



ESAP Newsletter

Issue No. 19, 2008

Ethiopian Society of Animal Production

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CHALLENGES AND PRODUCTION POTENTIAL OF THE FISHERY SECTOR IN ETHIOPIA

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Ethiopia is endowed with considerable water resources and wetland ecosystems, which includes twelve river basins, eight major lakes, many swamps, floodplains and man-made reservoirs (EFAP 1989). Lakes cover a total area of about 7400Km². Minor wa-



Fishing in Lake Hawassa, courtesy Zelalem Yilma

ter bodies such as creator lakes, dams and reservoir, occupy total area of about 400km². There are twelve

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FISHERY RESOURCE AND ECOLOGICAL CHANGE

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The Ethiopian rift valley is characterized by a chain of lakes which are known for their

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EDITORIAL

Dear ESAP Family,
And here we are with the 3rd quarter issue of the ESAP newsletter focusing on **Fisheries and Aquaculture: where are we?**

On the July 6, 2008 issue of Ethiopian herald an article on fisheries entitled *Fishery Reels in over Half a Million Dollars*, was published. According to this article Investors licensed with a nearly 107 million Birr outlay have been engaged in fishery in Amhara State. Furthermore, Alemu Admas, Bureau of Agricultural and Extension Work process owner stated that eight lakes, including Tana, 18 rivers, six dams and 110 man-made ponds have the capacity of producing over 288,000 quintals of fish annually. Combined, the four entrepreneurs have produced about 37,826 quintals of fish this budget year. This article also discloses that the investors, who purchased a government owned fishery enterprise, have earned 575,770 dollars in the last eight months alone form exporting 2,958 quintals of fish to Sudan. Upon going fully operational, the processing and manufacturing factories could effectively and properly utilize the abundant resource.

The above article says a lot about the countries fisheries resource and potential and also that the projected statistical calculations are attainable if we keep on working on this specified field in the next few years. Couples of articles are presented with a very interesting analysis of the whole nation and specific lakes regarding the resources, potential and opportunities of the countries fisheries industry.

Further more timely and entertaining articles contributed by many members and non-members of ESAP are incorporated in this issue. It's with the effort of all members that ESAP is going up the ladder so fast, and the editorial board of the Newsletter says thank you and keep on being active contributors in the future!!

THE PROJECTED MINIMUM DEMAND FOR FISH CANNOT BE MET FROM CURRENT FISH SOURCES

Workneh Ayalew workneh.ayalew@nari.org.pg

While the national per capital fish production average stays at less than a quarter of a kg per person per year, according to the FAO fisheries database, in fishing communities the annual fish consumption was observed to exceed 10 kg/person, indicating that increased supply of quality fish can encourage progressive expansion of average consumption in the country. In 2001, the current annual minimum demand for fish in the country was estimated to be equivalent to 1 kg/person, or about 65.3 thousand tonne. At this rate, population growth alone will push the national fish demand to over 83 thousand tonne per year by 2010, and 117.6 thousand tonne in 2025. Rise in income, increasing prices of competitive products (red meat, dairy products), and improvement and expansion in fish distribution or supply networks and improvement in fish product quality are expected to increase the projected demands by as much as 15 to 20 percent.

Ethiopia's fish production comes from waterbodies of inland (Rift Valley and other lakes) waterbodies, reservoirs and ponds covering about 6 thousand square km and over 7 thousand km of rivers. These resources have current annual total fish production potential of just under 52 thousand tonnes, but based on estimates made back in 2001, only about 30 percent of the calculated potential is harvested, hence capital fish production of less than a quarter of one kg per person per year. This may have increased in recent years due to greater private sector participation, specific project assistance and increased interest in water harvesting. Even if the annual total exploitable fish potential (of 52 thousand tonnes) was fully harnessed, this could meet only 79 percent of the current actual demand in 2001, 55 percent of the projected demand in 2010, and 44 percent of the projected demand in 2015, assuming constant human population growth and fish consumption rates.

In view of this, the present fish supply sources are unable to meet the minimum demand. This calls for an increasing focus on enhancement and stocking of artificially made ponds for smallholder freshwater

pond aquaculture. The country has potential for extensive aquaculture development. The agrarian economy also provides opportunities to develop suitable feeds to encourage small-scale commercial aquaculture. Commercial aquaculture for export also appears promising. In fact smallholder aquaculture can be promoted as part and parcel of rural development strategies.

