

Research Article

Establishment of Sericulture Technology for Training and Food Insecure Areas of West Harareghe Zone: The Case of Oda Bultum University, Chiro, Ethiopia

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Abstract

Sericulture is the backbone of alternative income generation to local communities. Sericulture is control deforestation, maintain climate change, control greenhouse gas effects and global warming, control erosion, flood and sedimentation down the slope. The ultimate aim of sericulture is established to combat desertification. Open job opportunity to youth, women, men, HIV/AIDS infested people. Generally, create job opportunity without categories age for all age groups, except under age and over aged people. These are through silkworm rearing and establishment of mulberry plantation for silkworm food. This project was entitled with: establishment of sericulture technology in Oda Bultum university for training of trainees and food insecure areas of west Harareghe zonal watersheds: the case of Oda Bultum university, west Harareghe zone, Oromia regional national state Ethiopia. The objectives include: The students will be able to acquire knowledge, skill and attitude practically in the field of sericulture technology; to produce the higher and the most competent manpower in the field of sericulture technology; to make the University the exemplary for others' Universities, colleges, and institutions in the field of sericulture technology and to create a means of alternative income source for the university; to create job opportunities for the jobless youth by recruiting in the department; to provide training, introduced and implemented sericulture in the rural areas of west Harareghe zone and to make the university silkworm seed center or grange center of silkworm to west Harareghe zone and even if eastern Showa and eastern Harareghe zone and even though including the Qafar and Somali region in the long run. Questionnaires will be develop in closed and semi-closed; then that distributed randomly to Woreda, zone, and kebele, NGOS and governmental organization to select the most suitable areas to establish the sericulture technology. Thus, the collected feedback shall be analyzed and based on that decided the where needs priority. Mentoring of the project treds should conducted at certain intervals weekly or monthly. Evolution of the project shall be carry out at the middle or at the end of the project.

Keywords

Sericulture, Project, Silkworm, Seedlings/Mulberry, Job Creation, Cocoons, Value Chain and Market

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1. Introduction

1.1. Project Background and Justification

Sericulture is refers to the rearing of silkworm for the production of silk yarn; then weaving into expensive cloth after reeling into threads or garment and cultivation of mulberry plantation [14] which is serving as source food for silkworm larvae. There are more than 400 species found on the world that are produce silk to protect from their enemies while a few of them are known for commercial purposes. These are: bombyx mori, (monophagous species feed on *Morous alba*), Eri silkworm (polyphagous feed on castor and cassava trees), Muga silkworm and Tasar silkworm, respectively [1]. Sericulture suits both marginal and small-scale landholders because of its low investment, high assured returns, short gestation period and rich opportunities for enhancement of income and creation of family employment through the whole year [2]. Sericulture is both art and science raising silkworm to produce silk the “Queen of textile industry.” It is one of the tool that is alleviate poverty in developing countries such as Ethiopia by generating high income and create job of opportunity [10]. Also it is eco-friendly to environment. Sericulture has play a key role in the economic development of the world [2, 11]. According to these two studies the China is the first leading country and India is the next country that is leading the world in this economy regards in the producers of raw silk and in consumers of pure silk [10, 7]. It plays an important role in foreign currency exchange earning opportunity for the developing countries through the world. *Compared to agricultural crops, sericulture provides more employment round the year and fetches higher income to the rural farm families. Sericulture has been an important income generating cottage based industry in the country. This industry has been providing sustainable income for different strata of people in the rural society including the landless [7].*

Sericulture industry concerned with the production of silk is divided into five phases, viz., and cultivation of mulberry, silk worm seed production, rearing of silk worm, reeling of raw silk and weaving of silk. Cultivation of mulberry and rearing of silk worms are the farm based activities managed by the silk cocoon producers. Mulberry leaf is the host plant for silk worm. It is possible to harvest four to seven crops per year in the tropical areas.

Mulberry leaves converted in cocoons inside silk gland and the quality and the quantity of cocoons production depends on the quality and quantity of mulberry leaves. The study conducted by [11] had also reported that, the major silk producers developing countries like- Brazil, African, Thailand, Vietnam, Indonesia, Egypt, Iran, Shrilanka, Philippines, Bangladesh, Nepal, Myanmar., Turkey, Mexico, Uzbekistan and the United States. And the most silk consumers of the world developing countries are; China, India, USA, Japan, Italy, France, United Kingdom, Switzerland [13],

Germany, UAE, Korea, and Vietnam [20] For instance, in rural economy of India silk production ranks the highest and presently the 2nd producer and consumer of silk on the world. Silk yield in India radically increasing and it manifold since independence from the raw silk production level point of view which it produces about 1437MTs during 1969 to 1974, 21000MTs during 2010 to 2011 and 23679MTs during 2013 years [9]. Globally India is the single country that are rearing the four races of silkworm mulberry silkworm, Eri silkworm, muga silkworm and Tasar silkworm which are the most popular for commercial production [11]. So that, Indian experiences are the best to imitating the developing countries like Ethiopia. In Ethiopia sericulture is agro-based industry whereas in other world they are an admixture of agriculture, industry and forestry based activates [17].

