relations and Neighborhood of Illegal Traffickers and Local Law Enforcements: Most smugglers were born and grow up in Setit and Kafta

Humera districts and have strong blood and social ties with community. Local security forces dictated that arresting suspects and confiscating of agricultural commodities used to be found in smuggling was difficult due to the existence of strong social connection between traffickers and the community. Likewise, another challenge roused was free released of suspected with different undefined reasons following arrests in front of the law affects moral and motivation of local law enforcements. Additional blaming and out casting with their beloved relatives and friends was also an extra burden to them and their cooperation in the work. Local peoples participated in trafficking were also served as agents for those coming from another part of the country for this purpose. According to local security forces there are many traffickers from almost all parts of Ethiopia in the study area for this purpose and used local poor and unemployment youths as agents for illegal trafficking of agricultural products out of Ethiopia.

Indirect Involvement/Intervention of Government

Authorities: Significant number of smugglers was boosted with their relatives and business partners potentially influencing government authorities or business partners who twisted decision of law enforcements. The major means of exercising was leaking of confidential information to traffickers and enable to shift their route of smuggling and paves a smoothly road of exit to their destinations without legal permit. The other indirect involvement of individuals those who are in a government position were providing of legal permit for unrestricted passage of crop biogenetic resources through custom checkpoints. Biodiversity rich part of the world implements conventions on biological diversity to safeguard and monitored their plant genetic resources as state of sovereignty and considers the legal justification in access and utilization of them. The indirect involvement of individuals those of who are in a government position violating conventions on biogenetic resources of access and benefit sharing and the act is also breached legal limit to be exercised by legal providers. Worldwide convention on biological diversity indicated that accessing of plant genetic resources requires prior informed consent and joint agreement through negotiation with countries of origin before transferring the genetic material [10]. All negotiations and agreements should be done under the umbrella of access and benefit sharing frameworks of Nagoya protocol on the conventions of biological diversity [11].

The Existence of High Unemployment Rate: The number of unemployed youths significantly high and exacerbated illegal accessing of crop genetic materials to third parties without consent and knowledge of concerned entities. Youths in both Setit and Kafta Humera considered illegal smuggling of biogenetic resources as basic means of surviving and the ultimate source of income to their livelihood. Unless alternative job opportunity is not providing for youths in the study area, tackling of illicit accessing of biogenetic materials to other countries will not be ceased. Based on observation during this assessment availability of suitable area for smuggling in addition to unemployment rate maintain momentum of smuggling and keeps attracting individuals to engage in this practice. The youths in the study districts usually purchased biogenetic materials either from local market or from other parts of Ethiopia and packed in *Jerikanto* make suitable for transport in crossing of Tekeze River. Even though youths employed different transport systems like motor vehicle, equines and camel; most of them utilized their shoulder to smuggle up to 40kg of genetic materials to the boarder.

A Porous Border Area difficult to Control by Security Forces Due to Extremely Larger Terrestrial Border Line with Both Sudan and Eritrea:

The landline border to Eritrea and North Sudan is extremely longer, which poses difficult to watchdogs with border patrol and law enforcement forces. An undulated feature of the landscape with the availability of larger galley and higher coverage of forests creates an advantage/opportunity for smugglers to trafficking the genetic materials without any big problem. The other problem was the suitability of the area for motor riding by smugglers and difficult to trace them with vehicles by security forces. Because of the disclosed facts confirmed by the respondents, smugglers utilizes the existing natural barrier as an advantage and generates business in trafficking with the aid of motor vehicle, equines, camel and human shoulder. It was the usual event, witnessing of traffickers accidentally chased by security forces to confiscate the biogenetic materials intended to be smuggled.

E-Crime: The peoples involved in illicit trading were considered as users of high speed network SIM card coming from north Sudan, which functions better in Setit and Kafta Humera districts. Security forces and custom administrators were found under pressure to monitor such peoples in effective and efficient manner to address the

threat and protect society posed by illicit trade. Smugglers were taking an advantage of Sudan's network functions in border and easily access of SIM cards to meet buyers and to make counter-intelligence against law enforcements. Hence, smugglers also committed e-crimes which pose a great challenge for their identification, disruption, close monitoring and brought them into justices.

