ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL OF SCIENCE ENGINEERING AND TECHNOLOGY

THE TRACES OF A FRUGAL SOCIETY IN RURAL TURKEY

M.Sc. THESIS

Hatice Hâle BAYSAN ARU

Department of Urban and Regional Planning

Regional Planning Programme

MAY 2019

ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL OF SCIENCE ENGINEERING AND TECHNOLOGY

THE TRACES OF A FRUGAL SOCIETY IN RURAL TURKEY

M.Sc. THESIS

Hatice Hâle BAYSAN ARU
(502151055)

Department of Urban and Regional Planning

Regional Planning Programme

Thesis Advisor: Prof. Dr. Aliye Ahu AKGÜN

MAY 2019

İSTANBUL TEKNİK ÜNİVERSİTESİ ★ FEN BİLİMLERİ ENSTİTÜSÜ

TÜRKİYE KIRSALINDA KANAATKÂR BİR TOPLUMUN İZLERİ

YÜKSEK LİSANS TEZİ

Hatice Hâle BAYSAN ARU
(502151055)

Şehir ve Bölge Planlama Anabilim Dalı

Bölge Planlama Programı

Tez Danışmanı: Prof. Dr. Aliye Ahu AKGÜN

MAYIS 2019

Hatice Hâle BAYSAN ARU, a M.Sc. student of İTU Graduate School of Science Engineering and Technology student ID 502151055, successfully defended the thesis entitled "THE TRACES OF A FRUGAL SOCIETY IN RURAL TURKEY", which she prepared after fulfilling the requirements specified in the associated legislations, before the jury whose signatures are below.

Thesis Advisor :	**Prof. Dr. Aliye Ahu AKGÜN** İstanbul Technical University	.....
Jury Members :	**Prof. Dr. Gülden ERKUT** Istanbul Technical University	.....
	Asst. Prof. Dr. Serkan BAYRAKTAROĞLU Kadir Has University	.....

Date of Submission : 03 May 2019
Date of Defense : 23 May 2019

To all of the frugal people in Anatolia,

FOREWORD

First of all, I would like to express my gratitude to my advisor Prof. Dr. Aliye Ahu Akgün who has been guiding me since the begining of my master program in ITU. She has always shown me new roads to walk and ensured me to have eye-opening discussions and conversations with her, about not only science, but also everything related to life. Before I started to my study, one day, I saw her in the faculty, she said that she has got a book reccomendation that I could be really interested in, namely, Frugal Innovation that inspired me for this work. Whenever I get desperate about my study, she encouraged me not to lose my belief. I will always feel that I am lucky to study with her. She is a real proffessor who I look up to her during my life.

I am also so lucky to be grown up in a big family consist of my dear parents Aliye and Dursun Ali, my dear brohters, Fatih, Yavuz and Selim, my lovely sisters, Ayşegül and Zeynep. This family is my first school of frugality. Many times, I had to reject their attractive offers about to come together. So, I would like to thank all of them with an apology for their understanding during my study and their supports in my entire life.

All of my teachers and professors who are M. Çağlar Meşhur, Arzu Taylan Susan, Rahmi Erdem, Filiz Alkan Meşhur, Elif Gündüz, Neslihan Sağ, Sedef Eryiğit, M. Akif Sağ, Mehmet Topçu, Kadriye Topçu, Sinan Levend, Fatih Eren, Kıvanç Ertuğay in Selcuk University Faculty of Acrhitecture where my academic decency started to be shaped; I owe all of them a debt of gratitude. In addition, I am also grateful all of my teachers and professors in Istanbul Technical University for their guiding me during my graduate study.

This thesis is the work of the frugal people who I met, from various villages of Turkey. I would like to thank İbrahim and Birsel Bayrak who host me and my husband one week and allowed us to experience that we will never get anywhere else. I am also thankful Semra and Ali Ünal, Server Vural and İlhan Koçulu for their hospitality and sharing their special experiments; Burak Özdemir for his efforts to teach me everything about cheesemaking; Hüseyin Hamza Ortaç for his accompaniment in Bismil; Abdullah Furtana who shared his experiments also.

I also should thank all of my directors in Istanbul Metropolitan Municipality for that they allow for me to accomplish this study. And my dear co-workers, especially Kadir Topcu for his supports in English language, Öznur İçin for that she listened us with her infinite patience every moment, I would like to thank all of them.

The last but not the least, I am grateful for all supports of my best friend who is the lead in my rural dreams and my dear husband, Çağlar Aru.

May 2019

Hatice Hâle BAYSAN ARU
(Urban Planner)

TABLE OF CONTENTS

Page

ABBREVIATIONS

ATM : Automated Teller Machine

BoP : Bottom of the Pyramid

CFLs : Compact Flourescent Lights

CSB : Ministry of Environment and Urbanization

DPT : State Planning Organization

FHM : Fatal Heart Rate Monitor

GEKA : South Aegean Development Agency

GPS : Global Positioning System

HPS : Husk Power System

MIT : Massachusetts Institute of Technology

PV : Photovoltaic

R&D : Research and Development

TaTuTa : Eco-Agro Tourism and Voluntary Knowledge and Skills Exchange on Organic Farms

TKDK : Establishment of Supporting Agriculture and Rural Development

TURKSTAT : Turkish Statistical Institute

UK : United Kingdom

UNDP : United Nations Development Programme

VG : Vortex Grammateller

ZKA : Zafer Development Agency

LIST OF TABLES

Page

LIST OF FIGURES

Page

THE TRACES OF A FRUGAL SOCIETY IN RURAL TURKEY

SUMMARY

While each kind of possessed resources was being consumed rapidly because of economic growth approach of the previous century, we face the threat of resource depletion today. Particularly this situation and many other dynamics have changed the nature of economies. With these changes, innovation that is the main concept of information economies has been perceived as a different way. Innovation was been perceived that it is related to development caused by having high-cost processes of it. Nowadays this perception has been shake due to the fact that there is a new approach that innovation can be made in developing countries and emerging econommies with low-cost. This approach is called as "frugal innovation".

Frugal innovation is briefly defined as every kind of innovation activities which is achieved with minimum input that it has been popular in both developing and developed countries. Developing countries struggle with a series of problems such as poverty, limited resources, infrastructure lacknesses, rapid population growth. Such the problems play a trigger role in doing innovation. Some researches propound that limited resources and necessity of urgent solution increase the capability of innovation. In addition, high-cost innovation and production processes are not sustainable in terms of economy and ecology. This situation prompt also firms in developed countries to doing frugal innoation.

Frugal innovation can be seen in many different regions, sectors and needed areas with different purposes alongside of that it basicly refers to innovation activities carried out with optimal using all of the possessed limited resources. Frugal innovation is considered by firms as using at minimum level of economic and ecologic resources with their instinct of sustaining their existence in the market. Also, the concept of frugal innovation can be considered as creative and innovative activities with their limited resources for individuals also. Individual frugal innovations are mostly seen in rural areas. Root cause of this situation is that the population who needs urgent solutions to their technic and social problems live in mostly rural areas.

In this study, rural entrepreneurs who perform frugal innovation activities are what are expressed as the traces of a frugal society. The frugal society is a utopia in a series of criticisms that were brought to social and environmental problems caused by the economic growth and technological development that is possible by the accumulation of capital after the industrial revolution. Frugal abundance society refers to a social system built by people who have consciously and voluntarily preferred a simple life which has less needs and keep the social and environmental values above economic ones. The study considers rural frugal innovations from the perspective of frugal society which is described in de-growth theories. In order to define the entrepreneurships as rural frugal innovation in frugality context, some criteria have been determined.

Being a frugal innovation of an innovative activity; sustainability, affordability and good performance criteria should be ensured. This means that it needs emergence of an affordable and well-performed product at the end of a sustainable innovations processes. In rural areas, frugal innovation activites should contain first a solution that is found by local people for a problem that can be defined by the local people. Rural frugal innovation should also be carried out in a way that contributes to rural areas and rural population and meet all other frugal innovation criteria. Otherwise, it is not possible to talk about rural frugal innovation.

This study defines the concept and puts forward the activities of rural frugal innovation in the context of frugality. The main purpose of the study is to determine, to examine and to evaluate the frugal innovation activities that fit the definition.

In this study, rural entrepreneurship activites which took place in newspapers and various news sources, were listed in order to identify rural frugal innovation. Five of the activities in this list were selected for case studies, which could serve as an example for frugal innovation. In order to evaluate case studies in terms of the criterion of rural frugal innovation, method of in-depth interview on-site was used. According to the study, rural frugal innovations in Turkey can contribute to success of local and rural development. They also can be constituents that can build the frugal abundance society described in de-growth thinkings. Frugal innovation studies especially within the context of rural show a very-up-date and new research ground. So, the study has a guiding character for future studies.

TÜRKİYE KIRSALINDA KANAATKÂR BİR TOPLUMUN İZLERİ

ÖZET

Geçtiğimiz yüzyılın ekonomik gelişme anlayışıyla, sahip olunan her türlü kaynak hızlı bir şekilde tüketilirken, bugün azalma tehdidi ile karşı karşıya kalınmaktadır. Bu durum başta olmak üzere; pek çok dinamik, ekonomilerin doğasında değişimler meydana getirmiştir. Bu değişimlerle birlikte, bilgi ekonomilerinin başlıca kavramı olan Yenileşim (inovasyon) de farklı algılanmaya başlanmıştır. Yenileşimin yüksek maliyetli süreçleri kapsadığı ve dolayısıyla gelişmişlikle bağlantılı olduğu algısı, günümüzde yenileşimin çok düşük maliyetli bir şekilde gelişmekte olan ülkeler ve ekonomilerde de gerçekleşebileceği gibi yaklaşımlarla sarsılmaktadır. Söz konusu yaklaşıma "tutumlu yenileşim" denmektedir.

Tutumlu yenileşim kısaca en az girdi ile en çok çıktı elde edilen her türlü yenileşim faaliyeti olarak tanımlanmakta olup hem gelişmiş hem de gelişmekte olan ülkelerde popüler hale gelmiştir. Gelişmekte olan ülkelerde var olan yoksulluk, kısıtlı kaynaklar, altyapı eksiklikleri, hızlı nüfus artışı, ekonomik ve sosyal eşitsizlikler gibi bir dizi problemle baş edilmektedir. Bu ve bunun gibi problemler, yenileşim faaliyetleri gerçekleştirmede tetikleyici bir rol üstlenmektedir. Yapılan bazı araştırmalara göre kaynakların kısıtlı oluşu ve sahip olunan problemlere acil bir şekilde çözüm üretilmesinin gerekliliği yenileşim yeteneğini artırmaktadır. Öte yandan yüksek maliyetli yenileşim ve üretim süreçlerinin ekonomik ve ekolojik açıdan sürdürülebilir olmayışı gelişmiş ekonomilerde de firmaları tutumlu yenileşime yönlendirmektedir.

Tutumlu yenileşim, temel olarak eldeki kısıtlı kaynakların en uygun şekilde (optimal) kullanılmasıyla gerçekleştirilen yenileşim faaliyetlerini işaret ederken pek çok farklı özelliğe sahip bölgelerde, farklı sektörlerde ve ihtiyaç alanlarında, farklı hedeflere yönelik olarak gerçekleşebilmektedir. Tutumlu yenileşim, firmalar tarafından piyasada varlıklarını sürdürme içgüdüleriyle sahip olunan kısıtlı ekonomik ve ekolojik kaynakları en az düzeyde kullanmaları olarak ele alınmaktadır. Firmaları bu şekilde maliyeti düşürmeye yönelik davranmaya iten; kaynakların sınırsız olmaması dolayısıyla mevcut gidişatın kendileri açısından sürdürülebilir olmayışı, müşterilerin artan çevresel hassasiyetlerine yönelik talepleri doğrultusunda hareket etmek zorunda olmaları, gelişmekte olan ülkelerde yaşayan çok düşük gelir grubu içerisinde yer alan insanlara yönelik olarak da ürün ve hizmet üretilebileceğini keşfetmiş olmaları gibi sebepler bulunmaktadır. Kavram; bireylerde de hayatta kalabilme içgüdüsüyle ellerindeki kısıtlı imkanları yenileşimci ve yaratıcı bir biçimde kullanarak gerçekleştirdikleri faaliyetler olarak değerlendirilmektedir. Bireysel tutumlu yenileşimci faaliyetlerin dünya genelinde daha çok kırsal alanlarda gerçekleştiği görülmektedir. Bunun temel sebebi ise, dünya genelinde teknik ve sosyal çözümlere acil ihtiyaç duyan nüfusun yoğun olarak kırsal alanlarda yaşıyor olmasıdır.

Çalışma kapsamında ele alınan bir diğer konu ise ekonomik büyüme, kalkınma ve teknolojik ilerleme meselelerine eleştirilerin başlangıcı olan 1960'lı yıllardan bugüne kadar giderek teorik altyapısının güçlenmesinin yanında pratikte de sosyal bir

harekete dönüşmeye başlayan "küçülme" konusudur. Ekonomik küçülme, kabaca gayri sâfi milli hâsılanın artışı olarak tanımlanan dolayısıyla niceliksel bir artış olan ekonomik büyümenin tam aksi yönünü, yani gayri sâfi milli hâsılanın küçülmesini savunacak kadar radikal değişiklik programları önermektedir. Küçülme savunucuları, günümüz ekonomi bilimi aracılığı ile tanımlanan tüm kavramlara karşı çıkmaktadır. Kalkınma, sürdürülebilir kalkınma, sürdürülebilir büyüme, yeşil ekonomi, ekolojik ekonomi gibi güncel teori ve pratik alanları da aynı şekilde eleştirilere maruz kalmakta ve küçülme savunucuları tarafından sert bir biçimde reddedilmektedir.