Sericulture is an important labour intensive work of sector in the world. It is divided into two sectors the farm and industry sectors. *The farm sector involves growing silkworm's food plants, rearing silkworm to produce cocoons and eggs. Reeling, twisting, dyeing, printing, finishing, knitting form the industry sector.* Sericulture provide income in regular to community without bias of caste, creed, gender and religious. Both rich and poor groups of the community earn the same or equal income from it [8]. However, in Ethiopia the reverse is true and until remains in the research sectors and a few farmers adopted and started in rearing of silkworm for raw silk production [17], Sericulture is the cash crop [2] and it provides the revenues with in the 30 to 45 days. China was the origin for silkworm 300 B. C.

Sericulture was spread from china to other countries through colonization, marriage, trades and friendship; for example to Japan, Italy, Korea, Arab countries, America and India. Silkworms are classified based on geography, host plants, reproduction e.g. multivoltism and number of larvae that are molting for its growth and development [17].

Sericulture was introduced to Ethiopia when Ethiopia was governed by feudalism government of the emperor HaileSelassie in particular during Italian colonization Era. Italy was considered Ethiopia for the supply of raw materials (cocoons) for their textile industries and implemented in their country because of the Ethiopian climate is the most suitable for mulberry plantation and rearing of silkworm to produce silk production. As different sources (Ethiopian Research Centers) had reported sericulture where introduced into Nekemet, Gonder, Harare, and Jimma during feudalism government. However, this technology was discontinued without innovated into the local societies. However, until 1930s it was not known nothing about silkworm rearing and silk production in Ethiopia [17]. For the second time, sericulture was introduced into Ethiopia again during the Dirge regime of the Ethiopian socialist government at Ziway in collaboration with Cuba (Soviet Union). During this time also without disseminated into the local societies this

technology was discontinued. The employers were the Cuba people and the harvested cocoons were directly transported to their country and not processed in Ethiopia. Presently, during this Ethiopian Federal Democratic republic (EFDRG) of government for the third time sericulture was introduced into Ethiopia and established in the Ethiopian Research Center and Agricultural TVET. The differences between the past and present policy are both the government organizations and NGOs were/are provide training for local people, supply seeds in free charge for local people, provide training at Universities and at Colleges level. Because of it is considered sericulture as one of the instruments that ensures food security and food self-sufficiency in the country.

Ethiopia is one of the poorest countries on the world which is running Agriculture-Industry leading economy [3], while currently reform itself and she is leading nature based development. In order to achieve the government planned economy and development for the society's the enhancement of livelihood by establishment of sericulture in the University and dissemination to the surrounded society and the Woreda found in the zone of rural areas and per urban areas are play a key role on economy; because, sericulture is a cash crop which refers to an admixture of forestry, agriculture and industry [18].

Significance of sericulture include create job opportunities for women, rural people, people infected by HIV/AIDS, landless people, and disable people, to generate foreign currency, diversifies source of income for household subsistence and commercial purposes, [15] maintain environmental climate change and reduce global warming of greenhouse gas effects [16]. Of all it improves the economy of the nation, state and local communities. As the study done by [13], had stated, sericulture is a labour intensive industry in all its phases. It can generate employment up to 11 persons for every kilogram of raw silk production. Out of which more than 6 persons are women. If implemented properly in addition to that, sericulture plays a great role in reduction of erosion, runoff water, deforestation, sedimentation and desertification. It is the simplest technology in techniques, economically cheap and environmentally feasibly, has no negative impacts on ecology, and environment, which it is carryout with locally available materials.

Varies studies were compared and had revealed that the costs to be spent on is very low and returns obtain from sericulture is very high [6, 3], respectively; the contribution from sericulture enterprise was found to be the highest at 52 percent (Rs 82315/ha/yr) followed by paddy sun flower (20 percent), bivoltine rearing earns higher net returns than crossbred production, owing to climatic suitability, and skilled manpower and technical guidance received from developmental agencies. As the study done by [13] had stated, soybean -wheat 15% and soybean- gram 12% in paddy area, where as it was as high as 54% followed by cotton- pigeon pea 17% soybean-wheat 16% and soybean – gram 13% in cotton area and sustained income continued up to 15-20 years [7]. As

this study [6] had been shown that through comparison; really a surprising technology if established, and disseminated into the rural communities and properly run it should be solve multiple problems of the community watershed,, Woreda, zone, state and nation.

These are, therefore, if sericulture will be establishing in the University and zone properly; they will provides training for the students and the local societies while it plays a crucial role in poverty alleviation and it controls watershed natural resources degradation from their grassroots through establishment of mulberry planation on mountainous, marginal, and fragile lands including farmlands. Because of it is the fundamental of an alternative source of income generation and job opportunity creation for the local societies and combat the water, land, forest and soil from degradation by saving others watershed natural resources such as our forests [15].