It may be argued that the rather conservative food culture and the preference for red meat may discourage commercial smallholder aquaculture in the country. At least in areas and communities where there is regular and sufficient supply of fish, eating habits of Ethiopians has been noted to be shifting in favour of fish. The notion that aquaculture in Ethiopia remains more potential than actual practice should be seriously challenged. The real constraints to development of inland aquaculture are lack of technological options, limited market infrastructure, poor transport and communication networks and very nominal development support from the public extension services.

THE NUTRITIONAL VALUE & HEALTH BENEFITS OF FISH

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Over 70% of the planet is covered with water which harbors diverse flora and fauna of economic significance for humans. In contrast with the vast marine waters the inland freshwaters constitute only 3% of the world waters. Both marine and freshwater bodies harbor a diverse fish fauna which serve as sources of high quality animal protein in general.

Fish can be harvested either directly from capture fishery or from fish farming. The harvest from the wild has progressively declined globally. On the other hand, the production from fish culture has steadily risen in the past two decades. It is hoped that intensification of

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FISHERY RESOURCE *continued from page 1*

ecological and economical importance. Most are best tourism attracting sites and have ample fish fauna. Of these lakes some are under dramatic change due to direct and/or indirect human involvement: Fluctuation in water volume, pollution from industries and municipalities, siltation from degraded catchments and other anthropogenic factors are the real threats of our inland fresh water resources. For instance, Lake Abijata is one of the middle rift valley lakes which is shrinking dramatically, whereas Lake Beseka is expanding from time to time.

Change in water volume has great impact the water chemistry which results change in the biodiversity found in the Lake. Currently, due to change in water chemistry of Lake Abijata, there is no fish and fishing in the lake. On the other hand lake Beseka has shown an increase by 39 km² within 30 years (from 1960s-



1990s) and its current volume is 42 km². The probable causes are due to surface runoff, groundwater flux from percolated irrigation water and submerged numerous hot springs.

Lake Beseka is located 200 km from Addis Ababa on the way to Djibouti. The lake is found in the middle rift valley south of the volcanic Mount. Fantale at 955 m above sea level. It is known by its water chemistry alkaline (pH = 9.5), saline (electrical conductivity: 6.3 mS/cm) and by the presence of numerous hot springs. The Lake is rapidly expanding which has severe implications on a major highway and a railroad run along

lake Beseka's northern shore, sugar plantation south of Beseka and to the near by towns, Metehara. To control the lake level, 8 electrical water pump having discharge capacity of 166lit/sec-300lit/sec are planted west of Haro Adi town. These pumps are used to pump the lake water into the river Awash keeping 2% of the lake water by volume. However, the water chemistry of the lake can affect the hydrochemistry of the river and the ecosystems downstream in the long run.

Lake Beseka has beautiful physical appearance and useful biodiversity. The hot spring found at the south-west is supposed to treat neurological disorders and rheumatic pain hence taken as thermal therapy. Beseka harbours two commercially important fish species (Cat fish and Nile tilapia), Crocodiles, alligators and beautiful birds. The fish resource of the lake is estimated as 205 tones per year and current production does not exceed 15-17 tones per year by 30 permanent fishermen. The water is not used for drinking purpose both for human and domestic animals being in area where water shortage is crucial. However, it is known by its bleaching power and can be said principal laundry for dwellers of Matahara town and the surrounding Karayu community.

Lake Beseka has got little attention by the local administrative bodies and the Karayu community probably due to its water chemistry. Local administrative bodies have organized local people to wash cars on the Lake and there are seven car washing sites on the northern shore of the lake few kms from Matahara. Cars contaminated with a number of chemicals, oils, greases and other substances are washed in the open lake. Grease and oils taken by wind to the southern shore of the lake was observed covering the water surface. This reduces the amount of dissolved oxygen in the water which is fatal for all aquatic flora and fauna. Further more, this contaminated lake water might have great impact on productivity of river Awash and on life depends on the down stream of river.

Resources in the lake are also not considered as valuable. Fishermen work-

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SOME HILARIOUS ACCOUNTS FROM MY FIELD RESEARCH

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When you carry out a participatory research you get a bunch of information. The scope of many of scientific publications may not allow you to report everything. I have conducted my doctoral research on small ruminant production systems in two areas of Ethiopia, namely Adilo and Kofele. Let me share you few amusing accounts I have had in my field study. Ready?