High Income of this Illegal Trading Attracts Traffickers' Attention into These Businesses: According to the information received from the respondents in the study districts, if one trafficker was successful in smuggling of biogenetic materials into Sudan and Eritrea, it can make a profit in the range of 600-700 Ethiopian Birr per 40kg of crop genetic materials. It indicated that how much the business is profitable and youths can earn such amount of money per day with the above a specified quantity of smuggling of crops. Profitability is not solely dependent on quantity of smuggling and fetching higher price of agricultural commodities in market of neighboring countries but also benefited from currency exchanges. Traffickers were not only benefited from smuggling of agricultural commodities but also involves in illegally importing of different industrial products mostly from Sudan to Ethiopia. Hence, traffickers illegally supply agricultural products like tef, faba bean, field pea, chickpea, pepper, garlic, potato, coffee, *gesho* and spices to Eritrea and Sudan and in return they brought mobile phones, hand watch, radios, tapes, detergents, clothes and other related industrial products from Sudan to Ethiopia. Therefore, based on respondents estimation, successful trafficker can earn more than one thousand (>1000) Ethiopian Birr per day from both illegally smuggling and importing of agricultural and industrial products respectively.

Lack of Taking Therequired Actions Measures Against Illegal Traffickers When Attempted to Smuggling Forcefully Onaround the Border: Even though smugglers were not armed with machine guns to cover cross the border in fighting, lawless has been widely seen while attempting to smuggling. When security forces were approaching their position and asked to surrender unconditionally, they were not willing to do and started to run to escape from them. During this time security forces were hesitating particularly militias to take the required irreversible actions against smugglers. Hence, smugglers understanding the heartbeat of the security forces and endures them dare to run on bare foot

and using motor vehicle when law enforcements were seen in a distance without fear of life threatening actions. Border patrol with security forces simply will not bring significant influence on action and movement of smugglers unless required legal and physical measures will not be considered to practices against smugglers.

Legal Coverage: Youths in Setit Humera town were organized and form a cooperative of livestock fattening at kebele 01 which is located on the river bank of Tekeze border to Eritrea. According to the respondents, the activities of are not limited to livestock fattening, rather they are involved in illegal smuggling of agricultural commodities mostly tef towards Sudan and via Sudan move to Eritrea. Youths used the cooperative as a legal coverage of smuggled and stored unauthorized agricultural commodities. Furthermore, respondents observed that there a number of livestock fattened by these cooperatives, but they claimed that they did not supply to the local market, rather they smuggled directly to Sudan and then Eritrea. It also poses problems to security forces to monitor in border because these smugglers have legal entity and have a right to take their livestock into the riverbank of Tekeze which in the way covertly crossed to Sudan.

The other stated problem was exporters' exports tef, legumes, coffee, pepper and other agricultural products directly to Sudan without legal permission from the Ethiopian biodiversity institute (EBI) but holding export license. What was observed that law enforcement do not capture or confiscate agricultural commodities with custom clearance and have export license, regardless of required permit to access these crop and livestock genetic materials from a concerned party (EBI). Hence, crop and animal genetic materials illegally access to other countries and the benefits obtained from using these resources would not be shared in the future. It did not give a sense whether illegal traffickers were smuggled these agricultural genetic materials to other countries or not because these materials were legal exported without knowledge of the Ethiopian biodiversity institute and sign binding mutual agreements on how to access and sharing the benefits.

Poor Awareness of Smugglers, Law Enforcements and Residents on Impact of Illegally Trafficking Biogenetic Resources on Access, Benefit Sharing and the Overall Socioeconomic Impact on the National Economy and Sovereign Rights: During this assessment time the researcher learnt that law enforcements and the general

public have no idea about what biogenetic resources mean and convention on benefit sharing from these resources. When biogenetic materials need to be accessed to other countries, there need to be signed an agreement with the concerning body like the Ethiopian biodiversity institute that provides a letter of permission to pass custom checkpoints. Hence, custom and law enforcement personnel's should have to check exported biogenetic materials holding a letter of permission to pass checkpoints and transferred to third parties by a concerned entity of the Ethiopian biodiversity institute in vis-à-vis to having export license. But practically in custom checkpoints located northwestern Ethiopia, exporters did not ask letter of permission to pass checkpoints probably due to awareness problems. Therefore, the institute should organize an awareness raising campaign, particularly to custom checkpoint personnel and law enforcement first and then to the general public. The awareness raising should be focusing on what biogenetic material means, what adverse impacts are there when illegally accessed in other countries, what criteria are needed to pass custom checkpoints and which institution in the country is responsible to permit legally pass of these biogenetic materials.

Disregard and Poor Attention of Low Enforcement:

Western Tigray is located in volatile zone of Ethio-Eritrean border where a number of anti-peace elements were frequently crossed and posed problems. The Major focus of law enforcements in the area was mainly on maintaining peace, stability and security of local residents. This implies that the issue of illicit trading of biogenetic material oriented from agriculture accessed illegally to other countries is entirely disregarded or given less emphasis. This is also another rationale that traffickers were boosted to smuggle genetic materials to other countries without fear of law and some life threatening actions against cross national boundaries illegally withholding of valuable resources.