Bu çalışmada kanaatkâr bir toplumun izleri olarak ifade edilen şey kırsal alanlarda tutumlu yenileşim faaliyetleri gerçekleştiren girşimcilerdir. Kanaatkâr toplum, endüstri devrimi sonrası rastlanan sermayenin birikmesiyle mümkün olan ekonomik büyüme ve teknolojik gelişmenin sebep olduğu toplumsal ve çevresel problemlere getirilen ve yukarıda bahsi geçen küçülmeyi öneren bir dizi eleştiri içerisinde yer alan bir ütopyadır. Kanaatkâr bolluk toplumu; bilinçli ve gönüllü bir şekilde sosyal ve çevresel değerleri ekonomik değerlerden üstün tutan, basit, sade ve fazla ihtiyaçlardan arınmış bir yaşamı tercih etmiş insanların inşa ettiği toplumsal bir düzene işaret etmektedir. Bu düşüncenin günümüzde en önemli temsilcisi olan Latouche, kanaâtkar bolluk toplumunun; ilkel çağlardaki üretim ve tüketim biçimlerinin bugünün ekonomik terimleriyle açıklanamayacağı gibi günümüz ekonomi biliminin kalıpları dışında yer alan değerlerle küçülmenin kendiliğinden gerçekleşeceğini öne sürmektedir. Çalışma, kırsal alanlarda gerçekleştirilen tutumlu yenileşim faaliyetlerini küçülme teorilerinde tasvir edilen kanaatkâr toplum persfektifinden ele almaktadır. Bu kapsamda ele alınacak girişimciliklerin kırsal tutumlu yenileşim olarak tanımlanabilmesi için birtakım kriterler belirlenmiştir.

Bir yenileşimci faaliyetin tutumlu olabilmesi için; literatürde sürdürülebilirlik, satın alınabilirlik ve iyi performans kriterlerini sağlaması gerektiği bilgisi yer almaktadır. Bu da, sürdürülebilir inovasyon süreçleri sonucunda satın alınabilir ve iyi kalitede bir ürünün ortaya çıkması anlamına gelmektedir. Kırsal alanda ise tutumlu yenileşim faaliyetlerinin literatürde yer alan bir tanımı bulunmaması nedeniyle çalışmamız kapsamında bir kırsal tutumlu yenileşim tanımı yapılmaktadır. Küçülme ekonomisi teorilerinden gelen kanaatkârlık düşüncesi bağlamı göz önünde bulundurulduğunda, bir kırsal tutumlu yenileşim faaliyetinin, öncelikle yerel halk tarafından tanımlanabilen bir ihtiyaç ve probleme yine yerel halk tarafından üretilmiş bir çözümü içermesi gerekmektedir. Kırsal tutumlu yenileşimin tanımı küçülme ve kanaatkârlık düşünceleri ışığında yapılırken en önemli kriter, küçülmeyi öneren teoriler içerisinde "yerellik" olgusuna sıkça vurgu yapıldığından, bu kriter olmaktadır. Bu bağlamda, çalışma kapsamında kentsel alanlardan kırsal alanlara daha sonradan göç etmiş nüfus kırsal nüfus kapsamında değerlendirilmemiştir. Söz konusu yenileşimci faaliyetin ayrıca, kırsal alanlarda veya kırsal alanlara katkı sağlayacak şekilde; yerel halk tarafından ya da yerel halka katkıda bulunacak biçimde gerçekleşmesi ve sürdürülebilirlik, satın alınabilirlik ve iyi performans olmak üzere tüm tutumlu yenileşim kriterlerini de sağlaması gerekmektedir. Aksi takdirde kırsal alanlarda tutumlu yenileşimden bahsetmek mümkün değildir. Ele alınan örneklerin kanaatkâr bolluk toplumu düşüncesiyle örtüşmesi bakımından ayrıca bilinçli ve gönüllü bir "sadelik" tercihini içermesi gerekmektedir.

Bu çalışmada, öncelikle kırsal alanda gerçekleşen tutumlu yenileşim kavramı ve faaliyetleri, kanaatkârlık düşüncesi bağlamında tanımlanmaktadır. Çalışmanın temel amacı ise Türkiye'de söz konusu tanıma uyan kırsal tutumlu yenileşim faaliyetlerini tespit etmek, irdelemek ve değerlendirmektir.

Çalışmada, kırsal tutumlu yenileşimci faaliyetleri saptamak adına ilk olarak gazetelerde ve çeşitli haber kaynaklarında yer almış kırsal girişimcilik faaliyetleri listelenmiştir. Bu listede yer alan faaliyetlerden tutumlu yenileşime örnek teşkil edebilecek beş tanesi vaka çalışması yapılmak üzere seçilmiştir. Kırsal tutumlu yenileşim kriterleri açısından değerlendirilmek üzere bilgi toplamak için yerinde derinlemesine mülakat yöntemi uygulanmıştır. Çalışmanın sonucunda Türkiye kırsalında gerçekleştirilen tutumlu yenileşim faaliyetlerinin, yerel ve kırsal kalkınmanın da başarısına katkı sağlayabileceği ve ayrıca küçülme düşüncesi içerisinde tarif edilen kanaatkâr bolluk toplumu ütopyasını oluşturacak yapı taşları olabileceği tespit edilmiştir. Kırsal tutumlu yenileşim çalışmaları oldukça güncel ve yeni bir araştırma zemini ortaya koyduğıundan, çalışmamızın gelecek çalışmalara yol gösterici bir niteliği bulunmaktadır.

1. INTRODUCTION: SEARCHING THE TRACES OF FRUGALITY

Economic growth had left its importance to economic development and there are too many different approaches to achieving economic development. Many different changes in nature of economies come with global changes such as industrial revolution, world wars, diminishing resources and environmental damaged have forces states and societies to rethinking economic growth, economic development, technological development, innovation etc. World system has been changed rapidly since industrial revolution. In the past, the technological development in and the transfer of technology by heavy industry were the most important key for economic growth. Today, information society is frequently mentioned in development literature. Innovation is an indispensable concept of information society. In this chapter; aim, scope, methodology of the thesis which discusses how these changes affected the perception of growth, development, innovation and what kind of relationship between these changes and rural areas occurred are explained.

1.1 Aim

In this thesis, it was desired to understand the change of world depending on the limited resources and many economic-social problems which are mentioned in previous section and will be explained in detail in the next chapter and the relationship between these changes and rural areas. The motivation behind choosing the research subject "rural frugal innovation" bases two inspiring books that one of them is "Frugal Innovation: How to do better with less?" (Radjou & Prabhu, 2015), and the other one is "Vers une société d'abondance frugale: Contresens et controverses sur la décroissance" (Latouche, 2011). Both of them emphasize using resources at minimum level i.e. being frugal. Radjou and Prabhu (2015) reveal what frugal innovation is with innovation implementations which are carried out with frugality in both developed and developing countries. They argue that people and firms do not need huge economic sources to do innovation and frugal innovation including simple solutions can change the world. "Frugal Innovation" book aroused a

curiosity on understanding what can be emerged by using all kind of resources at minimum level in rural areas. In addition to their potentials, rural areas have many deficiencies in terms of economic resources. Whereas increasing the quality of life of rural areas, bringing infrastructure to rural required economic resources. In literature frugal innovation is shortly defined as doing more with less. Minimal using of bag of tricks means frugality. On the other hand, defining frugality in the context of only innovation would be inadequate. Therefore, background of frugality also needs to be searched. Theoretical background of frugality concept bases on the critics of economic growth in 1970s. After that period, it was concluded that growth doesn't mean development as the result of a series of discussion. Then, economic development which includes many parameters not only related with the economics started to be discussed. After that, another discussion that economic development is also insufficient without sustainability criteria started as a result of environmental problems and decreasing non-renewable resources which are used as they have no limit in previous time periods. While sustainable development discussions are still up-to-date at the same time controversial, we are confronted with the thought of de-growth as another discussion which arguing growth is not progress like de-growth is not opposite to progress. The criticisms to growth composed in a theory and a frugal abundance society is described by Latouche (2011). He contributed with the thoughts of all of the growth critics and theorised his de-growth think as against to every kind of economic growth and development in his book of "Vers une société d'abondance frugale: Contresens et controverses sur la décroissance" which is the second inspiring book of the thesis.

Frugal innovation is a current issue which was used in engineering first and then spread to both developed and developing world rapidly. Frugal innovation briefly means an innovation which is done in a frugal way. It overlaps de-growth thought and frugal society thought with many points of it especially when it is in rural areas. Frugal innovation examples in rural areas generally front as rural entrepreneurship. So, there is a theoretical background of the motivation to compose this kind of a study including criticism on growth and development, de-growth, frugal society, frugal innovation and rural frugal entrepreneurship. In this framework, this thesis aims to reveal rural frugal innovation with the theoretical framework of frugality and to search whether there is rural frugal innovation in Turkey or not.

So, the thesis which aims to put forward what the frugal innovation is with all of its dimensions in considering of its theoretical background and to examine thoroughly the implementations which are suitable for frugal innovation in rural Turkey, seeks to answer the following questions.

- Are there any implementations which can set an example for rural frugal innovation in Turkey?
- If so; to what extent are these implementations frugal and innovative?
- Can these rural frugal innovation implementations be constituents of 'frugal abundance society' described by Latouche?

The next section, presents the scope and structure of the study in the light of the aim and question which is explained in this section and introduces each of five chapters of the thesis.

1.2 Scope

In order to serve for aim and find answers to questions mentioned in previous section, the study has three objectives including (i) to explore what rural frugal innovation is completely; (ii) to investigate whether there is rural frugal innovation in Turkey and (iii) evaluate rural frugal innovations in Turkey. In this context, the thesis consists of five chapters. The chapters include researching theoretical background, defining "rural frugal innovation" by considering this background and a research on the basis of five case studies to evaluate frugality in rural Turkey (Figure 1.1).

In this context, the first chapter, "Introduction: Searching on Frugality of Rural Turkey", introduces the aim, scope and methodology of the thesis. It offers the background of the study briefly, clarifies aim of the study, research questions, structure of the study and data and methodology used in the study.

The second chapter, "Backgrounds of Frugality and Defining the Concepts" contains the summary of the in-depth literature review about theoretical background of the study and the sections define related concepts. Theoretical background comprises three sections. First of them evaluates frugality by the background of the concept, where it comes from and precisely the meant of the concept in this study. The second section includes explaining the concept of frugal innovation with different emerging

definitions, general features and implementation examples from the world. Last, the third section describes the concept of rural frugal innovation and determines certain criteria to define it.

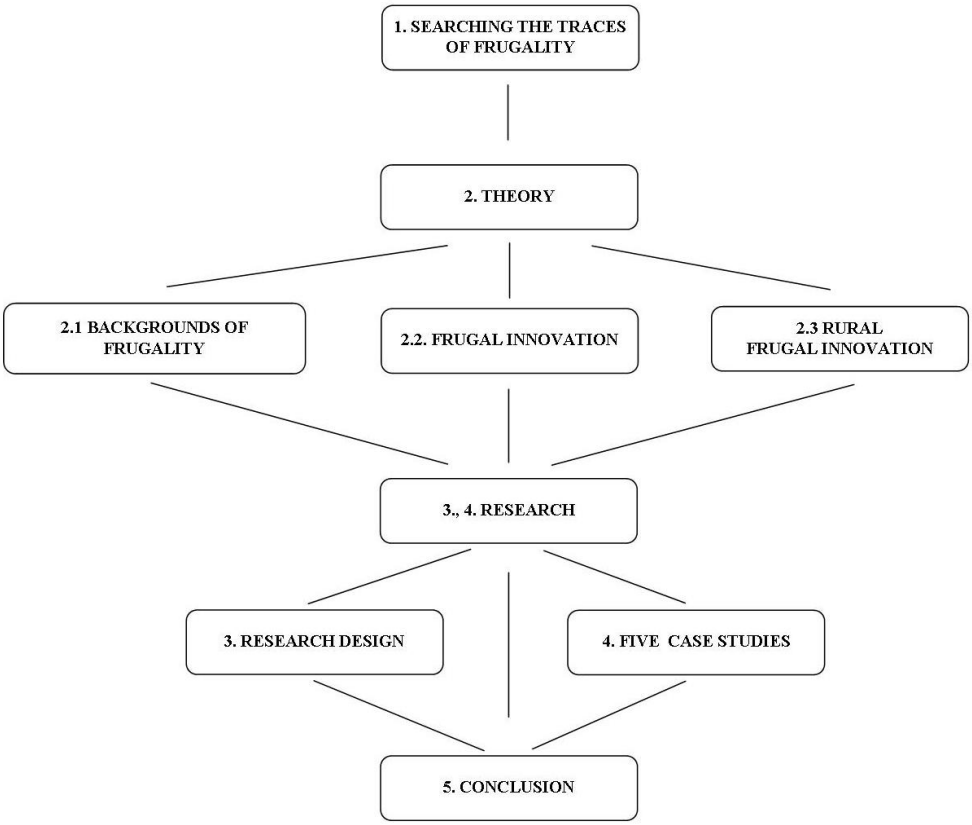

Figure 1.1 : Structure of the thesis.

The third chapter reveals the design of the research about evaluation rural Turkey in terms of rural frugal innovation in Turkey. This chapter includes the aim, scope, data and the methodology of the research.

The fourth chapter analyses the selected case studies referring to the definitions and criteria in second and third chapters. There are five case studies including a rural entrepreneur each located in Turkey's different regions and provinces. Each of the case studies are explained by general information about the district or province of the case, the story of entrepreneur and its contribution to its environ, evaluation of the case in terms of rural frugal innovation. The chapter concludes with a section discussing comparatively cases studies as a whole within the context of rural frugal innovation in Turkey.

The fifth chapter discusses the results of the study and whole thesis as well as recommendations for future work.

Following section describes the methodological approaches used in collecting and analysing data in all of the chapters of the thesis.

1.3 Data and Methodology

This section explains how the research questions are answered and which data and methods are used in order to obtain three objectives of the study. The study has three steps from introduction to conclusion (Figure 1.2). First step has an exploratory approach for understanding what and how rural frugal innovation is. In this step, document analysis is the method and literature archive is the data. Second step is searching rural frugal innovation examples and eliminating them in order to look for the traces of frugal society in Turkey. All of the rural entrepreneurs in Turkey are the sample of the research. There is not any database to give information about entrepreneurs in Turkish statistical system; because of this reason, methodology of this step is also document analysis and archive of newspapers, magazines and results of twitter search are used as secondary data. Third step which is evaluating the selected examples as case studies uses in-depth interviews face to face and on telephone. Data collected from the archives were eliminated in terms of the criteria which are determined according to the definitions and principles of rural frugal innovation explained in the second chapter of the thesis. There are five case studies in this thesis located in Amasya, Aydın, Diyarbakır, Uşak and Kars provinces. While collecting the information about the districts of case studies, demographic and agricultural data of Turkish Statistical Institute were benefited. These are quantitative data used in this step of the research. Then, in order to achieve detailed information about the selected case studies, it was contacted with the entrepreneurs via telephone or social media. And a series of interview questions were prepared in order to collect data which can be based on evaluation. Actually, examining on-site aimed within the scope of research firstly. But three of them were can be examined in their own places when one of them bases on face to face in-depth interview and the other one of them bases on in-depth interview on telephone. First and second case locations were visited in September of 2018 and in-depth interviews were done with İbrahim Bayrak and Semra Ünal. Third and fifth case locations were on the other hand, visited in November, 2018 and in-depth interviews were done with Server Vural and İlhan Koçulu. Despite of the unexpected weather conditions, the village of Boğatepe could

not be visited. Fourth case location also could not be visited because of that the entrepreneur cannot accept any visitor to his facility. He also doesn't accept that any photograph of his facility was used in the study.