How do I start? Ok...Farmers in Adilo reported the medicinal value of goat milk. It is normally provided to small children, old and sick people having in mind this special attribute. Yet, it is not devoid of shortcoming. The key informants alleged that drinking goat's milk make children more aggressive and argumentative than the other group of children. I will be

very much stunned if I encounter any scientific item that will support this notion.

During a group discussion in Adilo, some key informants gave an account that dead body of small ruminants particularly those suspected of serious diseases like anthrax would be given to the marginalized local potters who are normally in lower social class of the caste system in the area. When the key informants asked about how those local potters could resist the effect of fatal diseases like anthrax, they said "*These people put the blood of the animals died of anthrax in the scratched part of the tip of the fingers of small children. Then the bodies of the children would be wounded and produce lesions. But after those wounds get healed, there will be no problem when they eat the meat of animal died of anthrax.*" The whole story was a long way from being

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Ethiopian Society of Animal Production (ESAP)

16TH ANNUAL CONFERENCE

Theme: **Commercialization of Livestock Agriculture in Ethiopia**

Date: **October 8,9,and 10 2008**

Venue: **Ethiopian Institute of Agricultural Research (EIAR),
Headquarters, Addis Ababa**

The 16th annual conference of ESAP will focus on:

- Increase the market competitiveness of livestock and livestock products
- Better policy interventions for meeting local and international market specifications and opportunities
- Enhanced quality and reduced losses in livestock products
- Competitive and sustainable market oriented livestock production
- Better livestock marketing information system to reduce the gap between demand and supply

THE NUTRITIONAL VALUE...

Continued from page 2

aquaculture appears to be the best option to meet the growing demand of fish in the future. In Ethiopia fish production either from the natural system or fish farming is comparatively low when compared with other African countries and the Sub-Saharan Africa. However, despite the poor fish eating habits and low level consumption, the demand for fish even in our country is growing nowadays especially in larger cities and the capital, Addis Ababa.

Fish are preferred to either beef or mutton, and this might be due to the high nutritional content of protein and quality lipids in fish.

The high nutritive value of fish originates mainly from the composition and contents of its lipids. Lipids in are biochemical esters of fatty acids and glycerol. Based



Fresh fish from the lake: Courtesy Zelalem Yilma

on their carbon chains and levels of unsaturations, fatty acids can broadly divided as saturated fatty acids (SAFA), monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA). The quality of lipids depend on the proportion of unsaturated long chain carbon fatty acids mainly PUFA. Among the $\omega 3$ PUFA, the 20 carbon eicosapentaenoic acid (EPA) and the 22 carbon docosahexaenoic acid (DHA) are biologically important molecules. The contents of $\omega 6$ PUFA such as arachidonic acid also affect the lipid quality.

From medical point of view, the lipids are grouped as good or bad lipids based on the levels of PUFA, MUFA and SAFA. Good lipids contain more PUFA whereas bad contain more saturated fatty acids. Cattle and other land animals by and large contain more bad fat (SAFA) and less (PUFA), where as aquatic animals such as fish contain more PUFA and less SAFA. Epidemiological surveys and studies showed that people with more fish eating habits in their diet are reported to be less exposed to heart disease, and cardiovascular

complications. This has been well established on earlier scientific results reported based on data obtained from Greenland Eskimos. The low incidence of coronary heart diseases in Eskimos has been attributed to the high intake of fish rich in $\omega 3$ poly-unsaturated fatty acids (PUFA). Later studies also supported earlier reports and confirmed the role of PUFA of fish and other aquatic animals in lowering the risk of heart problems in humans. In addition, the $\omega 3$ PUFA are important for normal growth and healthy development of the nervous system in fish and other animals. That is why parents are advised to feed children with fish oils for their health and normal development.

Investigations on the contents of lipids in fish have been documented for marine and temperate fish. Similar data on the lipid contents of tropical fish mainly from Africa are very scarce. However, there are only few investigations reported on Ethiopian fish of commercial importance so far (Zenebe Tadesse et.al.,1998A & B). This study showed that tilapia, catfish and Nile perch sampled from Ethiopian lakes contain quality lipid rich in $\omega 3$ PUFA, mainly EPA and DHA. The amount of PUFA analyzed from Ethiopian fish was found to be comparable with their temperate counterparts. Very recently, the lipid quality of tilapia collected from highland lakes showed unusually high levels PUFA and this was attributed to the composition of fish diet. These studies provide base line feed information for the aquaculture industry to produce fish with high quality lipids of the required standard for human health.