This project work is not only paper end works but also it needs discussion of integration of concerned professionals, organizations and local societies and revise and jointly implemented through provision of training and gap filling of knowledge and skill. Finally, it will work to make the university the grange seed center for the west Harareghe zonal watersheds of food chronic areas in particular.

1.2. Project Goals Objectives

1.2.1. Project Goals

The goal of the project is to establish sericulture technology in the Oda Bultum University and to teach the students in practice in order to generate the higher manpower skills for varies companies and the Ethiopian societies based on the formulated Ethiopian higher Educational institutional Policy, curricula and the plan of the Oda Bultum University in linkage. Also, to provide training for the local societies; to distribute silkworm seeds in free charge to local people, to create an alternative source of income generation that are supplements the economy of agriculture and to improves the livelihood of the local society through the maintenance of food insecurity and restoration of degraded watershed through afforestation of mulberry plantation and others silkworm food plantation. Sericulture has the potential to save the natural resources particularly control deforestation of forest covers and expansion of excessive agricultural practices on marginal and fragile lands. The goals attempt and struggle to work by reforming the top down approach- the old method and subsisted by bottom it up approach- the new method by encouraging empowerment to local people to improve the income of women and poor sector of the society [12].

Overall in the long run to select properly in team the most vulnerable zonal community watersheds and the one which match with this technology and innovate to the decided community watersheds. The major aim to increase ground water and ground water table recharge by implementing sustainable development of alternative income source and

minimization of deforestation which encourage conversion of forested lands into agricultural lands to increase the damage of watershed by increasing runoff, erosion and sedimentation to down streams from upper streams of watershed [4, 12].

1.2.2. Project Objectives

- 1). To train the students to acquire knowledge, skill and attitude practically in the field of sericulture technology.
- 2). To produce the higher and the most competent manpower in the field of sericulture technology.
- 3). To make the University the Exemplary for others' Universities, Colleges, and Institutions in the field of sericulture technology and to create a means of alternative income source for the University.
- 4). To create job opportunities for the jobless youth by recruiting in the department of sericulture.

- 5). To provide training, introduced and implemented sericulture technology in the rural areas of west Harareghe zonal watersheds particularly in areas of food unsecured and suitable for sericulture technology.
- 6). To make the university silkworm seed center or grange center of silkworm to west Harareghe zonal watersheds and even if to eastern Showa and eastern Harareghe zone and even though including the Qafar and Somali region in the long run.

2. Project Value Chain

This Table 1 below had revealed that the way of value chain. Simply how to identify and solve the problems to improve silk /cocoons production in quality and quantity. Problems and solutions [5].

Table 1. Show Value Chain.

Constraint	Constraint	Constraint	Constrain	Constraint	Constrain
Lack of mulberry cutting materials	Zero awareness	Lack of land	Lack of rearing house	Workers	Market available
Solution	Solution	Solution	Solution	Solution	Solution
Buying and supplying from melkassa or SPNN	Providing training Sustainable monitoring and evaluating	The university must solve	The university must construct	The university must recruiting (from 8-12 grade)	Micro and small enterprise must solve by establishing with the concerned body

3. Materials and Their Specification

Table 2. Show Consumable Materials.

Items	Unit	Qt	Specification	Remark
Feather	No	-	-	Whit in color
Foam rubber strips	Roll	10	Size 25 cm*25 c Cover outside and bottom of rearing bed	Thin, long and made of spongy
Paraffin paper	Roll	5	Melting point 55 d. c. immersed in paraffin paper	Prevent drying of bed and chopped leaves
Chop stick	Pair	10	Length 17.5-20 cm	Made of bamboo
news paper	Roll	50	-	-
Chopping knife	No	6	Length 30-50 cm	Made of wood
Sac	No	20		
Nylon (Abuyadi) cloth	Meter	10	-	Made of cotton
Dry giant grass	Bundle	5		
Reed	Bundle	4		

Table 3. Fixed Materials.

Items	Unit	Quantity	Specification	Remark
Rearing box/tray	No	20	Circular diameter 1.1-1.4 m and depth 7.5 cm	Made of light wood, reed and bamboo
		30	Rectangular length 90 cm, depth 5-15 cm, width 70 cm	20 lumber L=4m, w=30 and Di=30cm and 10= veneer Bottom covers for rearing trays
Mountages	No	30	Length=1m, width=1m & depth=5cm Size=5cm*5cm per silkworm	150 =Local or Australian lumbers 45= Local or Australian veneers
Rearing stand	No	8	height =2 -2.5 m, length= 1-1.5 m width = 0.9-1 m, space b/n shelf 20 cm	Made of eucalyptus, cupressus or graviola
Pole	No	60	Length 3m or 2m, diameter 8-10cm	Made of eucalyptus, cupressus or graviola
Lumber	No	200	Length 4 m, diameter 30cm	Made of eucalyptus, cupressus or graviola
Veneer	No	60	Length 4 m, diameter 30cm	Made of eucalyptus, cupressus or graviola
Chip wood	No	30	Length 4 m, diameter 30cm	Made of eucalyptus, cupressus or graviola
Antwell	No	8	Area 20 cm ² , depth 2.5cm, height 7.5cm	Made of concert, cement and sand
Watering cans	No	10	-	Made of plastic
Leave storage box	No	12	Length 3 m, width 1 m and depth 0.8 m	Made of nylon thread or cotton
Basket	No	20		Leave transportation and storage Made of reed, bamboo
Selene	No	20	No specification	Made of reed, bamboo, grasses