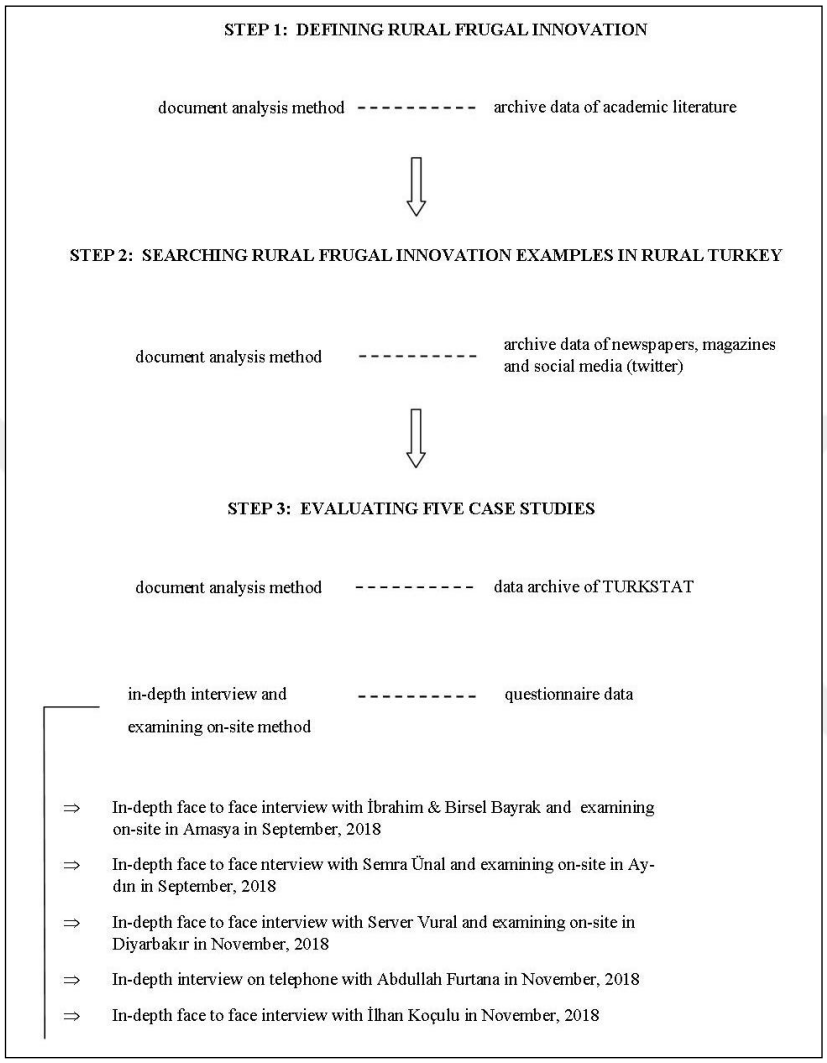

Figure 1.2 : Methodological steps of the thesis.

Briefly, methodologies of the thesis are document analyses, qualitative data analysis and in-depth interview with entrepreneurs. Data which are used in the thesis are archive of literature and various news sources, demographic and agricultural data obtained from TURKSTAT and questionnaire data achieved via interviews. Next chapter describes the theoretical background of the subject and defines the concept of "rural frugal innovation".

2. BACKGROUNDS OF FRUGALITY AND DEFINING THE CONCEPTS

It needs to define two concepts, frugal innovation and rural frugal innovation for searching rural frugal innovation in rural Turkey. Frugal innovation concept was used in engineering area firstly, but origin of frugality bases on a serious of discussion in the recent past. In this study, meaning of "frugal" which is used in defining rural frugal innovation takes inspiration from frugal innovation but bases itself on de-growth as theoretical background of frugality. This chapter presents a summary of discussions about de-growth theories in terms of frugality and in the light of these discussions, it defines frugal innovation and rural frugal innovation with many examples from all around the world.

2.1 Theoretical Background of Frugality

Before modern age economic structure had based on the agriculture in most of the countries. With industrial revolution started in Britain, many changes on economic system started to emerge. Accumulation of the capital has started to shape economies and so economic differences between countries. On one hand cities had been becoming the centres of spaces of capital accumulation, on the other hand rural areas and agriculture had been decreasing their importance and giving migration to the cities rapidly. Increasing differencies between north and south also started to shape in this period (Maddison, 2007). The question of what the role of state on capital accumulation and the share of accumulation have been widely discussed. Classical approach which supports no intervention to the market had been the mainstream approach to economy until the crisis of 1929. Economy could not be equilibrated itself after the crisis of 1929 (Bocutoğlu, 2012). After that, Keynes emphasized the importance of role of state first and Keynesian economy started to rise. After Second World War in order to put backwardness on the agenda regional science was established by Walter Isard (Boyce, 2003). Concepts like economic development, preventing inequalities between regions have started to gain importance instead of economic growth which is treated as only GDP growth. Many economists argued

that the market failure and regional inequalities can be prevented with state investments in that period. By the way the resources which are input for economic activities had been still using like that they will never be consumed.

All of the theories about the economy have been shaped by the assumptions accepting that economic growth and economic development are indispensable, in 1970s. This situation has started to be questioned. Acceleration of life comes with technological development, increasing of communication devices, development of transportation technologies and their effects on human life started to be criticised. Jacques Ellul (1964) in his book of "The Technological Society" categorised historically the techniques used as traditional and modern. He compared old techniques with new ones and tried to explain its relationship with the economy. He argued that the society shaped by technological development for economic growth had been disassociated and dissolved the human personality through mechanization. Technologic development contrary to what is believed, limits the freedom of individuals.

Meadow et al called as "The Club of Rome" (1972) published a report entitled "The Limits of Growth" within the scope of a project carried out with MIT in 1972.The research had two main purpose: (i) to gain insight into the limits of world and its constraints on human numbers and activity and (ii) to identify, the dominant elements and their long term effects on the world system. Five basic factors that limit growth of the planet which are population, agricultural production, natural resources, industrial production and pollution were examined. According to the results of the report, population and industrial capacity will start to decline if current trends will continue in one hundred year; it is possible to change these trends and the earlier starting people to change the more chance they have.

Schumacher, an economist, also criticizes the economic growth, technological acceleration and complexity in terms of production and consumption. As Schumacher (1973), science of economy assumes that everything has a price so the money has the highest of all values. He distinguished between primary and secondary goods and said that human cannot produce the primary goods which are won from the earths. But the market does not care about this distinction; it provides a price tag for all of them. Whereas human is not a producer, he is only a converter According to him, attitude of modern economic values means above ends and this

situation destroys freedom and power of human to choose ends he really favours. Therefore, we must distinguish between means and ends. He mooted that modern technology and high level transportation and communication system make people footloose (Schumacher, 1973: 51). He supported that necessity of finding "right livelihood" instead of choosing between modern growth and traditional stagnation as well as necessity of developing the methods and equipment which are cheap that everybody access them, small scale and suitable, compatible with man's creativity. He is not against the technology but he believes that the task of technology must be making work human has to do to stay alive easier. This kind of technique is an intermediate technology which is with a human face. To bring this technology including simple methods is more difficult than advanced and complex methods. Schumacher (1973: 142) emphasizes the importance of voluntarily participation of everybody with a national consciousness of self-reliance instead of the planning and interventions of scientists, planners for a successful economic development.

Ivan Illich also criticised the current economic and technological system in the same period. In his book of "Energy and Equality" (Illich, 1974), he inferred that equality and industrial growth cannot be achieved at the same time and lots of energy consuming destroys both the physical environment and also social structure and societies must limit the existing energy consumption. He supported a post-industrial life style. In post-industrial life, people succeed to decline their market dependency and reached it through protecting an infrastructure which is technical and producing unquantifiable use value of 'tools for conviviality'. Ingmar Granstdt who continued the tools for conviviality of Illich suggested establishing of local workshops including common usable machines which enable people to produce their necessity such as clothes themselves in neighbourhoods (Latouche, 2011). This suggestion matches up with the ideas of Schumacher (1973) that there is no another thing gives people pleasure except a work that people do via their two hands and brain.

Nicholas Georgescu-Roegen significantly affected the establishment of the idea of ecological economy and de-growth philosophy. He also criticised hardly the neoclassical economic approach. According to him, neoclassical approach ignores how to allocate the exhaustible resources to present and feature generation. He indicated that "mankind cannot return to the cave or to the tree" and continued as recommended some points for 'minimal bioeconomic program' in his paper "Energy

and Economic Myths" (Georgescu-Roegen, 1975). His recommendations are around by 'de-growth' which was explained as reduction of production and consumption in a way that makes environmental conditions better at local and global levels and increases human welfare in short and long terms.

Andre Gorz is another supporter of 'de-growth'. He argued (1989) that the idea of industrialism that promised people to save from scarcity, injustice and misery and powered people to dominate nature was collapsing. But this situation does not mean that people have not any option, contrary this means that people must to find a new utopia. He suggested a new economic system which enables to people more free time and right of leisure. He strongly emphasized that working time must be reduced. Thus people should be able to have access to skilled, creative activities.

Latouche composed all of these ideas and developed his own de-growth idea which can be achieved only by a frugal society voluntarily. He explains his ideas about frugal abundance society and de-growth economic structure in his "Vers une société d'abondance frugale: Contresens et controverses sur la décroissance" book, published in 2011. He defines the concept of 'de-growth' as escaping from the baleful circle of producing boundless necessity and product and from its increasing dissatisfaction, and alleviating the selfishness comes from individualism with conviviality. As Latouche (2011), de-growth society must also regulate the production, use environmental resources wisely, and consume them via goods and services. But it will make real this as like the abundance society which does not know anything about economic counting like description (Sahlins, 1972).

A de-growth society which has frugal abundance must:

- Decline the theoretical global efficiency (methods damaged the environment, much energy consumption etc.),
- Get activities turned back to their own locates, end the exploitation of the south,
- Ensure ecological employment in all of the economic activities,
- Escape from the useless necessity and from excess,
- Ensure everyone to work people to be able to productive.

Herman Daly (1996) argues that a sustainable development is not possible because this concept is perceived as sustainable growth but we cannot grow limitlessly and sustainable growth is impossible. Sustainable development should be perceived as qualitative improvement of a physical economic base which is defined within the scope of limits of ecosystem and kept stable. And this means zero growth. Sustainable development must be a development without growth. His teacher, Nicholas Georgescu-Roegen criticised Daly's stable-state economy that it is not an ecological salvation in long term, economy has to de-grow not stay stable and he also criticised that it is unspecified at what level economy keeps stable. Latouche (2011) also criticised Daly's suggestion on a system that does not consume resources faster than renewing them and does not remove garbage faster than absorbing old waste, because of such a system is not compatible with the dominant economy according to him.

As Latouche, local production and consumption are inevitable tools for reducing ecological footprint. And it needs to fragment big distribution tools and exit from certain commerciality. Thus, we rediscover the simpler and more natural pleasures that lead to savings in the resources of the planet. They can be a source of pleasure as well as necessity, such as man's cultivation of the soil in his own garden, making his own bread and kneading. The culture of locality must be recreated. In the idea of Latouche the de-growth society is not only against capitalism but against whole consumer society. Capitalism, liberalism, development and growth are all the same for him and he rejects all. Another economy or another development such as Keynesian, statist green, humanistic, sustainable one is not possible. To achieve a frugal abundance de-growth society, there are seven points begin with 'r' which are revaluation, reconceptualization, restructuralization, relocalization, reduction, reuse, recycle. Altruism instead of egoism, cooperation instead of competition, the importance of social life instead of unlimited consumption, locality instead of globality, autonomy instead of heteronomy, what is reasonable instead of what is rational and relationality instead of the materiality must gain importance.

Another concept, sustainability also appeared in the agenda after 1980s and since that time many international organization have tried to make policies to achieve sustainable development. But it can be understood de-growth is very different from sustainability. Latouche (2003) harshly critisizes sustainable development and he

argues that sustainable development is a paradoxal oxymoron; it can only be illusory mystifications. De-growth theories support a radical change which can be occurred with a frugal abundance society against all of the development and economic model. But declining resources issue has forced both development supporters and the others to use them in a minimal way.

All of the backgrounds of frugal thinking and different approaches to economic system in different time period are shown in a timeline (Figure 2.1). As it specified at the beginning of the section, when economic growth which means increasing of GDP was the only important parameter until the second half of 20. century; it still keeps its importance in current economic system although different approaches such as development, regional inequalities, sustainability and last frugality have been articulated to it. Ellul, Meadow et al, Schumacher, Georgescu-Roegen, Illich, Gorz and Daly are the pioneers of de-growth thought and they have affected many thinkers for years. There are differences, similarities and also matches in their thoughts beside that the main common issue in their ideas is consume less i.e. being frugal.