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complications. This has been well established on ear-

CHALLENGES AND POTENTIAL *Continued from page 1*

river basins in the country that stretch over a total length of 7000km. These water bodies are home for more than 183 fish species that are economically and ecologically important to the country (Sheberu Tedla, 1973). The fishery production potential of the major water bodies of Ethiopia is estimated to be 40, to 50 thousand tons per year. Beside the capture fisheries (fish catch from natural water bodies; lakes and rivers) the country has huge potential for aquaculture development through out all the regions.

Food production in most part of the world is not on a par with human population growth. Therefore, in addition to increasing agricultural production, it is necessary to search for alternative food source. Exploitation of aquatic ecosystem, particularly fishery is a well-developed activity in several part of the world. Specially, in countries like Ethiopia, where there is sever shortage of food, the country should utilize its divers resources in a sustainable way. In this regard aquatic ecosystem can serve as cheep source of animal protein (fish) and needs to be exploited so that the problem of food shortage can be alleviated.

Despite the huge fishery production potential, both from capture fisheries and aquaculture sector had been given less attention so far in Ethiopia. This was attributed to the poor fish eating culture of the society coupled with the low attention given to the sector. For this and other minor reasons the country was not benefited from this sector. Currently the situation has changed and showed some improvement in research and development of the sector. Moreover, the local demand and consumption of fish has risen a great deal in major cities. Ethiopia has started exporting fish as reported export commodity list of the country. This means the county started benefiting from the sector both in terms of food security and foreign exchange than ever before. As a result investors are highly attracted to the fisheries business. However, fishery sector still has several problems and challenges which need collaborative efforts from expertise, policy makers, governmental bodies and the private sector. Among the several problems in the sector some of which include:-

Over exploitation of the capture fishery specially on those lakes which are located in over popu-

lated areas close to the main roads are affected by over fishing due to the usage of destructive gears and lack of proper management scheme. On the other hand there are several areas where the resource is under utilized or even untapped due to lack of awareness.

Aquaculture, specially fish farming is well advanced venture in several part of the world, but it is in its infancy stage in Ethiopia. Farmers and local investors lack confidence to engage in this particular sector despite its productivity and profit.

There is shortage of trained personnel and training institutes in the country in general.

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BEST PICTURE OF THE MONTH



Lake Side Grazing, Hawassa

Courtesy:Zelalem Yilma

FISHERY RESOURCE... *continued from page 3*

ing on the Lake usually do not harvest the abundant Nile tilapia due to their small size. Their attention is only the cat fish which has good market demand in the area. There is interesting complex food chain between the organisms living in the Lake. Fishermen are interested in catching the cat fish using the small tilapia as bait. However, the cat fish do not feed on the dead tilapia as the live and fresh one is in excess. The fishermen diverted their attention to use small frogs (locally called Kastos) as bait. The frogs have shown success in attracting the cat fish but crocodiles in the water eat the caught fish from the hook. Some of the Crocodiles are found dead while eating the caught cat fish from the hooks. Some fishermen use gillnets and beach seine on few selected sites, but crocodiles are big obstacles to fish with these fishing gears. A number of crocodiles can be caught with single catch and the crocodiles can completely damage the net material when entangled. Moreover, a number of crocodiles die due to car accident while they cross highway and a railway along the northern shore of the Lake. It is believed that the present improper utilization of water will certainly lead to irreversible damage on the fragile rift environment.

In general, Ethiopia has huge aquatic resources which are not yet utilized. The agro ecology is conducive both for culture and capture fishery, However, Culture fishery is not yet started and the capture fishery has numerous bottlenecks; Lack of infrastructure, eating culture, market, and attention are some of the many problems.

PROJECTED MINIMUM.... *Continued from page 2*

Given that the mode of production is predominantly artisanal, involving some 15 thousand fishers (only a third of which are considered full-timers), that use primitive locally produced wooden boats and a variety of gear including traps, spear, gillnet and beach seine, and hooks, there is enormous room for improvement by investing in more efficient fishing methods including motorized fishery. But this requires a radical departure from the prevailing extension support that has mainly emphasised extensive aquaculture in the form of stocking and enhancing artificial lakes, reservoirs and small waterbodies.