4. Project Appraisal

Before implemented the project the following activities will be assessing: suitability of project implementation sites, donation organization/source of fund to run the project (required work costs), identification of technical persons, economically feasibility, impacts on ecology and environment. Social adoptability and its challenges to introduced into local community. In addition to that, topography, climate, market availability/market competition and similar projects that is running sericulture in the Woreda/ Zone, product quality (cocoons quality), transportation distances, future threat (if implemented because it will not established for student training alone) and opportunities (e.g. in job creation, income generation, etc) will be assessing. Source of seed supplying, labour and local available materials to run this project will be identifying. Stakeholders included in the future from the university, Districts, and zones (of government and non-governmental organizations) will be assessing before dissemination into the rural areas and implemented. Since, this project is not established for teaching purpose only; but also for poverty alleviation in the zone's where the University is situated. The land for the establishment of sericulture (i.e. rearing house and establishment of food plants) will be request from the University and the Chiro District Rural Land Administration Office.

5. Project Required Technical and Work Cost

All the initial costs needed to establish and run the project for the first time will be covered by Oda Bultum University [12]. The project is required nominal persons in knowledge, skill and attitude regarding the principles of sericulture establishment or the persons that can be run the project in practice by following the scientific procedures.

Until produce cocoons and benefited from selling of cocoons and processed silks all the costs that will be covers payment of salary for daily and permanent labour, and nominal persons, including costs of building rearing house, rearing materials, chemicals and others will be donated by the university. Because of the project will be establish primarily for education purpose. However, once established and start to produce cocoons, reeled cocoons and sell the products all the costs will be covered by the project itself [18].

Except for the establishment sericulture is covers all necessary costs from the production and benefited the people. No any costs requested from any organization and anybody. Even if the establishment is very low costs compare to other projects like poultry, fish, and wood processing enterprise. Benefits are greater than costs unless it is not follow up and guidance with expert of the sericulture when different pests

(aphids, mealy bug, and mite) and diseases infected mulberry plants (powdery mildew, root rot) which losses mulberry crops and then declined the cocoons production [13].

6. Design of Silkworm Rearing House

Design and layout of silkworm rearing house is very significant. Rearing house is built north to south direction with sufficient windows for the circulation of fresh air. The purpose is to prevent CO₂ suffocation by larvae and from moisture loss with mulberry leaves. Producing CO₂ by larvae plus transpiration of moisture by mulberry and castor leaves is highly increasing room temperature beyond 25-27°C. Such condition increase mortality rate of larvae because it made suitable for the occurrence of virus, fungus and bacteria. In addition to that increasing moisture; it is moist pupae inside the dried and stored cocoons. So that, the smell of moisten pupae attract insect pests that are damage cocoons and lower their quality on market and the process of reeling. It is built from locally available materials like wood, grass, mud, stone and soils. In hot areas, roofs made from soils and wood, or grasses and wood. In addition, it is made of can and wood while walls made from wood and mud, stone, and mud, concrete and cement. Windows is covered with mesh wire to protect entry of birds and rat into the rearing house which is the enemy of silkworm larvae.

For the purpose of this project the rearing houses that have six classes will be building. Each class is used for different purpose: for rearing (1), cocoons storage (1), for spinning (1), for mating and incubation (1), for storage of materials (1), and for leave storage (1). The house is divided into square block inside.

7. Executive Summary

7.1. Description of the Problems

Of all problem's Teaching and learning by the students in practice is a bottleneck problem in sericulture course; so that establishing sericulture in the University it will be solve the primary problem's and it help to harvest the higher manpower. Next to that as known West Harareghe zone is one of the Oromia regional zones which severely impacted in poverty and food insecure areas. Establishing and disseminating sericulture through the entire zone it will be solve definitely the problem of poverty, watershed degradation, ground water and ground water table recharge [3] and improve the basic livelihood of the society. In addition to that it saves over exploitation of the natural resources (e.g. forest resource) in the zone through combating of deforestation, illegal timber cutting for income generation called the mechanisms of forest resource saving and the ultimate goal of enhancing water quantity and quality in the watershed which increase agricultural production and productivity. Create an alternative

means of income in special case for women, and HIV/AIDS infected people in the rural areas of the zone.