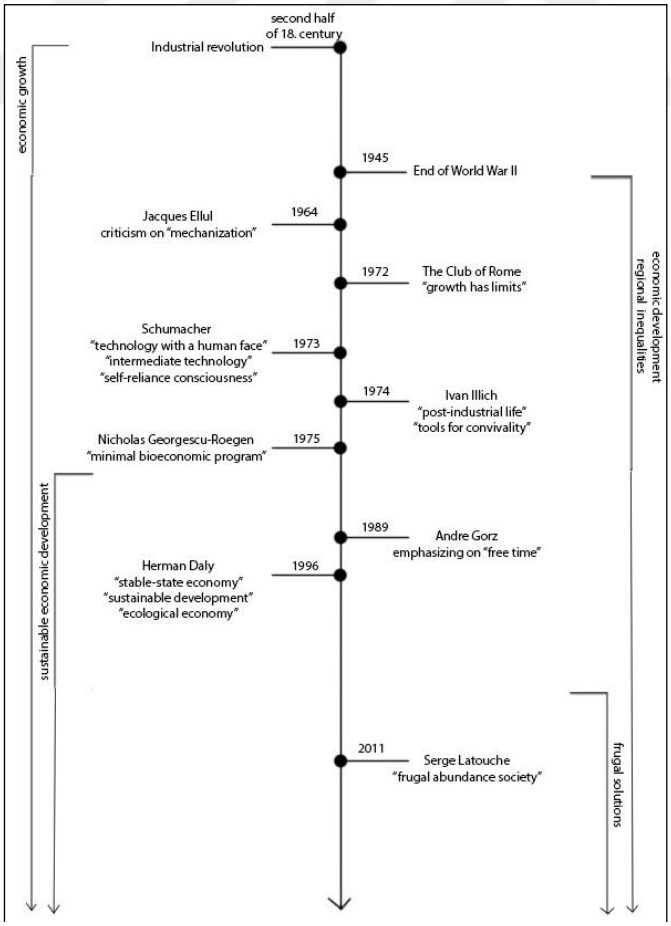

Figure 2.1 : Timeline of de-growth as the background of frugal thinking.

2.2 Frugal Innovation

As it can be understood from previous section, global economic system forces both firms and individuals to be frugal in life. Frugality which can be perceived as using minimally of all resources, limiting the necessaries, becoming plain in the life can help with achieving a sustainable, peaceful society which solved its economic problems. In this section, frugality will be examined in-depth in the context of innovation and which activities can be considered as frugal innovation in the world will be reveal.

The word "jugaad" means economical in use or spending, requiring little expense or few resources in Indian language. It's the ability to come up with very simple but effective solution using limited resources. It's a way of managing things with minimal resources. There is no an exact translation in English but there are parallel words in other emerging countries where people have really limited resources. In China it is called "shanzai" (Bhatti et al., 2013) and in Brazil "gambiarra" (Radjou et al., 2012). This word also means "living without waste". It called as "frugal" in English (Leadbeater, 2014).

Innovation means better solution that meet new requirements. Crossan and Apaydın (2010) define it as "Innovation is: production or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and establishment of new management systems. It is both a process and an outcome."

It can be said that frugal innovation is a kind of innovation doing frugal ways in all respects.

2.2.1 Towards a frugal innovation from innovation

Economy was transformation of input into output with production function and economic growth was growing of input and mechanization during the most of the 20th century. This aspect started to change in the second half of 20th century. Environmental issues, health and sociological problems forced to move heavy industry depending on natural resources from developed countries. Economy has started to transform to information economy and the information has started to be

basic input to economy. Industries have started to transform depending on information and creating the information. Information is also important because of that it is resource for innovation which can be defined as new ways, methods, solutions that economic and social ecosystems have to find to survive, sustain and meet new needs.

After the concept of sustainability which is defined as "meeting the needs of present without compromising the ability of future generations to meet their own needs in three dimensions: ecological, social and economic" briefly, was introduced to all of the world's agenda in 1980s it was started to implement in many fields. Innovation which is the most important point of information economy is one of these fields. And it has multi-layer processes which need too many sources like an exist need, an advanced technology and advanced human capital who used this technology and financial support. Sources of innovation can be considered as much cost and it has implemented in a cost way for years because of it perceived like that. So, innovation has implemented by developed countries for years. This situation has started to change with trigger of three different reasons (Figure 2.2).

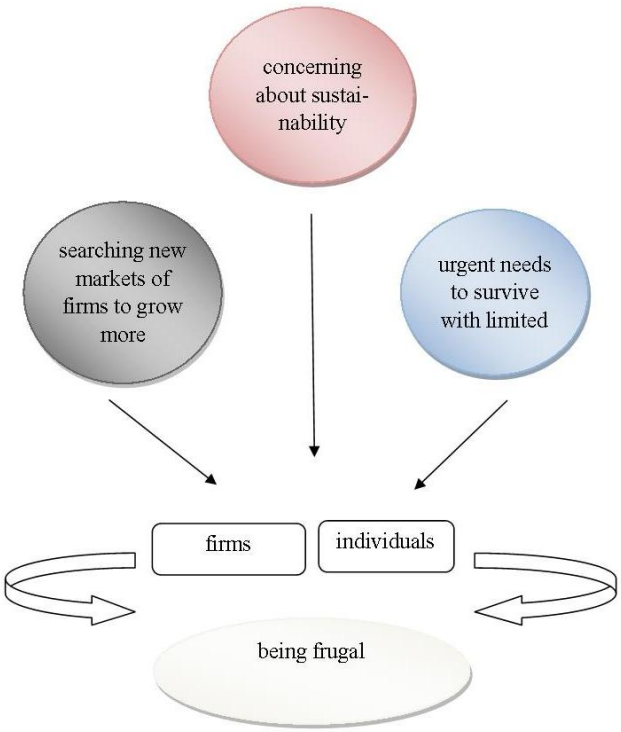

Figure 2.2 : Three reasons trigger perceive of innovation to change.

One of these reasons is originated from concerns of firms about sustainabillity. Firms need a lot of resources to do production all the time and resources are mostly limited.

If they continue to use these sources in the same way, resources will decrease and there will no resource to use in their production. This is not only the end of resources but also the end of firms and their power economy.

Second way of changings in expensive innovation process is originated from problems of developing and undeveloped countries and their lack of resources. Undeveloped and developing countries especially their rural regions have a lot of problems about basic needs to survive, not about get bigger or advancing their economy. They have to find solutions for their problems in a way even in this lack and inadequete conditions. So their solutions actually mean innovation and it is not expensive and cost.

Third reason changing present innovation way is the more growth request of firms. Firms especially multinational entreprise ones, have to do change, novelty to sustain their existence and this change can be in their customer profile. Big firms want to be bigger and produce for certain segment customer can add customers in different segment even sub-segments to their production range. They have discovered the Bottom of the pyramid (BoP). BoP refers to the people that their nubmers are four billion people in the world and who live with less than 2 dollar a day (Beers et al., 2014). Production process for sub-segment customers is cheaper and firms can make more profit to serve sub-segments customer.

These reasons have caused to change perceive of innovation and inspired that innovation can made in a cheap way to all of the world.

2.2.2 Origin of the concept and its diffusion

Schweitzer who is Renault's CEO had surprised when he saw their own expensive and stylish car was not sold more than Lada which was sold for 6000 dollars 1997. He wanted a car produced for 6000 dollars from Jean Marie Hurtiger. Then Renault had united Dacia and created a team included French and Rumanian. High quality design approach of French and low cost sensitivity of Rumanian came together. They created a car (Logan) using 50 per cent fewer material in 2004. The next CEO of Renault Ghosn revealed definition of "frugal engineering" in order to express the skill of fast innovation with low cost.

Frugal innovation concept means that skill of fast and low cost was firstly used in Europe. Its diffusion can be explained with different examples from the world.

ChotuKool is a small-size fridge produced in India in 2009 doesn't need to electricity. This is an example for local diffusion in the country. The fridge had diffused among several provinces with similar socio-economic conditions in India rapidly. Tata Nano as another example is the cheapest car in the world produced by Tata Motors in India in 2008. This production has not served not only for its own country but also some neighbouring countries like Bangladesh, Nepal and Sri Lanka. VG (Vortex Gramateller) which is an ATM powered by solar energy and low cost produced in 2008 and then it started to spread into the other Asia countries, Middle East and Africa. GE's (General Electric) very low-cost ultrasound machine is another diffusion example in terms of it spread both developed and emerging economies (Hossain et al., 2016).

There are four different diffusion ways of frugal innovation depending on where and how it is implemented. These ways are local diffusion, diffusion to the neighbouring countries with similar socio-economic conditions or to the other countries with similar socio-economic condition and to the other countries with different socio-economic level (Figure 2.3).

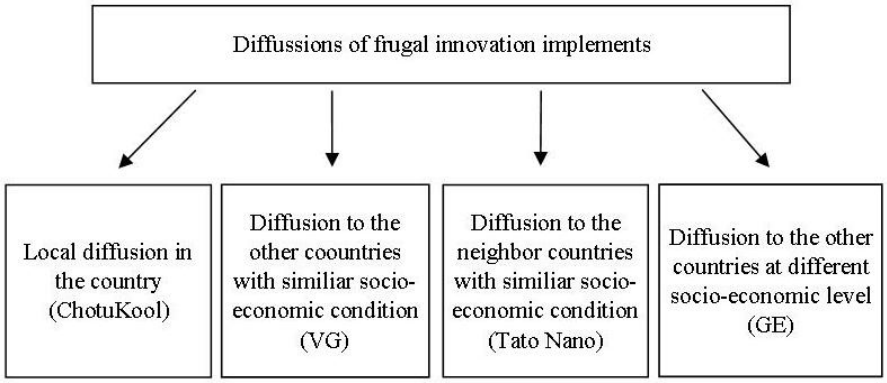

Figure 2.3 : Four diffusion ways of frugal innovation in the context of implements.

Innovations in developing countries have aimed to solve local problem. It was a result of finding solutions to their own serious problem with really scarce sources in developing countries but it started to spread among developed countries (Bianchi et al., 2017) because of concern of sustainability and looking for new markets.

2.2.3 Different definitions of frugal innovation

An innovation consists of five phases including emergence of a need, researching the ideas, developing the idea, implementing it and marketing according to Adıgüzel (2012).

Emergence of a need which is first phase of innovation can be based on ideas of firm employees, changing needs of customers, studies of rival customers or newly developed technologies or suppliers. The most important factor of phase of emergence of a need is customer. Customers can be the only factor themselves (Adıgüzel, 2012).

Customers are also important to make firms innovative via prediction of needs not exist yet. This situation is actually a part of ideas phase. Sometimes though there is not any need in customers firms research ideas and determine a new need. Ideas phase also occurs in that researching an idea as an answer for needs of customers. Firms' employees as human capital are the most important factor in this phase. Only one of the produced ideas that can be implemented in real life is chose at the end of this phase.

Developing phase is moving the chosen idea to a process or product. Strategies, resources of adequate money and human, R&D expenditures are factors play role in the success of development phase.

Idea which is completed necessary analysis goes to the related engineering unit to turn a physical product. This is the implementation phase. Product produced in a small amount is launched to the market to test.

Marketing phase is the phase of putting product passed the test successfully and produced a large amount to the market. Production possibilities or necessary assignment with production facilities and marketing efforts play an important role in this phase. Because of these reasons, this phase can be much cost.

Innovation which consists of five phases mentioned above can be defined in different ways depending on how much innovative is a process in which phases of it. There are also some different approaches in literature to define frugal innovation, resulting from different approaches of innovation.

- Product-based definitions: Frugal innovation seeks to minimize the use of material and financial resources (Tiwari & Herstatt, 2012) and is characterized by low price, compact design, limited use of raw materials or reuse of existing components, ease of use, cutting-edge technology to achieve lower cost (Rao, 2013).
- Market-based definitions: Frugal innovations are originally developed products or services for very specific applications in resource-constrained environments (Zeschkyet al., 2014) Frugal innovation aims to provide the essential functions people seek to satisfy with a given product. For frugal innovators scarcity is both fact and opportunity (Cunha et al., 2014). Frugal innovation refers to those innovative products and services which are developed under conditions of resource constraints (Agnihotri, 2015).
- Criteria-based definitions: Innovations are frugal if they simultaneously meet the criteria substantial cost reduction, concentration on core functionalities, optimised performance level (Weyrauch & Herstatt, 2016). All resource-constrained innovations have the following features: cost effectiveness, ease-of-use, prescriptive variable (Agarwal et al., 2017).
- Process-based definitions: Frugal innovation as the means and ends to do more with less for more people (Radjou & Prabhu, 2015). The design innovation process that properly considers the needs and context of citizens in the developing world (Basu et al., 2013).

In addition, there are over dozen of concepts that overlap with the frugal innovation concept including cost innovation, resource-constrained innovation, shanzai, jugaad(Pisoni et al., 2017)., even Ghandian innovation (Annala et al., 2018) All of these innovations represent slightly different background but bear the similarity of affordability in frugal innovation. Frugal innovation also shares some ideology of disruptive innovation. Disruptive innovations are product and services that are not as good as currently available products. Some frugal innovations have made or are about to make their way from low-income markets to wealthier markets. These innovations are labelled as reverse innovations or grassroots innovations. Reverse innovation as a resource constrained solution that has been introduced first, either successfully or not in emerging market or developing and then successfully

transferred to developed countries. There are other kinds of reverse and grassroots innovations such as socially-driven and sustainability-driven innovation (Pansera & Sarkar, 2016) Al reverse innovations are also frugal innovations. However not all frugal innovations become reverse innovations (Khan, 2016).

It can be obviously seen that there are some parts that make a production process an innovation; a need, an idea, a production process includes designing and developing, marketing. When these processes are occurred in a frugal way it can be called as frugal innovation. It will be understood well what frugal innovation is exactly after mentioning about features, principles and some examples.

2.2.4 General features and principles of frugal innovation

According to Rao (2013), there are 4 main characteristics of frugal innovation: affordability, good performance, sustainability, usability. Frugal innovations are cheap, robust in harsh environment, easy to use and repair, new uses of existing technologies, made of used and local materials.

In addition, Radjou and Prabhu express that there are three basic elements of frugal innovation including, quality, affordability and sustainability. And they suggest some principles for firms to do frugal innovation successfully in their book which is published in 2016. These principles are like below:

- Principle one in the book is “include your customers and iterate”. Collapsing of expensive, time-consuming, inflexible, not-so-eco friendly and not including customers research and development models in 21. century is not surprising. To do frugal innovation the firms must include customers into research and development, look for cheap solution as much as possible and think like customers, reduce bureaucracy and take account supply chain issue in their research and development process. Observing customers who need solutions in their natural environment can help researcher to understand what customers actually need.
- Flexing the assets is the second principle. New tools (such as robotics and 3D printers) and new approaches (such as social manufacturing and continuous production) can help firms. This principle also emphasizes creating a frugal supply chain. Those are important to do that: Returning to local, using local sources, sharing the sources, finding innovative solutions to problem of

access to far remoteness places, integrating logistic and manufacturing, sharing data with partners.