Globally aquaculture is recognized as an alternative means of achieving food security and poverty reduction in the rural area, and is now considered an integral part of rural and agricultural development policies and strategies in many developing countries, particularly in the densely populated, low-income countries of south-east Asia. Wet agroecologies of the country, particularly the humid highlands and humid lowlands of western Ethiopia with conducive natural water cycles need to be explored for opportunities in smallholder pond fisheries. The numerous upcoming large and small projects on irrigated agriculture and water harvesting also offer opportunities for integrated commercial fish farming. The major constraints to fish culture development at smallholder farmers level have been identified earlier (e.g. Eshete Dejen, 1999) as biological, infrastructure and economic. More importantly smallholder fish farming can be developed as an integrated operation along with vegetable gardens, poultry and perhaps rice cultivation, as has been flourishing in south-east Asia, including in urban and pre-urban areas.

The promulgation of the fisheries development and utilization proclamation (No. 315/2003) in 2003 provided the necessary legislative framework to control the prevailing problem in over-exploitation of fish re-

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PROJECTED MINIMUM....*Continued from page 2*

sources, expand the development of aquaculture, increase supply of fish and conserve fish biodiversity.

Viable small-scale aquaculture, more specifically inland freshwater fisheries, in rural communities can increase fish supply and consumption at household level primarily as a source of quality animal protein on a more continuous basis than other sources. Aquaculture can generate income, especially in downstream processing of products and adding value to agro-industrial by-products. There are also spin-off benefits and multiplier effects either directly in the production of essential input supplies or indirectly through manufacture of cages, nets and other tools. Converting otherwise wasted feed ingredients (e.g. plankton, algae, fish, etc.) in water into high quality animal feeds can also become a major economic activity.

Fish can potentially comprise a large share of the daily diet, particularly where diets are deficient of animal protein, making it an essential element to food security interventions in rural communities. Another important attribute of aquaculture is the ease with which surplus fish can be stored, either in cured or live form. Fish production ponds and reservoirs can also be used to store fish live in a manner that can bridge the food gap created between planting and harvesting of staple food crops, a strategy vital for mitigating difficulties in seasonal food insecurity and drought. Furthermore, fish has high biological value as measured in its superior nutrient profile to other meat types: it is an excellent source of high quality animal protein, highly digestible energy, omega-3 polyunsaturated fatty acids, fat soluble vitamins (A, D and E), water soluble vitamins (B complex), and minerals (calcium, phosphorus, iron, iodine and selenium) required by men, women and children.

Global aquaculture production has grown at 11 percent a year over the past decade and is projected to continue increasing. Expansion of this industry globally has been fuelled by the increasing demand for fishery products coupled with declining catches from marine bodies. Consequently aquaculture has become an important economic sector in most developing countries. Ethiopia is missing out from this trend, but with committed policy and development support, it is possible to catch up from lessons learnt elsewhere.

HILARIOUS ACCOUNTS... *continued from page 4*

funny and sounded vicious. But, the vaccination concept in the minds of the local people was truly startling though there was no a report of attenuating the pathogens.

Some farmers in Adilo area said cows may fall sick when they are tethered closely to sheep during the nights mainly as a result of the 'gas' sheep used to blow. Oops! Whether they were mentioning a myth or researchable topic is not yet established.

One of the challenges I faced during the flock monitoring was a number of farmers removed the plastic eartags blaming them for negatively affecting the body condition of their animals. Some other farmers did not see any problem. I am really wondering whether those plastic tags affected the body condition of the animals or the perception of the farmers.

One more! Sheep keepers in Kofele gave an interesting account when they were asked how to differentiate better milk yielding ewes from the poor yielders in places like local market. One of the answers was "by looking at their lambs". Mostly the young animals of good milk yielders have a good body condition than the other group. The strategy sounds analogous to an old saying: "tell me who your friends are and I will tell you who you are."

I am looking forward to hearing your experiences, too. Who knows, they could be no-nonsense hypotheses for the upcoming researches?

'AMORA GEDEL': A PLACE WHERE NATURE MEETS DIFFERENT NEEDS

Zelalem Yima zeyilmak@yahoo.fr

'Amora Gedel' plainly means 'pit of crow', is a place South-East of Hawassa lake. Hawassa is the capital city of the [Southern Nations, Nationalities, and Peoples Region](#) laying on the [Addis Ababa - Nairobi](#) road about 275 km from Addis Ababa, with a latitude and longitude of [7°3'N 38°28'E](#) and an elevation of 1708 meters. According to CSA (2005) the total human population of Hawassa is estimated at 125,315 consisting of 63,267 men and 62,048 women. Hawassa is not only one of the most touristic cities of Ethiopia but also home for a number of colleges, universities, factories, and agro industries.