7.2. Description of the Goals and Objectives

This project will be established to assure the education quality and then, to achieve both goals and objectives that settled by the University and the Ethiopian higher educational institution of Mistry of higher education plan. The main objective of the project is to produce the higher work force in knowledge, skill and attitude in establishing sericulture, producing market oriented and high quality silk products, to create work opportunity for local people and to diversified rural source of income. Moreover, to reduces the adverse effects on natural resources, environment and to conserve and utilize natural resources in sustainable manner and to improve socioeconomic of the watershed citizens.

7.3. Project Program Plan

The plan will be depends on the project nature, such as benefits gained, costs to establish and running, need of the customers/trainees of the course, availability of the resources and technical manpower to run the project, market availability for the products, the needs of the project by the University and others company. Based on such and such factors, the project will be continuing in depth through the whole and favorable areas of the zone.

7.4. Project Duration

Based on the feedback of daily or, weekly or monthly monitoring and evaluation of the project may be at the middle or at the end of the first phase of the project.

7.5. Project Resources Requirement

For the first all of the costs will covered by the University; until produce the cocoons and sell on the market. Hereafter, once established, running and gained revenues from selling of cocoons production it will be covers all the costs by itself (project). Almost all the project will be run by locally available materials, which are very cheap. It requires intensive labor forces to run the project while it is not a problem in Ethiopia as well as in the West Harareghe Zone.

7.6. Description of Project Inputs

In broad sense to establish and achieves the goals and objectives for this project; three basic requirements must be fulfilled. These basic requirements are land to establish mulberry plantation, and construction of silkworm rearing house, and rearing appliances.

1). Description of Project Location

The project is located in Oda Bultum University, Chiro District, Western Harareghe zone, Oromia National Regional

State, Ethiopia. It is located at 321 Km far away in the eastern direction from the capital city of Ethiopia Addis Ababa. Specifically, located in the direction of eastern from the public road those pass by bisecting the Chiro town, the capital city of the Western Harareghe zone [19].

2). Description of Criteria for the Selection of the Project Site

The course of sericulture is on giving for Regional Agricultural developmental agents in particular under the department of animal science and forestry. Thus, the establishment of the project is primarily to teach the students in practice. Secondly, no competition of market because no sericulture projects in the area; agro-climate, soil type and topography are suitable for silkworm rearing and mulberry plantation establishment. There is plenty of labour and plenty of jobless people in the zone. So that, the project will be alleviate this problem. There are no market problems after harvest cocoons to sell. Because, it possible to supply to Addis Ababa, Adama and Derie Dewa textile industries in addition to use in cottage industry locally.

3). Description of Target Project Beneficiaries

Sericulture technology has a potential to benefits the students, all the beneficiary groups of the societies without any division in sexes, ages and education levels. It creates means of job for rural and rural town, of women, youth, men, landless and jobless people. Sericulture has a potential to supplement an income generated from agricultural production.

Income generation from sericulture distributed equally for all. In addition, Create means of job for graduates from TVET, Higher Education and those Dropouts at lower grade level.

4). Description of Project Stakeholders/beneficiary groups

During the establishment or after the establishment of the project the following stakeholders should be involved: animal science, watershed management and forestry of department staffs, instructor of the course, students, assistance, (s) daily and permanent labour, and others concerned staff of the University. In addition to that; zone animal science agency, forestry and watershed management, Chiro District animal science office, natural resource and environmental protection office, kebel developmental agents (agricultural extensions), District and Zone youth office, women supporting organization, non- governmental organization, (indigenous and exotic,), small and micro-enterprise office and others related organizations will be included in the project [12, 1].

5). Activity Schedule

All the activities will be carrying out as described in the following tables. However, based on the conditions faces the plan will be readjusted. This readjustment also depends on the organization capacity and capability to run the work activities. Because this duty is not personal center instead it is need the participation of the college of agriculture, department of animal science, watershed management, forestry and the whole university staff members.

Table 4. Shows Silkworm Rearing House Activities.

Activities achieved	Unit	Quantity	Months											
			J	F	A	M	M	J	J	A	S	O	N	D
Land request	Ha	1									X			
Land division in block and design	Pd											X		
Supplying materials	-	-												
Building rearing house	No	1												X
Rearing house Construction materials												X		
Tin can	No													
Split wood	Bundle													
Posted pole	No													
Veneer	No		X											
Sand	Bag		X											
Nail	Packet		X											
Wire	Roll		X											
Concrete	Bag		X											
Cement	Bag		X											
Lumber	No		X											

Activities achieved	Unit	Quantity	Months											
			J	F	A	M	M	J	J	A	S	O	N	D
“sand made tube”	No		X											
Paint	Can			X										
Formalin or chlorine	Lt									X				
Knapsack sprayer	No										X			

Table 5. Shows Mulberry Plantation Establishment Activities.