- Creating sustainable solutions is another principle in the book. Tarkett which is a flooring firm was mentioned as example to sustainable production and its changing in time in terms of sustainability and increasing of its sales rate. Some factors forced firms to care about sustainable. These factors are explained in this section: Declining sources, healthy and ecological demands of customers, claim of employees from their companies to care about environment. Various implementations gave in this section like biomimetry which is imitating natural models and methods of living organism. The authors outline the concept of a "spiral economy" which combines and integrates the principles of the sharing and circular economies, "a virtuous system that generates ever more value while reducing waste and the use of natural resources." Sharing web sites like Airbnb, BlaBlaCar, Skillshare, Wear It Share It set an example for sharing economy. Sharing economy is important for frugality because of it reduces personal consume. Rate of personal car owner decreased to 2% from 6% between 1999 and 2013 due to the trend of this kind of sharing sites in Germany. Turning wasted glasses into new and luxury furniture of FIAM Italy firm also is an example for spiral economy. Modular design like using a place for many different purposes is gave as an example in this principle. R&D and manufacturing managers can develop self-sustaining solutions that help both businesses and the environment, such as "cradle-to-cradle" (where components and materials are repeatedly recycled.
- The other principle is shaping customer's behaviours. In this section behaviours about awareness or environment of customers can be changed with some creative solutions by firms and products. These creative methods are visualisation, comparing with others (maybe their neighbours), rewarding. Writers also refer aspects about that less is better of degrowth theorists like Schumacher, Ehrenfeld and Hoffman. From this perspective writers say that the firms should promote their customers to consume less and in a sensible way instead of forcing to consume more. It needs to be balanced frugality and abundance. The suggestions to managers are: separate your customers in

terms of predisposition to change, organize sale crew for frugal customers and solutions, use social pressure, get frugality attractive, design products long lasting, design for future customers, explain that less sale is better to investors.

- "Co-create value with prosumers" is the fifth principle. Prosumer means that consumer who can also produce. The authors emphasize the important of participating of customers to production and designing process. Decathlon and Starbucks is mentioned as firms implement this successfully. Horizontal economy which is explained as new values system that enables customers to design, produce and market products and services themselves without any middleman. Some constituents of horizontal economy are makerlabs, do it yourself labs, sharing platforms, purchasing platforms support local and small-scale producers. First-hand implementations like "La Ruche qui dit Oui" which ensures local and fresh foods to customers from producers directly is another example explained in this section.
- Last principle is "make innovative friends". The authors mention about power of knowledge is not important so much anymore, sharing of it is more important. Sharing ideas and skill of realization of it or sharing wastes with the other who can use it as raw material; this sharing relationship had defined as symbiosis. And implementation of this principle had explained with various examples.

After all of these features, principles and elements of frugal innovation which was explained in different studies and implementations, some keywords related with frugal innovation can be put forward. These are; cheap solutions, participation, low cost production, need-oriented thinking, local raw materials, short supply chain, supporting local producers, local production, local consumption, to be easy to use and repair (Hussain, 2017), serving to multi-purpose use, creativity, sharing of information, sharing of property, sharing economy, spiral economy, recycling, zero-waste, eco-friendly solutions, consuming less, reducing needs, using of renewable resources (Figure 2.4). These keywords can be reproduced depending on the implementations which realized within the scope of frugality. And there are three main issues including all of the keywords. These are sustainability, affordability and quality as Radjou and Prabhu express in their book. Most of the keywords are related

with one or all of the main elements. For example sharing economy is related with both sustainability and affordability and also quality. A service or a product with a high quality is achieved in an affordable way as sharing instead of buy it again. On the other hand due to a new product or service is not producing one more time, sustainability is ensured.

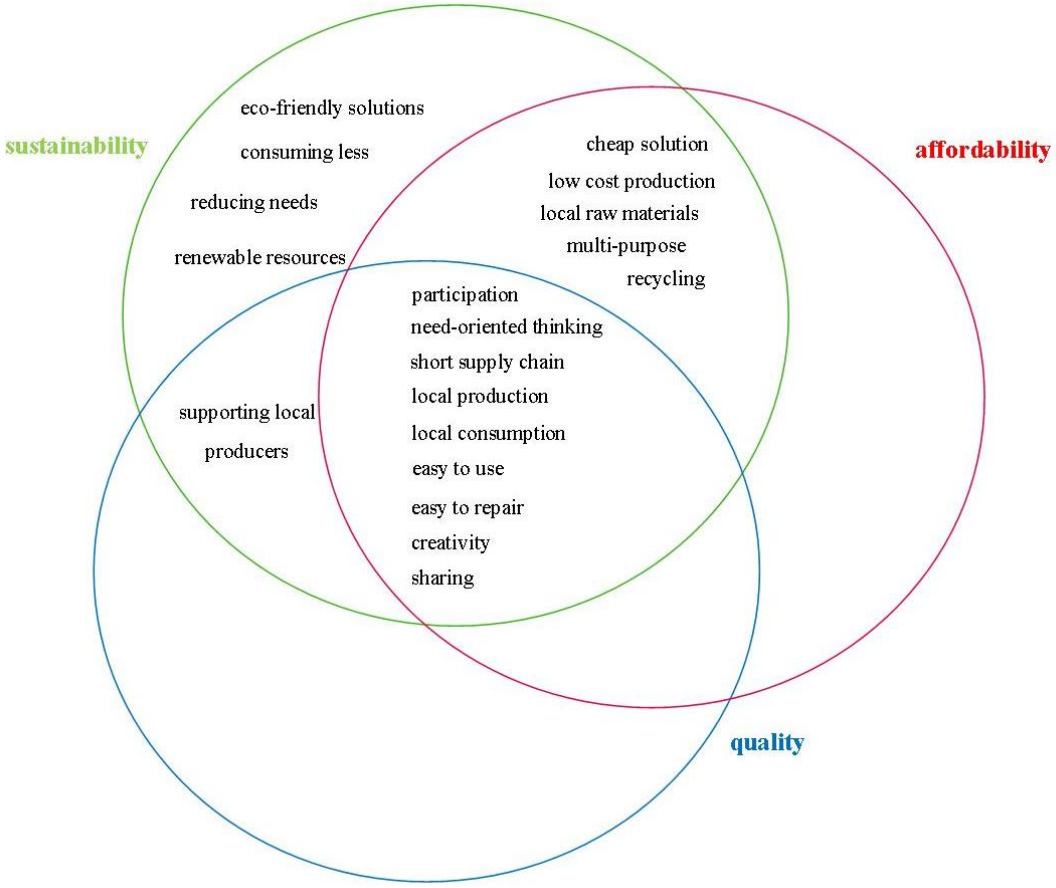

Figure 2.4 : Main elements and keywords of frugal innovation.

2.2.5 Examples of frugal innovation in the world

If an innovation is emerging a new thing in a certain process, frugal innovation is doing this process in a frugal way. Firms which want to sustain itself by nature must understand or predict the needs in the future of customers well and do something new. Current situation including limited resources, competition in sector etc. obliges the firms to do innovation in a frugal way. In addition, individuals who need urgent solution to their problems can do innovation although their limited resources. These activities can be also considered as frugal innovations. The most popular frugal innovation examples from different countries were demonstrated in this section.

- First example to implementation which completed in 2004 and caused to using concept of “frugal engineering” first time is originated from CEO of Renault’s willing of producing a modern, comfortable and reliable car which is also cheap after he recognized that Lada -a Russian automobile model was sold more than their luxury car. He wanted to do more with less. Price of car would be just 6000 dollars. This type of production model was not available for Renault’s R&D employees so the firm decided to produce the car in Rumania then it united with Dacia. French designer and Rumanian manufacture engineers studied together in a new team and they produced a car, designed basically and in a way that meets the needs of people at lower income levels and is also comfortable by using 50% less piece. This car was sold in mostly developing markets like East Europe and Middle East but also in Europe market. Dacia is now the fast growing automobile brand in Europe. Its global sales rate was 20% in 2008 but more than 40% in 2013. 95% of automobile’s pieces are recyclable. Then Renault aimed to produce automobiles in a more economical way then Dacia’s range. Therefore it can reach the markets of developing countries like India, China, and Brazil. It changed its Re&De activities around this aim. A team was sent to India to learn frugal production methods there. Renault’s these studies and activities are implementations of frugal innovation.
- GE (General Electric) is a firm rooted to the biggest R&D laboratory established by Thomas Edison in beginning of 1900s. It produced medical devices, airplane motors, wind tribunes, nuclear power plants, factories etc. Although these strengths company’s president of marketing admitted that they cannot do innovation with their traditional team and they have to change. Because the customers do not only want to buy product they also want personalized services to do their job well. Competitive conditions are the other reasons to force GE to change. GE presented its patent technologies to usage of ordinary people. And some people developed some products using GE’s Technologies like energy-effective air conditioner which can be command and this product was sold 300 dollars in plenty amount. It made partnership with start-up firms and started to produce affordable products in health, energy advanced production sectors flexibly. It also started to use

advanteges of amateurs from developing countries like Indonesia and adressed to the developing market also with its affordable products. GE, for example has developed 1000 dollars handheld electodiagram device (ECG), 15000 dollars ultrasound machine for underserved customers.

- Siemens developed a Fetal Heart Rate Monitor (FHM) in India inexpensive device to monitor the heart rate of foetuses in the womb.
- Two anaesthesiologists from the firm of Armsotrong Medical in the UK developed Shakerscope, a light source for a clinical examination for eye, ear and throat from their personal experiences in Zambia. This device provides enough electricity for 3 minutes on shaking for 30 seconds.
- Tarkett is a multi-national corporation about floor covering of hospital, sports facilities, schools, stores etc. Giannuzzi -CEO of the firm concerned about their annual growth rate and its creasing (10%). Because if this growth continue in that way the firm have to consume more resources like oil, water, wood and minerals. And these non-renewable resources are diminishing day by day. Firm recognized that they and their production process are not sustainable in terms of economic and environmental resources. Then it started to redesign its production model. It started to use recycling materials as raw materials, tried to reduce usage of energy and water in its production process and cared about using of healthy materials. In addition, these growth rate and net profit of Tarkett have continued to increase and it aimed to convert its material use to renewable and recycling material in rate of 75%.
- Unilever which is British-Dutch multi-national firm has its sustainable living plan started in 2010 and aimed to double the sales while halving the environmental effects. Sustainable Living Plan has three main goals: making better health condition of 1 billion people, reduction of environmental footprint, achieving all the agricultural raw materials from the sustainable sources. The firm produces concentrated detergents and deodorants. Rate of agricultural raw materials achieved from sustainable resources was 14% in 2010 and this rate reached to 48% in 2014 according to 2014 Report of Sustainable Living Plan.

- gThgrive which is a start-up company in Silicon Valley designed a sensor for farmers to measure environmental conditions like soil, humidity, temperature and to follow these conditions from far via smart phone or a web site. This product is like GPS determine what the most effective way is on the land is more. It has also the feature that can warn farmers in case of existence of possibility of a problem about environmental conditions before.
- Essilior –a French lens producer employees Indian young to do eye examination and prescribe in rural areas instead of open a shop there. Lenses are produced in cheap way in local points and sold with affordable prices for people from rural areas in India.
- MedicallHome is a healthcare company that provides hotline-based services to over 5 million individuals in Mexico. Customers can utilize from this services for 5 dollars in a month. Program includes service of doctor visit at home, ambulance service, accessing to a referral network of hospitals, clinics and laboratories.
- Aravind Eye Care Hospital in India is serving their patient at an ultra-low cost. It can provide percent of their cataract surgeries free of cost from subsidized payments by patients who still pay only 30 dollars.
- Micromax, Indian electronic firm produced mobile phones do not need recharging for a month or longer and its price is only 45 dollars.
- Safaricorn, Kenyan leading mobile network operator launched mobile phone-based Money transfer and micro financing service.
- M-Pesa that has revolutionized not only financial transactions but also communication patterns in Africa.
- Eko is a service of mobile banking in the same way in India and Easypaisa in Pakistan, Kopo Kopo in Kenya, WIZZIT in South Africa and bKash in Bagladesh.
- Bharti Airtel in India developed a new business model to deliver the cheapest mobile talk time of the world and gained an impressive profit margin.

- Tata Motors produced the cheapest car in the world is called Tata Nano in 2008. Its price was 2000 dollars. Nano is now positioned to meet the needs of many previously unserved customers.
- Transportation of patience in rural areas of the developing countries is another issue. eRanger ambulance service for rural Africa and “dial 1298” n India use a cross-subsidy model to provide affrodable or free serivces poor patients.
- Godrej an Indian company established in 1897 developed a portable, small-sized fridge from low-cost local materials in 2009. Its name is ChotuKool and its 45 cm by 60 cm so it can fit into small places. Capacity of it is 30 L and 7.2 kg. ChotuKool runs on thermometric cooling with a cooling chip an operated by battery. It can keep its contents cool for up 3 hours withoout a power connection. The fridge has become popular among low-income families, small shops. Features such as simplicity, portability and affordability attracted a large number of customers in India.
- Vortex Engineering in India developed an ATMs run by solar energy and need lower energy then the other machines, easy to use for rural customers.
- Husk Power System (HPS) is a company based in India provides power to rural Indians using proprietary technology that has been developed by the firm to cost-effectively generate electricity using a biomass gasifier that creates fuel from abundant rice husk waste. It operates 35-100 kW mini-power gasification plants and electrifies off-grid villages in the India. HPS serves 200.000 people through its 84 plnats in rural India.
- SELCO, founded in 1995, is a solar energy system integrator and a social enterprise from India. A typical system consists of four 7-W compact fluorescent lights (CFLs), and the electricity is generated by a small photovoltaic (PV) module, which is usually mounted on the roof of a house. A lead-acid battery is used to store electricity to ensure uninterrupted power. The innovation lies in a business model whereby SELCO arranges micro-loans for low-income customers from local banks, such as Grameen Bank. SELCO has so far sold over 200,000 solar systems, primarily in Indian states, such as Karnataka, Gujarat, Maharashtra, Bihar and Tamil Nadu.