Located West of Hawassa town, Lake Hawassa is an [endorheic basin](#) (closed or internal drainage basin that retains water and allows no outflow to other bodies of water such as rivers or oceans) with its major tributary being Tikur Wuha River. The Lake is 16 km long and 9 km wide, with a surface area of 129 square kilometers and a maximum depth of 10 meters. Major fish species inhabiting the lake include Nile tilapia, Clarias catfish and Barbus.

In Ethiopia there exist more than 101 fish species with at least 4 being endemic. Fish resources of the country are currently utilized mainly for food and sport fishing. Water is an important natural resource and a limiting factor for the economy of a country. This ecosystem has paramount importance as the major source for domestic and industrial water supply of the nation. In addition, the Ethiopian water bodies are a "natural laboratory" for education and scientific research. Generally the Rift Valley Lakes of Ethiopia in general and Lake Hawassa in particular serve as important sources of food for a good number of local inhabitants.

'Amora Gedel' is a walking distance from the city center. Horse carts 'Garis' and three-wheel scooter taxis are readily available for a reasonable price. End of the day is the best time for breath-taking sunset panorama. Walking along the shore one can observe how life goes every single day at this particular place: Fishing using both gill nets and lines;

little boys disentangling fishing nets; fish processing (filleting) and fish marketing. Local people and Ethiopian tourists come to enjoy fish soup 'assa shorba', boiled fish 'assa qiqil' and fried fish 'assa tibis'. One interesting scene is just observing local people taking pleasure from eating raw fish. By the time of reporting, the cost of a cup (about 150 ml) of fish soup was 1 Eth Birr and that of fried fish (about 200 g) was 5 Eth Birr. The large number of pelicans scavenging fish skins and offals represents additional attraction to the area. The lake also serves as a natural bath and washing machine for the surrounding people.

'Amora Gedel' means a lot through its economic, nutritional, social, environmental and touristic importance. This underlines the need of making a little more effort for its protection so that it will remain to be an important resource for all. If you get any opportunity of going to Hawassa, visiting 'Amora Gedel' will be an obligation. Believe me you will not be disappointed and you will discover much more.



Fish soup on sale at Amora Gedel

Courtesy: Zelalem Yilma

ESAP - Your Reliable Partner in Livestock Development

A POTENTIAL BUT OVERLOOKED BEE PLANT SPECIES:

Echium plantagineum L.

Debissa Lemessa Holota Bee Research Center, Ethiopia (lemdeb@yahoo.com)



Botanical Description

Family: Braginaceae

Common Name: *Paterson`s Curse* (Eng), *Natternkopf* (German)

This annual and biannual woody herb grows to a height of 1.5 m; It flowers from September to March and the colors are pink to purple at the base and blue at its top, which is a kind of indeterminate flower and stays flowering for a long time if continuously watered.

Ecological Distribution and Importance

It is an exotic ornamental plant. Even though there is no reliable information how it is introduced to the country, there is an assumption that it was a garden escaped from Mediterranean (Fichtl, & Admassu, 1994). From the preliminary assessment study, it was found that this plant has wide adaptability between the altitudinal range of 1800 and 24000m. It is seen growing in both fertile areas, overgrazed grass lands, on

degraded areas and along the roads.

Although detail study is not conducted on it as to its ecological importance, it produces a lot of biomass with in a short period and could be used for soil conservation.

Apicultural Importance

It was observed that honeybees very frequently forage abundant Nectar and dark blue pollen throughout the day which comes from this plant. It is growing fast and onset flower within less than four months whenever needed if water is available.

Propagation Methods of the plant

From the preliminary study conducted at Holota Bee Research Center, the following propagation methods of the plant were found to be effective. **Stem cutting:** involves forcing a cutting to produce roots on leaves or stems, **Division:** digging up the entire root system and chopping into 3-4 clumps. And **Seedling:** This plant also effectively propagates from the seed. It produces copious seed which has fast germination capacity with in a few days time. However, during seed collection if the dried leaves contacts the body it causes burning sensation from its inconspicuous spines.

In conclusion, it is highly recommended species of plant to increase honey production in high altitude areas.

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