Activities achieved	Unit	Quantity	Months											
			J	F	M	A	M	J	J	A	S	O	N	D
Nursery site preparation	Pd		X											
Prepare nursery seedbed	Pd		X											
Prepare composite soils 3:2:1	Pd		X											
Supply mulberry cuttings	Pd			X										
Mixing soil under shade and watering	Pd			X										
Waiting germination of weed a week	Pd			X										
Destroying weeds and moist with water	Pd			X										
Soil potting	Pd			X										
Placed pot on bed	Pd				X									
Shading pot	Pd				X									
Watering soil in pot	Pd				X									
Planting mulberry cutting	Pd				X									
Watering properly (with schedule)	Pd	30			X									
Weeding and cultivation	Pd	10				X								
Watering	Pd					X								
Planting in the field after 3 or 4 months	Pd								X					
Supply irrigation	Pd												X	
Weeding and cultivation properly	Pd												X	
Thinning after a yr	Pd						X							
Weeding and cultivation	Pd						X							
Pruning after 2 yr	Pd													
Herbicide chemicals	Lt													
Insecticide chemicals	Lt													
Pruning knife	No													
Polyethylene pots	Roll													X

1). Required Inputs

It refers a means of resource inputs. Basically sericulture establishment are requires rearing houses, materials, chemicals for disinfection, land to establish food plants, labour, seeds (silkworm eggs/larva and cutting materials (mulberry, cassava), seeds (castor plants). To achieve the stated goals and objectives they are prepared the work/activity schedule and resources allocation planning.

2). Materials and their Costs

Table 6. Consumable Materials for Rearing Silkworm.

Items	Unit	Qt	Estimated Price/Qt (Birr)	Total price (Birr)	Remark
Feather	No	-	-	-	
Foam rubber strips	Roll	10	300	3000	Size 25 cm*25 cm
Paraffin paper	Roll	5	155	775	Melting point 55 d. c.
Newspaper (old)	Roll	20	120	2400	
Chop stick	Pair	10	25	250	Length 17.5-20 cm
Chopping knife	No	10	22	250	Length 30-50 cm
Sac	No	20	15	300	100 kg
Nylon clothe	M	10	35	350	
Dry giant grass	Bundle	5	200	1000	
Reed	Bundle	4	85	340	
Bamboo	No	30	100	3000	
Cutting material	No	625	2.00	1250	125 causality rate
Forest soil	M ³	106.25	100	10625	Labor cost
Sand soil	M ³	106.25	100	10625	labor cost
Basic soil	M ³	381.75	100	38175	Labor cost
Total soil	M ³	531.25m ³	100	53125	1 pot =0.85 m ³
Polythene bag	Kg	125	100	12500	If 1 kg =100 pots
Sub-Grand total				137,965.00	

Table 7. Inputs for Raising Mulberry Seedling in the Nursery.

Items	Unit	Quantity	Place	Pd/vol or pd/pot	Distance (Km)	Round trip (km)
Forest soil	M3	106.25m ³	Jello forest		25	50
Sand soil	M ³	106.25m ³	Misso		20	40
Basic soil	M ³	318.75	Campus		1	2
Total soil	M ³	531.25m ³				
Polythene bag	Kg	200	-		-	-
Soil preparation						
forest soil	Pd	3	-		-	-
basic soil	Pd	7				
sand soil	Pd	3				
site cleaning	Pd	2				

Items	Unit	Quantity	Place	Pd/vol or pd/pot	Distance (Km)	Round trip (km)
Loading	Pd	5				
Soil sieving	Pd	5		100m ³	-	-
Pot filling	Pd	7		100		
Placed pots on bed	Pd	3		200		
Shading	Pd	6				
Posting pole	No	70				
Horizontal stick	Bundle	49				
Giant grass	Bundle	4				
Bed preparation	Pd	4		7 bed	-	
Sub-grand total						

Items	Required day	No trip	Vol/vehicle (m ³)	Price/uni (Birr)	Total price (Birr)	Remark
Forest soil	2	17	6	200	3400	No. of trip*price/vehicle
Sand soil	2	17	6	200	3400	
Basic soil	3	34	6	50	1700	
Total soil					8500	
Polythene bag	-	-	-	10	2000	
Soil preparation						
forest soil	-	-	-	100	300	
basic soil				100	700	
sand soil				100	300	
site cleaning				100	200	For sand + forest soil
Loading	7			100	3500	
Soil sieving	-			100	500	
Pot filling				100	700	
Placed pots on bed				100	300	
Shading				100	600	
Posting pole				20	1400	
Horizontal stick				5	245	
Giant grass				50	200	
Bed preparation	-	-		100	400	
Sub-grand total					28,345.00	

Table 8. Costs of Telephone, Fuel Energy, Vehicles and Wages.