- Tata Swach, developed by Tata Chemicals of India, is a gravity-driven "table top" water purification device for households, and it does not require electricity or running water. It was launched in India in 2009 as one of the world's most inexpensive water purifiers. The treatment technology is based on rice husk ash and nanotechnology. The technology is incorporated in a replaceable "bulb", which comes with a lifetime of 1500 liters and 3000 liters. Tata Chemicals of India claims that non-electric Tata Swach is effective at eliminating bacteria and viruses from water for safe drinking. Tens of millions of Tata Swach purifiers have been sold, but it seems that it is still too expensive to reach the extreme poor people of the low-income market segment (Levanen et al., 2015).

As it can be understood from the most popular examples, various kinds of innovation activities can set an example for frugal innovation even they were did for different purposes. These different purposes can be finding urgent solution to fatal needs of people who placed in the bottom of pyramid or firms in developing countries as they can be also searching new market and willing of growing more of big firms in developed countries via including people bottom of pyramid to their customers. Another purpose can be caring about sustainability of firms in developed countries or forcing limited resources to use them in a frugal way.

In sum up if we need to define frugal innovation with consideration of information gave in this section; if an innovation process is carried out within the any of keywords of frugal innovation explained in the section or in a frugal way, we can say that this is a frugal innovation.

2.3 Rural Frugal Innovation

In this study which aims looking for frugality based on rural frugal innovation in rural Turkey it needs to be defined "rural frugal innovation". There is not any definition for this concept in literature but it is possible to define via some criteria, information and implementations. It is tried to define "rural frugal innovation" in this section.

2.3.1 Relationship between rurality and frugality

Before trying to define rural frugal innovation and in order to understand relationship between rural areas and frugal innovation it needs to refer the concepts such as rurality and rural development. We face the significant differentiation of rural and urban after urbanization process started with industrial revolution rapidly. Rural areas has started to be thought as the areas where holds nonindustrial activities especially agriculture. When defining rural areas too many parameters related about kind of economic activities, demographic structure, land use character, socio-cultural structure are used. And the definitions are shaped around these parameters. In addition, the definitions can differ depending on the development level of different countries. Much as rural studies now consider the rurality as a social issue now (Woods, 2005) and although today there are too many cities that are enable to produce agricultural product in the world, the most important feature of rural areas is still that they are spaces of producing food.

When we think that rural areas have a strong connection with agriculture, it is seen that they have a significant importance within the scope of frugality which explained with consideration of criticism of economic growth. Almost all of the de-growth theories include some aspects about rural area, agriculture sector, using of land. Because criticism of economic growth presents returning to locality, self-sufficient and ecological living spaces as solution ways in its utopias. It depends what kind of economic activity is the agriculture like depending of the concept of rural.

Schumacher (1973) in the section of "The Proper Use of Land" of his book "Small is Beautiful" indicates some points about agriculture and rural areas. According to him each society must distinguish between ends and means and the problem is that people to see the things which was not created by themselves as only factor of production. Land is an end in itself firstly and it is meta-economic as Schumpeter. He said that agriculture and industry are separated from each other distinctly, agriculture is primary and industry is a secondary i.e. human life can be continued without industry but cannot be continued without agriculture. He also refers that management of land must be oriented around three mail goals which are health, beauty and permanence and three tasks which are to keep human in touch with nature, to humanise and ennoble habitat of human and to bring forth the foodstuff and other materials needed for a becoming life but contrary materialist view sees it as only food production. As

Schumacher we need to ask that what we spend our money for, not what we are able to afford before we decide the policies about land i.e. agriculture. And he agrees with the review of Herber (1963; Schumacher, 1977) that attempts and trying of people who migrates to rurality from cities are significant.

In addition, Andre Gorz (1989) cited a part below from Barry Jones in his book "Critique of Economic Reason".

"In subsistence economies, agriculture is not regarded as an 'industry' for the farmers - it is their way of life. They produce essentially to meet their own needs, with a small surplus to be stored or traded; they are not concerned with economic profitability, export potential, return on capital or concentrating on a single crop; they are not racing the clock or competing with their neighbours. The rotation of the crops matches the rotation of the seasons; the work takes a lifetime to carry out and is never completed. The concepts of wages, hours or holidays are not relevant."

We sum up the criticism of economic growth under the concept of de-growth theories in the previous section and in de-growth theories, rural areas, agriculture, food, society structure play important roles. In the report of Meadows et al. (1973) food was considered as first possible limit to growth in terms of arable lands. Food production i.e. feeding the world population sufficiently is dependent on the availability of non-renewable resources. And it was questioned whether there are limits to the earth's supply of these resources. The issue about how many people can be fed by our planet has been considered since the second half of 20. century. According to Latouche (2011) it needs to turn back to a sustainable agriculture although that the studies on capacity of this method are not clear yet.

Schumacher (1977) also says that it needs to support the groups like The Soil Association which are pioneer for the change through a new lifestyle escaping from growing economic system via studies on ecological agriculture with farmers.

Latouche (2011) argues that LETS (Local exchange trading system) accepted alternative money system with the purpose of accessing of everyone to certain services, cooperatives, slow city movement, post-carbon cities and the other movements like these can be a stage of the way of de-growth and frugal abundance society.

Definition of rural and rural development is difficult to be clear and it is considerably related with how the lifestyles are defined and treated within the context of frugality approaches of de-growth. But it is clear that in the frugal society utopias of Gorz,

Illich, Schumacher, Roegen, Latouche humans who produce the healthy foods in an ecological way touch with strong connections with nature, land, and agriculture. Hence, the frugality is in a huge relationship with the rurality.

2.3.2 Defining the rural frugal innovation

Frugal innovation can be defined as an innovation process came true within the framework of sustainability, affordability and quality in a frugal way according to the previous section. Innovation process must be carried out with the concern of sustainability and the new product occurred at the end of process must be both affordable and also well-performed. And it needs to seem keywords related with frugality in the processes of innovation. How much frugal an innovation is, depends on the questions of how many keyword and how much sustainable processes it has and how much affordable the final product is.

These questions can be also asked innovations in rural areas. Rural areas are confronted as the areas with many problems like population decreasing first, ageing of population, lack of social and technique infrastructure, having population with financial difficulties. These problems cause to increase of capabilities of people to do innovation to cope with difficulties. Because as it was inferred in previous section, it has to be a need first for beginning an innovation. And rural areas face with too many needs.

Thus rural frugal innovation can be defined as a frugal innovation which bases on a need belongs to rural area or rural population and contributes with sustainability of rural area with its processes. So, all of the features of frugal innovation apply for also rural frugal innovation.

2.3.3 Determining the criteria of rural frugal innovation

It is composed the main criteria of frugal innovation as sustainability, affordability and quality in previous section. There are many issues that placed in this tripartite framework as it mentioned above. Innovation also consists of four phases including need, idea, production and marketing. Criteria of rural frugal innovation can be determined with the help of innovation phases and frugality elements.

Need which is the first phase starts an innovation process must be related with rural areas and rural population first to call a frugal innovation as rural frugal innovation.

Second phase, idea must come from rural people in a rural frugal innovation. New product must be produced in rural areas because a rural frugal innovation contributes to sustain rural areas. Marketing phase which is the last phase of innovation also must be for benefit of the rural population. In all of these processes sustainable methods must be used and an affordable and well-performed product must emerge at the end of the process. Thus this kind of innovation is a rural frugal innovation (Figure 2.5).

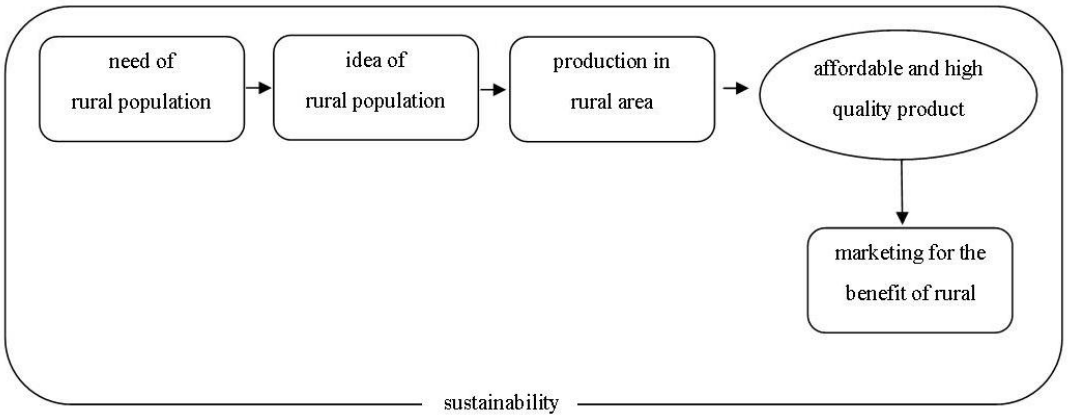

Figure 2.5 : Process of rural frugal innovation.

2.3.4 Examples of rural frugal innovation in the world

Some examples of frugal innovation mentioned in previous section may be came true in rural areas or the target consumer group may be rural population for innovation. But according to this study, solution for a rural need or problem must come from the need or problem owner itself. Examples in this context are intense in generally developing countries like India, China, African countries etc.

- Petti Petzar and Johan Jonker who are two engineers from South Africa developed a simple system for rural people who have to carry heavy loads of water on their head by hours because of they have no access to clean water near their home in order to prevent difficulties of this situation. The engineers invented a roller which is five times more capacity of water and enables ground to carry the weight. “Hippo roller water” allows people to transport faster and helps preventing the health problems caused from traditional carrying method. Hippo has been distributed with partnership of Africa Foundation and it has been also in other countries like India (Url-1).

- Mansukhbhai Prajapati who is a clay craftsman live in rural India turned clay into refrigerator through the cooling feature of clay. The name of tis low-cost fridge runs without electricity is MittiCool. It can keep basic foods like vegetables and fruits two or three days. It is very affordable for people live in rural when it compared with electricity fridge. Now MittiCool is marketing its entire kitchen product to the world (Url-2).
- Bachubhai Savijbhai Thesia who lives in Kalavad village in India invented an agriculture machine which can do many agricultural works in an easier way. Traditional agricultural machines need an animal and also, they compact the soil because of their weight but this machine, bullock do not compact the soil due to its light weight (Url-3).
- Transplanting onion seedling is labour intensive, time consuming process. Pandharinath Sarjerao More who is a farmer from India invented an affordable semi-automatic onion transplanter which can do three different work at the same time; onion transplanter, fertilizing and irrigation (Url-4).
- Mohammad Saidullah from rural India sells honey by his bike in the villages but he used to need to cross river and he used to not able to do that. In addition, they had not money to buy a boat. So he invented a bicycle which is enabling to ride on the water also. "My desperation made me an innovator" he said in a documentary video about his invention. This amphibious bicycle which is very simple solution to use bike on both land and water has helped the villager to transport for years (Bambach et al., 2018).
- In order to meet the increasing demand in informal settlements in Indonesia, two students developed an alternative building material made from cow dung with soil extracts and are cured using biogas. This material is 20% lighter, resilient and less expensive than clay bricks. With using this ecological material the agricultural lands that are damaged by clay quarrying are preserved. The problem may not be about rural area it may be about an urbanization issue but it affects the agricultural lands (Url-5).
- Mansukhbai Patel who lives in a village in India again developed a cotton-stripping machine. This machine removes the lint from the cotton shell easily and eliminates staple cutting. This simple machine is also affordable for

farmers. It both increases the quality of cotton and also reduces need of human labour (Kachru, 2011).

- Remya Jose, who was a student in a rural region in India, invented a pedal-powered washing machine when she was only 14 years old in order to be able to study her lesson while she is washing the clothes at the same time (Url-6).

These are the most popular implementations of frugal innovation in rural areas in the world. It is obviously seen that the most of these examples are from India. The possible cause of this situation may be that there are too many studies about frugal innovations from India and the concept is originated base on implementations especially from India. As it was specified previously, it is important that the idea must belong to need owner within the context of this study. Accordingly it can be seen that almost in all of the examples of rural frugal innovation, we encounter an entrepreneur. Therefore rural entrepreneurship is an important element of this study. Entrepreneurship is one of the important issues in rural development literature. According to Patel and Chavda (2013), rural entrepreneurs may face various problems such as financial, scarcity of resources, lack of infrastructure system, accessing to the market et cetera. On the other hand Radjou and Probhou (2016), added one more part to very famous anonymous proverb and they said it again as "necessity is the mother of invention, then the scarcity is the grandmother of innovation". Hence people live in rural areas are able to put together their scarcity and their creativity which is an opportunity of them according to Dabson (2001) and to emerge an innovation.

2.4 Summary of Chapter 2

Declining natural resources which are extremely used after industrial revolution have been one of the most important issue of the world since especially 1970s. Many ideas on economic growth, development, inequalities between regions have developed by various economists. Some of these economists supported continuing of economic growth and discussed how it can be carried out when some of them supported to change the system. De-growth theorists which placed in the chapter such as Schumacher, Georgescu-Roegen, Illich, Gorz, Ellul and last Latouche criticised the economic system even science of economy harshly. They argue that the current economic system must be changed completely and people need to do this voluntarily.

According to them people need to question their necessity, pass through a simple, slow, ecological life with a frugal point of view.

On the other hand frugality has been an obligation for also all of the actors of the system. Because there is no doubt that our non-renewable resources have been diminishing, environmental conditions have been getting damaged while the total population have continuing to increase. The firms in global economic system have been also frugal in order to sustain their existence. One another reason of this situation near ecological obligations is the demand of consumers tends to be aware about ecological issues; therefore, the market has to meet this demand. The other reason is on the other hand is serving the customers in BoP. Frugal innovation defined as doing more with less or doing innovation in a frugal way which is used first by Renault's CEO, now it has been spreading to the all of the world. When some authors asserts that frugal innovation which can be done for different purposes explained in this chapter can lead the sustainable economic development, some authors asserts that frugal innovation is unable to prevent inequalities (Knorringa et al., 2016).