The tackling of biogenetic resource smuggling by law enforcements is tedious work and requires facilities to effectively address the menace and relieved associated socioeconomic complications. Captured illicit traders by both federal police and customs authorities across Setit and Kafta Humera districts were limited in practice. Respondents noticed that long and plain border of Ethiopia to Eritrean and Sudan, logistics problems, benefit sharing of border patrols and poor cooperation of local residents with law enforcements have debilitated their capacity in controlling of cross-border trade. Federal

police and custom officers tasked with enforcing of illicit trading in the study area where chronically found poorly resourced to fight smugglers and effectively implement their job. Respondents in custom checkpoints verified that one of their major problems for the struggling of trafficking were unavailability of field vehicles to act rapidly and cover vast areas in patrolling. Unless the required logistics like vehicles is not alloted to law enforcements, the required change will not be come in this regard and momentum of illegally accessing of valuable genetic resources out of Ethiopia will highly exacerbate. Therefore, local residents and traders located in the study area will continue to buy plant genetic resources either from around the study area or other parts of the country at a low price and sell at higher price in nearest border town of neighbor countries. On the way back smugglers will bring industrial products illegally with lower price and sell at higher price in the study area, which affected legal traders in particular and the economy in general.

Counterintelligence: Security forces conducting personal surveillance on suspected smuggling routes and collecting intelligence information from communities in order to efficiently deterring of illicit biogenetic trading. Most of the time security forces were not successful in founding of traffickers because of poor collaboration with local communities and counter intelligence of smugglers. Traffickers take advantage of being a member of the community to collect sufficient counter intelligence information about position of security forces and always keep changing routes of smuggling. Hence, traffickers obtained adequate information on about the position of security forces and used that information for the purpose of smuggling in a successful manner. Hence, participation and involvement of local residents in hiding of commodities and traffickers adversely affect the mission of law enforcements. The indirect and direct involvement of local residents in illicit trading severely affects monitoring of traffickers and unauthorized accessing of biogenetic materials. Therefore, detachment of traffickers from the community requires unreserved efforts from all stakeholders in terms of awareness rising in related to economic and political consequences of illegal accessing of genetic resources.

Community participation in controlling of illicit trading is crucial for enhancing the effective operation and assuring disseminating of required information within the community that leads to responsiveness for better action. Motivating the communities to work together and established a sense of ownership towards biogenetic

resources trafficking for genuine cooperation mainly for the betterment of their own life and their communities is required the action and attitudes of the custom branch office. If the revenue and custom law enforcements fill local residents are helpless in fighting against illegal biogenetic trafficking, then residents keep acting as if they are acting. Hence, enhancing participation of communities in the illicit trading protection contributes prominently in monitoring and controlling of smugglers in effective manner. Switching local community's attitude to make required decisions and judgments based on own circumstance and conditions is remain job to do by stakeholders (law enforcements, custom officers and revenue authority of the region).

CONCLUSION

The cross-border trade was usually conducted in smaller quantities to avoid attentions when attempted to pass the national border and reached required destination. Smugglers involved in illicit trading, trafficked considerable amount of biogenetic resources in smaller quantities to cross via unofficial crossing routes. It was conducted in most time of a year repeatedly, to deliver biogenetic resources to the nearby border town of neighboring countries and receivers piled it until reasonable volume is reached. Most youths in the study area were living with families and get boring with this dependency life and looking for whatever alternative jobs that may assist in escaping from the existing socioeconomic crisis. Several numbers of youths in western Tigray were shifted into the illegal trade with hoping that earning income to support their life. These youths were frequently crossed national borders holding illegal biogenetic resources for sale in neighboring countries and return with industrial products to resale. It was understood that involving in illicit biogenetic trade activities were significant and has immense contribution to household welfare. Thus, developing appropriate policies to address the illegal smuggling in a proper manner in order to positively contribute on local food security and livelihood of unemployed youths is quite crucial. Additionally, development of market and road infrastructure and investing in agro-processing industries, which greatly contribute to poverty reduction and generates alternative job is not a work left undone for tomorrow.

Authors' Contributions: The first author performed the field study and analyzed the data and wrote the

manuscript. The second author performed in the analyses of the data and revised the manuscript and gave substantial input. All of us read the final manuscript and agreed on its submission.

Ethical Approval: This article does not contain any studies with human participants or animals performed by any of the authors.

Conflict of Interest: The Authors declare that we do not have any conflict of interests.

ACKNOWLEDGEMENTS

The researchers would like to thank to the Mekelle Biodiversity Center of Ethiopian Biodiversity Institute for their financial support. We are also grateful to all the participants-of the community, custom officers and federal and local law enforcements that through their active participation in the interview have made this assessment possible.

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