Activities	Unit	Qut	Dist (km)	Round dist (km)	Total dist (km)	No. tripe/day
Track cost	Vol	531.25m ³	46	92	6624	6
Fuel cost	Lt	6624	46	92	6624	6

Activities	Unit	Qut	Dist (km)	Round dist (km)	Total dist (km)	No. tripe/day
Telephone cost	Birr	12	-	-	-	-
Driver wage	Birr	12	-	-	-	-
Driver assistance wage	Birr	12	-	-	-	-
Profession wage	Pd	1				
Assistance profession wage	Pd	2				
Carpenter	Pd	2				
Permanent labor	Pd	5				
Cutting supply	Pd	2				
Silkworm supply	Pd	2				
Sub-grand total						

Activities	No. tripe	Reqtrip	Req day	Vol /trip (m3)	Price/travel (birr)	Total costs (birr)	Remark
Track cost	72	18	12	10m ³	200	10625	
Fuel cost	72	18	12	10m ³	25	165600	
Telephone cost	-	-	12	-	100	1200	
Driver wage	-	-	12	-	171	2052	
Driver assistance wage	-	-	12	-	165	1980	
Profession wage			12		185		
Assistance profession wage			12		185		
Carpenter			10		140		Contractor
Permanent labor			30		32.033	961	
Cutting supply			10		250	5000	Melkassa
Silkworm supply			10		250	5000	Melkassa
Sub-grand total						192,418.00	

Table 9. Fixed Materials.

Items	Unit	Quantity	Price/unit (Birr)	Total price (Birr)	Specification	Remark
Rectangular tray	No	30	1500.00	45000	Length 90 cm, depth 5-15 cm, width 70 cm	Made of light wood
Circular rearing tray	No	20	1500.00	30000	diameter 1.1-1.4 m and depth 7.5 cm	Made of, reed and bamboo
Rearing stand	No	8	1000.00	8000	2 -2.5 m height, 1-1.5 m length 0.9-1 m width, space b/n shelf 20 cm	Made of eucalyptus, cupressus or graviola
Pole	No	60	100.00	6000		
Chip wood	No	30	150.00	4500		
Lumber	No	200	400.00	80000		

Items	Unit	Quantity	Price/unit (Birr)	Total price (Birr)	Specification	Remark
Veneer	No	60	300.00	18000		
Antwell	No	8	100.00	800	Area 20 cm ² , depth 2.5cm, height 7.5cm	
Watering can	No	40	90.00	3600	-	Made of plastic
Leave storage box	No	12	1000.00	12000	Length 3 m, width 1 m and depth 0.8 m	Made of nylon thread or cotton
Basket	No	20	200.00	4000		Leave transportation and storage Made of reed, bamboo
Selene	No	20	400.00	8000	-	Used to dry cocoons
Square Mountage	No	30	1500.00	45000		Made of wood
Circular mountage	No	20	2000.00	40000		Made reed or bamboo
Grass mounatge	bundle	10	150.00	1500		
Banana mountage	Bundle	10	50.00	500		
String	Roll	10	60.00	600		
Rope	Roll	20	15.00	300		
Leave transport sac	No	10	150.00	1500		
Cocoon storage sac	No	20	15.00	300		
Thermometer	No	1	3000.00	3000		
Hygrometer	No	1	5000.00	5000		
Electric stove	No	5	1300.00	6500		
Charcoal	Kuntal	2	250.00	500		
Lakech or Merite stove	No	4	160.00	640		
Sub-grand total				325,240.00		

Table 10. Materials Request for the Construction of Silkworm Rearing House.

Materials	Unit	Quantity	Price/unit (Birr)	Total price (Birr)	Specification	Remark
Spilt woods	No	800	40	32000		
Morale	No	400	100	40000		
Horizontal poles (roof)	No	400	100	40000		
Down poles (roof)	No	400	100	40000		
Poles (walls)	No	400	150	60000		
“Buluket “?	No or m ³	2000	50	100000	Locally made	
White stone	M ³	1000	200	200000		
Concrete	M ³	800	150	120000		
Sand	M ³	800	100	80000		
Nail	Packet	10	100	1000	5, 8, 10, 12, and 15cm	

Materials	Unit	Quantity	Price/unit (Birr)	Total price (Birr)	Specification	Remark
Cans or tins	No	100	100	10000		
Wire	Roll	10	100	1000		
Rope	Roll	10	15	150		
String	Roll	10	20	200		
Lumber	No	300	150	45000		For windows and door
Chip wood	No	200	100	20000		
Plastic cornice	Roll	20	100	2000		
Wood oils	Can	10	100	1000		Varies color
Sub-grand total				792,350		

Table 11. Summary Costs of Establishment.

Activities of summary	Costs of activities	Remark
Table 6: Consumable materials for rearing silkworm	137, 965	
Table 7: Inputs for raising mulberry seedling in the nursery	28,345	
Table 8: costs of telephone, fuel energy, vehicles and wages	192,418	
Table 9: fixed materials	325, 240	
Table 10: Materials request for the construction of silkworm rearing house	792, 350	
Total	1,338,353	
Contingency 10%	133,835.30	
Over all total	1,472,188	

1). Project Implementation

Formation of strategies to implement using local social work and Providing full of empowerment to local people and local institution in implementing watershed democratic principle [4]. It is encourage of work parties and solidarity by efforts in the watershed by participation. They develop group formation of stakeholders or communities and social institution or organizations. They need arrangement of resources and resources mobilization to the selected sites of watersheds. Focus the gender issues and improves much more an interaction between groups and people in solidarity forms. Work on benefit sharing to facilitate work plans through the entire west Harareghe food insecure districts and watersheds in addition to for teaching and learning processes in the university. It must be work in the orientation to start income generation both in the University and in the zone besides the education training in practices.