Scarcity of resources triggers people to being creative for finding urgent solutions to their problems. And vital problems needed to be solved are generally seen in rural areas in developing countries. Thus, the most popular activities and inventions which can be example for frugal innovation mostly occurred in India, China, and Brazil. So, it needed to define rural frugal innovation and determine the features, criteria. This definition and criteria have been determined within the scope of backgrounds of frugality comes from de-growth theories. All of the de-growth theories care about rural areas particularly because of that they discuss how a frugal society produce and consume their primary necessaries such as first food. When the examples of rural frugal innovation around the world were composed it was recognized that almost in all of them there is an entrepreneur. These entrepreneurs have been already frugal people during their life.

In the next chapter, it will be set the research carried out with its theoretical backgrounds. Are there such as frugal entrepreneurs in also rural areas in Turkey and can they be constituent of frugal abundance society described by Latouche in his de-growth utopia? Next chapters will try to answer this question.

3. A RESEARCH ON RURAL FRUGAL INNOVATION IN TURKEY

The design of the research executed in the scope of the thesis was explained in this chapter. As it was indicated previously, aim of this thesis is looking for the tracing of frugality in rural areas in Turkey and trying to understand whether there is any trace of a frugal society which can be part of de-growth economy explained by Latouche in the country. And if so, how much frugal and innovative is it? A research which can answer these questions was designed. It was explained that which data and indicators can help to answer the questions and how can they be used in the research, with which methods.

The research explained in this chapter is both exploratory and descriptive research. First objective of the research is to explore the examples for rural frugal innovation in Turkey. In this step, the question of "what" was asked. What are the examples of rural frugal innovation in Turkey? The second objective of the research is to describe the degrees of the examples in terms of rural frugal innovation. The questions are "How much frugal and how much innovative are the examples?", "What are the contributions of them to their environ?".

So, this exploratory and descriptive research is a qualitative research. Social researches which aims to examine, to research and to understand social phenomena in their environment are generally qualitative researches. In addition to its various reasons, the primary reason of that is the complexity in communication of people (Demir, 2009). As world faces complex social problems, researchers increasingly using qualitative methods to consider these complex challenges (Bansal et al., 2018). The aim in qualitative researches is generally in-depth examining and studying of the variables instead of measuring them (Neuman & Wiegand, 2000). Qualitative research also aims to emerge in-depth insights and understanding the real problems of the world and how individuals or groups experience, perceive the reality which has multiple kinds in their natural context (Moser and Korstjens, 2017). The results of qualitative researches base on the deep expressions of individuals and construal of them (Maxfield & Babbie, 2005).

Two of three total steps of whole thesis which are specified in Chapter 2, belong to this chapter. Remember the steps; (i) defining rural frugal innovation, (ii) searching rural frugal innovation in turkey and (iii) evaluating the five case studies in terms of rural frugal innovation. Second and third step are included in this research. As it explained in Chapter 1, data of second step is archive of newspapers, magazines, social media which are secondary data. Census of population, results of survey, archive of public and private institutions, archive of newspapers and all of the sources in internet are rank as secondary data (Demirci & Köseli, 2009). Methodology of the second step is document/content analysis. Content analysis generally means every kind of techniques that systematic examining verbal and visual materials achieved from various data sources (Nachmias & Nachmias, 2000). Data used in third step on the other hand are also archive data of TURKSTAT in order to understand socio-economic situation the district of each case studies. Census of population, data of agriculture and husbandry of each districts were achieved from data archive of TURKSTAT and various studies related the issues. First methodology of this step is document/content analysis again. Second data sources of this step base on the case studies. Case study is a research method involving in-depth analysis of individuals or groups (Moser & Korstjens, 2017). Case study process consists of six stages including planning, designing, preparing, collecting, analysing and sharing (Baskarada, 2014). Methodology of in-depth interview for each case study with entrepreneurs was used in this step and the data are questionnaire data. Semi-structured interview which is the methodology of this step is a kind of interview, consists of open-ended questions and the questions are put by following the interview guide. Questions must be asked in a certain structure and framework and it is asked detailed information from the interviewee (Demir, 2009).

3.1 Sampling and Data Collection

Rural entrepreneurship is the main focus as sample in this research because of the aim of the study is looking for the traces of frugal society in rural Turkey. To achieve these traces, implements of frugal innovation which was thought around frugality concept in rural areas were searched. Definitions and criteria expressed in the second chapter showed that there is a rural entrepreneur in each the best examples of rural frugal innovation with in to context of frugal abundance society idea. Hence, rural

entrepreneurs in Turkey were chosen as sample in this study. There is not any database ensures to reach entrepreneurs in Turkish statistical system. Because of this reason, the news which was achieved from sources below were used to reach to information of entrepreneurs in the study:

- Archives of "Tarım" supplement of the newspaper of "Cumhuriyet" between 2005-2014)
- The website ensures access to ecologic farms of "TaTuTa" project
- undpturkiye.exposure.co which is the website of development stories in Turkey of UNDP
- Archive of "Yeni Ufuklar" magazine published by UNDP
- Archive of "Kırsal Kalkınma" magazine by TKDK (Establishment of Supporting Agriculture and Rural Development)
- Achive of "Türk Tarım Orman" magazine published by Ministry of Agriculture and Forest
- Results of searching on Twitter with the hash tag of "kırsal" and "girişimci".

Entrepreneurs achieved by all of these sources' news were marked on a Turkey map (Figure 3.1) and also it is shown that how many entrepreneurs were achieved from which data sources (Table 3.1). Number of results according to the review of data sources after overlapping is forty. Some of them have been frequently located in different sources. As it can be seen in the map, there are forty rural entrepreneurs who created an innovative idea in Turkey.

Table 3.1 : Number of the entrepreneurship news achieved from different sources.

Source	Number of result	Number of frugal result
Tarım supplement of Cumhuriyet	5	0
TaTuTa website	4	1
undpexposure.co	6	4
Yeni Ufuklar	5	4
Kırsal Kalkınma	0	0
Türk Tarım Orman	15	5
Twitter	20	5
Number of result after overlapping	40	10

Ten entrepreneuship was thought as match with also frugality. Some of them attempted with the supporting of Ministry of Agriculture and Forest within the scope of a project. Some of them had used their own personal capital accumulation when some of them had only the potentials of local as capital. The next chapter explains how it is made a choice among all of these examples.

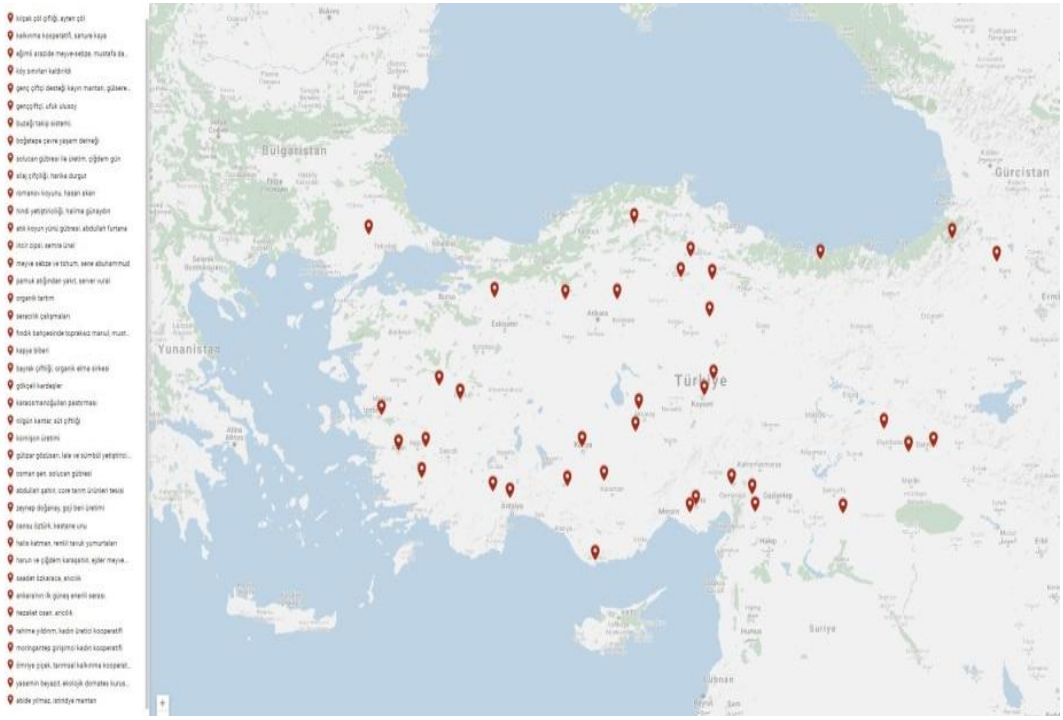

Figure 3.1 : Locations of rural entrepreneurs in Turkey.

3.2 Selecting the Cases

A new product has been emerged or a product has been produced in a new method creatively in all of the examples and ten of them was considered as related with also frugality. Five entrepreneurs were selected among these examples by criteria of rural frugal innovation determined in the previous chapter in order to examine how much frugal and how much innovative are they deeply. And they also selected in the light of their popularity and of course accessibility to entrepreneurs. Selected examples are the most popular entrepreneurs in the last five years in Turkey. In addition, remember the criteria; need, idea, production and marketing must be to contribute with sustaining rural areas; affordable and high-quality product must be emerged and all of the processes must be carried out with the sustainability concern. The five examples which are selected as case study are;

- Organic vinegar production in Gümüşhacıköy, Amasya
- Dried fig chips production in Kurtuluş, Aydın
- Fuel production from agricultural wastes in Bismil, Diyarbakır
- Fertilizer production from waste of sheep's wool in Uşak
- Cheesemaking in Boğatepe, Kars (Figure 3.2).

Figure 3.2 : Locations of the case studies.

The first case, organic vinegar production is in Black Sea region; the second and the fourth case study are in Aegean region; third case study is in South-eastern region and the last one is in East Anatolia region of Turkey. Education level of four of them is at university level when one of them, Semra Ünal's is at high school level and she is a housewife. All of the case studies include an idea related with the region's own character. For instance, Amasya is a region where have too many kinds of apple and it is at the forefront with apple. Similarly, Aydın is the fig region of Turkey, Uşak has the cluster of wool industry and Kars is famous with its local cheeses in Turkey. Four case studies base on an idea as a solution of a certain problem. But, case study of Kars contains too many solution ideas within the framework of a whole development work as. Case studies of Diyarbakır and Uşak are related with agricultural production indirectly when the other case studies have direct agricultural activities. But they are selected to examine because of their contributions with their rural environ (Figure 3.3).

Where are these cases in terms of rural frugal innovation within the context of frugal abundance society? How much are they frugal and innovative? What are the contributions of the entrepreneurs to rural? Can they be traces of frugal abundance society of de-growth utopia? In order to answer these questions the cases were examined deeply and evaluated within the scope of seven criteria of rural frugal innovation:

- Need: First step which causes to emergence of an innovation must be about rural area and rural population.
- Idea: Second phase of the process must be found by need owner's itself.
- Production: Production phase must be made real in rural areas or in a way to contribute with rural areas.
- Marketing: Marketing must be for the benefit of rural entrepreneurs such as accessing to the market without any middleman.
- Sustainability: All of the innovation process must be organised with an ecological awareness.
- Affordability: Product which was produced at the end must have an affordable price to can be bought by everyone.
- Well-performance: Product which was produced must be well-performed.

Rural frugal innovation	Organic vinegar production	Dried fig chips production	Turning agricultural wastes into fuel	Sheep's wool fertilizer production	Development studies in Boğatepe
Location	Gümüşhacıköy district, Amasya province	Kurtuluş, Kuyucak district, Aydın province	Bismil district, Diyarbakır province	Central Uşak, Uşak province	Bogatepe villages, Kars district, Kars province
Name of entrepreneur	İbrahim Bayrak	Semra Ünal	Server Vural	Abdullah Furtana	İlhan Koçulu
Birth date of entrepreneur	1956	1976	1969	1982	1958
Occupation of entrepreneur	Science teacher	Housewife	Biology teacher	Computer engineering	Business man
Beginning year of innovation	2010	2013	2013	2013	2000
Scope of innovation	Agriculture in 900 m^2 land and processing of the agricultural products in 100 m^2 space	Orcharding with 500 fig trees and processing of them in house gardens and 20 m^2 facility	Processing agricultural wastes in 1000 m^2 facility located in 10000 m^2 area	Fertilizer made from wool production for organic agriculture in 3000 m^2 covered are in industrial zone	Ecological agriculture, husbandry, cheesemaking in dairy farm, healing herb production in a facility
Capital at the beginning	The orchard	The orchard	500.000 $	1.000.000 TL	Potentials which come from past of the villages

Figure 3.3 : Short descriptions about the cases.

3.3 Methodology

In this exploratory research, some qualitative methods were used such as document analysis of archive data and in-depth interview face to face and on telephone with the entrepreneurs. In-depth interviews face to face with Bayrak, Ünal, Vural and Koçulu and on telephone with Furtana were done. The reason of why face to face interview could not be done with Furtana is that he indicated that they cannot accept visitor to their facility and he can help in this way. Bayrak Farm was visited in September of 2018, all of the production processes were observed and related photos and videos were taken. Ünal's production place was also visited in September of 2018, face to face interview was done with her and some photos and videos about production process were attached to the personal archive. She shared her own photo archive because of that the season of drying fig ended at the visiting period. Facility of Server Vural was visited in November of 2018 and face to face interview was done with him. Interview with Koçulu was done also in November of 2018 in Kars. Visiting Boğatepe village was also in the schedule of the study but it could not be happened because of the unexpected snowstorm. Koçulu also has shared his photo archive for this study. Lastly an interview was done with Furtana in November of 2018 but any of photos about his production places wasn't use the study because of that he doesn't accept that.

3.4 Summary of Chapter 3

This chapter explains research design of the study. This exploratory study which aims looking for the traces of frugal society with rural frugal innovation that defines with some criteria and considering of de-growth in rural Turkey choses rural entrepreneurship in Turkey as the sample. In order to collect the data of entrepreneurs in rural areas news published on the newspaper and various internet websites were used as sources. Forty innovative rural entrepreneurs were achieved with in this way and five of them were chosen as case studies to examine how they are in terms of rural frugal innovation deeply. The methodology used in the study is in-depth interview face to face or on telephone (Figure 3.4). The next chapter will examine all of the cases with their general information and evaluation within the context of rural frugal innovation.