The teams of the project integration and in participatory should be search additional resources to implement well the project in manner that solve the problems. That is; searching additional funds of finances and materials requires from the projects existed and others organization. The implementation of the project should estimate the required labour forces and means on person's day.

Methods of Achieving Goals and Objectives

This is the most intensive part of any project work. It can be reach on target point in integration with different discipline and departments. Creating efficiently linkage with different government organization, non-government organizations and already existed projects in the watersheds, districts, zone and region. Meaning the project programme must be merge with the different projects existed in the watershed that work on food security in particular in dryland areas of cultivated lands to grow and produce crops.

8. Assessment of Work Progress

8.1. Project Monitoring and Evaluation

Carry out jointly by adjacent sub-watersheds, community watersheds, gender consideration and benefits sharing by observing the project weakness and strengthening more by strengthening women participation in monitoring and evaluation. Monitoring should be an input of project evaluation to investigate its condition at all. It provides the basic information because of do so by recording the data. Whereas evaluation assess the project progress in three categories: preparation of plan that help to carry out evaluation, assess outcome results and impact assessment from environmental, ecological, economic and social aspects.

In general project monitoring and evaluation would be carried out in participatory approaches of watershed principle that is participatory monitoring and evaluation to see failure [4], trends, modification, improvements bring due to implementation of the project on women youth, disable people, poor households and the like and it may be cut out the project from social, economic, environmental and ecological point of view.

8.2. Project Proposal Writing

As soon as possible they will conducted the activity of monitoring and evaluation by the integration of Woreda watershed team, developmental agents and leader of the kebele and then, every changes that will bring by the project on the local people and watershed natural resource rehabilitation including in the first hand the income generating by the project for women, youth and disable people must be reporting to Woreda, zone and region. Investigating the trends on poor people, female headed household in particular should be included in the reports. And at all full project proposal will be writing on the changes of observed by the team of the project in participation with farmers.

9. Conclusion

Sericulture is agro based industry in the economy of agricultural sector and to start basically request three requirements. Rearing house, rearing appliances and mulberry plantation. Sericulture is established with low investment and high return establishment of sericulture project to produce silk (cocoons) must be needs technical manpower, costs or means, identify competent projects, market access, and problem identification. Description of duration, and value chain, inputs, preparation of action plan, description of criteria of site selection, objectives and goals, description of stakeholders,, implementation, monitoring and evaluation.

In general sericulture improve income status of poor, landless and create unemployed.

Abbreviations

ATVETC	Agricultural Technical Vocational Educational Training College
B. C.	Before Cheeriest
cm	Centimeter
CO ₂	Carbon Dioxide
Di	Diameter
EPA	Environmental Protection Agency
e. g	Example
Etc	Extra
EFARD	Ethiopian Federal Agricultural and Rural Development
Ha	Hectare
Kg	Kilogram
Km	Kilometer
L	Length
Lt	Litter
MTs	Metric Tons
M	Meter
M ³	Metric Cube
No	Number
NGOS	None Governmental Organizations
Pd	Persons per Day
Qt	Quantity
SPNN	Southern People Nation Nationality
SWC	Soil and Water Conservation
TVET	Technical Vocational Educational Training
Vol	Volume
USA	United States of America
W	Width
Yr	Year
°C	Degree Centigrade
2 nd	Second

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Author Contributions

Mussa Abdula Ibro is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The author declares there is no conflicts of interest.

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Biography

Mussa Abdula Ibro was born in 1979 G. C. Ifabas kebele, Tullo Woreda, west Harareghe, Oromia state, Ethiopia. I was begun my elementary education in 1986 G.C. at Ifabas primary school and finished at Zegita primary school in 1990 G. C. I was finished my joiner education at Hirna number one primary and joiner secondary school in 1993 G. C. I was attended my secondary education at Hirna senior secondary high school up to 1999 G. C. I was joined my higher education and finished in 2003 G.C. in BSc Degree in Forestry. I was recruited by EFARD Bureau 2003 G. C. and work up to, 2014 G. C. as instructor at Mersa ATVETC, Amhara state, Ethiopia. I was awarded certificate of sericulture from Korea international Cooperation agency in collaboration with Amhara micro and small enterprise since, 2006 G. C. at BahirDare. I was graduate my post graduated in MSc Degree in Watershed Management (SWC) 2013 G. C. I was recruited in Lecturer and I am on working at Oda Bultum University. I was married and born three children.