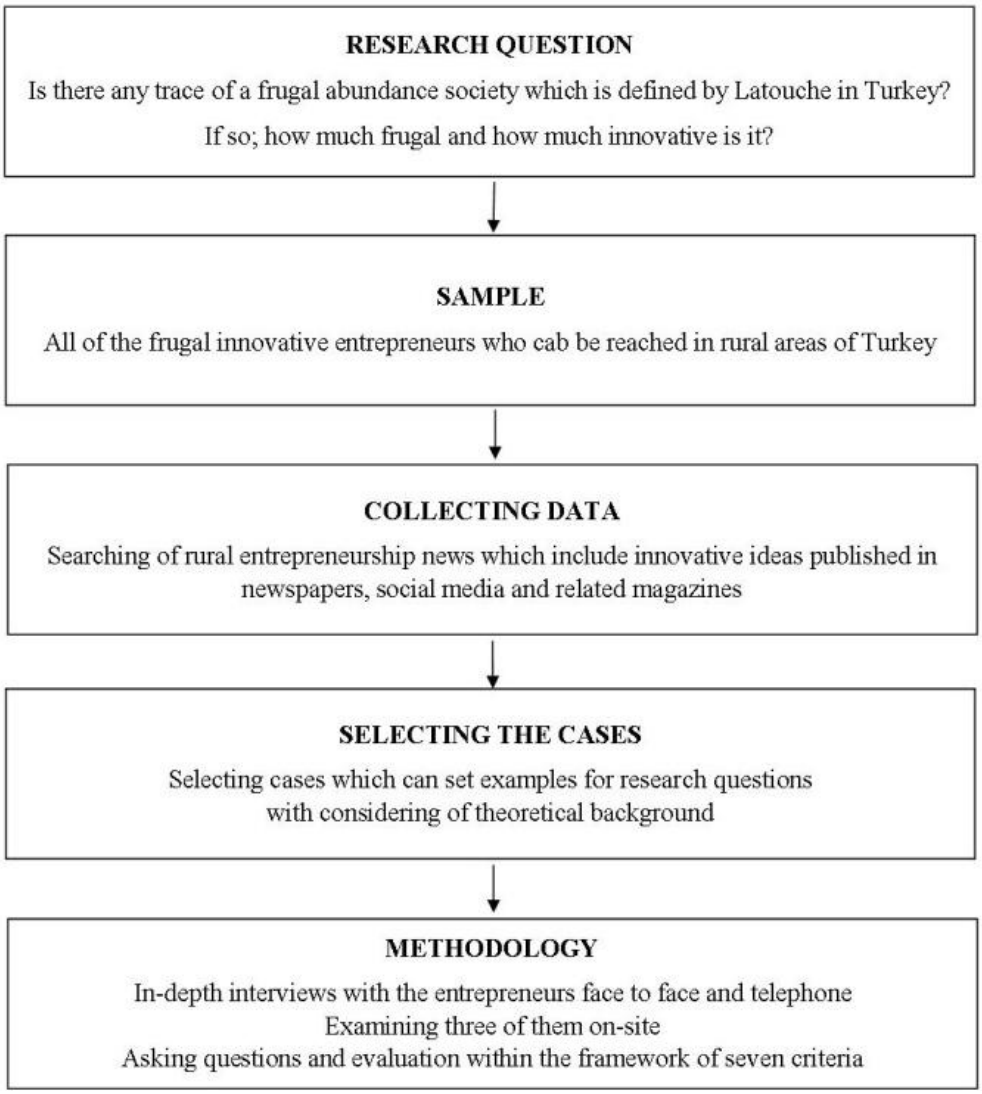

Figure 3.4 : Stages of the research.

4. RURAL FRUGAL INNOVATION ANALYSIS OF CASE STUDIES

This chapter explains the investigations, the examinations and the evaluations of the selected examples as case study which are production processes of organic vinegar, dried fig chips, alternative fuel, wool fertilizer and cheese. Explainations of each case study consists of three section. First sections give the general informations about location of examples such as natural environmental, social, demographic, administrative, economic and agricultural structure. Second sections explain everything about frugal innovative entrepreneurs and their attempt such as personal informations, background and detailed story of attempts. Lastly, third section is the evaluation of the cases in terms of frugal innovation.

4.1 Organic Vinegar in Gümüşhacıköy

4.1.1 General information about Gümüşhacıköy

Gümüşhacıköy is one of the districts located in the west of Amasya province located in Middle-Black Sea geographical region in Turkey. The district is surrounded by Tavşan Mountains in the north and İnegöl Mountains in the west. Total area is 60.452 hectares and 33% of this is agricultural area, 22% is pasture, 15% is forest, %22 is rocky area and %8 is residential area. The altitude differs between 1200 and1500 meters in the villages when it is 810 m in city (Köprülü, 2006).

The effects of both black sea and continental climate are seen in the district because of its geographical position located on transition from Black Sea to Inner Anatolia. This situation causes to diversity of plant resisted to both two types of climate.

872 districts of Turkey are sorted and divided into six groups by their socio economic development level in a survey by State Planning Organization (DPT). Gümüşhacıköy is ranked 422nd and in the third degree developed districts according to this survey (DPT, 2004).

Population has declined both totally and ruraly when it has increased in terms of urban in the last ten years. Gümüşhacıköy is a shrinking district in terms of population although urban population has increased (Figure 4.1).

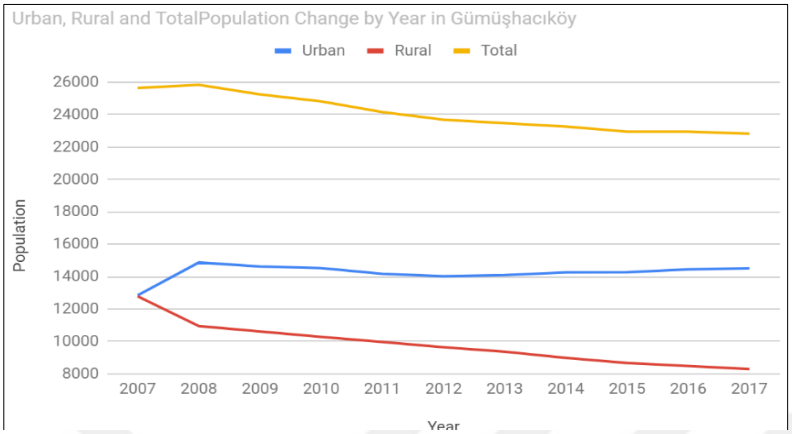

Figure 4.1 : Urban, rural and total population change by year in Gümüşhacıköy.

According to the survey by DPT (2004) ratios of employment by sectors in Gümüşhacıköy are 75% in agriculture, 5% in industry and 10% in services. In the same survey these ratios are 48% in agriculture, 14% in industry and 38% in services sectors in Turkey's average (Figure 4.2). It can be said that Gümüşhacıköy is an agriculture district.

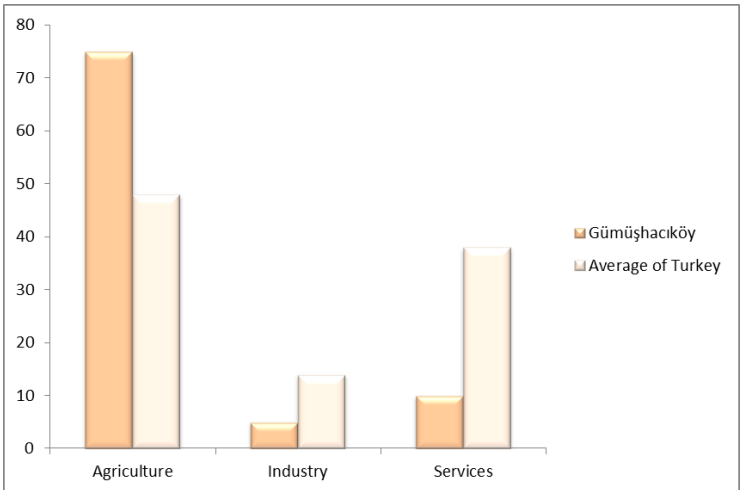

Figure 4.2 : Employment by sectors in Gümüşhacıköy.

There are 3413 farmers registered to Farmer Registry System according to data achieved from District Agriculture Office. This number had declined to 2861 in 2008, to 2949 in 2009. 85,9% of total agricultural land is field crop land when 2,4% of it is fruit land, 6% of it is fallow land and 5,3% of it is vegetable land (Figure 4.3).

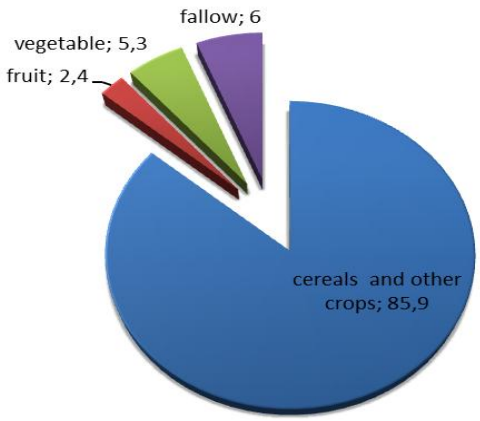

Figure 4.3 : Distribution of agricultural land types in Gümüşhacıköy (TURKSTAT, 2018).

Main products of field crop is sugar beet and wheat, onion, barley, sunflower, poppy, chickpeas, tobacco follow it respectively (Table 4.1).

Table 4.1 : Ratios of field crop production produced in Gümüşhacıköy (TURKSTAT, 2018).

Field crop	Ratio in total production (%)
Wheat	34,4
Barley	2,2
Chickpeas	0,2
Tobacco	0,1
sugar beet	62,4
Poppy	0,4
Sunflower	0,2
Onion	0,1

The fruits which are produced in orchards are mainly apple, cherry, walnut, pear, sour cherry, cranberry, and quince (TURKSTAT, 2018). Transition from Black Sea climate to continental climate and existence of waterways make Amasya and its surroundings sufficient for growing many kinds of apples (Table 4.2).

Table 4.2 : Ratios of fruit production produced in Gümüşhacıköy.

Fruit	Ratio in total production (%)
Grape	0,7
Apple (Golden)	7,6
Apple (Starking)	16,8
Apple (Amasya)	13,9
Apple (Granny Smith)	6,6
Apple (Others)	16,4
Pear	5,3
Quince	1,8
Cherry	16,5
Sour Cherry	4,4
Cranberry	2,6
Walnut	7,5

4.1.2 Organic vinegar production in Bayrak Farm

Bayrak farm is an ecological farm established by Bayrak family in the process of transition to retired of İbrahim Bayrak. Ibrahim Bayrak was born as one of children of a farmer family in Gümüşhacıköy and married with Birsel Bayrak when they young. His job is science teaching and they lived in various cities in Anatolia because of this situation. He had occupied with agriculture in every vacant area he found. He bought a 400 m^2 land with his own savings in 1994. Now he has 900 m^2 square farmland with which he bought with his retirement pert in 2000. He wanted to turn that land into an orchard so planted the fruit seedlings gained from Pamukova and Gümüşhacıköy District Agriculture Office. He tried to do agriculture without using chemical pesticides as much as possible in first years. But main goal has been completely organic farming since the beginning. He grew a variety of vegetables and fruits for his families own consumption and quince and mostly apple for economic gain. He passed to completely organic farming and reported this to Farmer Registry System in 2004. He had met with Victor Ananias who is the founder of Buğday Association for Supporting Ecological Living at a seminar about organic farming in the same year and participated in this organization in 2005. The farm is also a member of TaTuTa (Agriculture, Tourism and Barter) in Ecological Farms (Figure 4.4).

Figure 4.4 : Bayrak farm and the farm house from the orchard (Personal collection).

Bayrak presented his organic fruits directly to market in first years. Organic farming is a labour-intensive activity and limited agricultural production can be achieved in a certain area. On the other hand, only bright, well-shaped and flawless fruits have value in the market. The fruits falling to the ground or spotted were unable to reach to consumers with their real value even though they had high quality. Therefore, most of the fruits used to be wasted. Because of those reasons, Bayrak family had started to have financial troubles. They were forced to find a solution to this problem and decided to turn their fruits into the products with high economic value. These products are boiled fruit juice, jam and especially vinegar. They had distributed their products in plastic bins to the consumer first-hand between the years of 2010-2013. A middleman who was aware of this production intervened to the process of sale and he had wanted to buy their products wholesale to sell organic shops. Bayraks accepted the offer to access to a bigger market. They had to do bottling, labelling and packaging themselves now.

The family renewed their production space for the purpose of producing in easier way. Now they have three fireplaces to cook fruits and to achieve vinegar, jam, boiled fruit juice; an oven to dry their tomato pastes; packaging-labelling-store room and the tank room (Figure 4.5).

Figure 4.5 : Fireplace, oven, packed and labelled products in store room and the tank room in Bayrak Farm (Personal collection).

There are six hundred fruit trees in the orchard. Four hundreds of those are apple, fifty are quince, thirty five are walnut and the others are cherry, pear, plum, sour cherry, berry, hazelnut. Blackberries, raspberries and strawberries are also grown in that orchard. In addition to this, there are fifty chickens, seven gooses, six beehives and a fish pond in the farm (Figure 4.6). Bayrak tries to grow different types of vegetables and fruits according to the climate of region.

Blackberries, raspberries and strawberries are turning into the jam and sold via Cooperative of Bee Women. Woman from Gümüşhacıköy's and Suluova's different villages came together in 2012. Members of the group were educated about packaging, handling, logo and production. This group was transformed a cooperative in order to be more organized, to contribute with economy of rural, to provide cooperation among producer women in 2015. Birsel Bayrak is a member of this cooperative. She prepares jam to be sold by cooperative.

Figure 4.6 : Fishpond and beehives in Bayrak Farm (Personal collection).

There are two types of products which are turned into vinegar. First group is organically grown in the family's own orchard. Second group is organically grown again but gathered from the nature. Mayflower (alıç), cranberry (kızılcık), mountain apple (acık) and wild pear are included in the second group when apple, strawberry and quince are included in the first group.

The average amount of production can change between one tonne and thirty tonne in a year depending on climatic conditions and the nature. For example fifteen tonne vinegar were produced in 2018. The more trees give fruits, the more vinegar Bayraks produce. But there is a certain amount which is aimed by the family. This is twenty tonne for a year. And they need thirty tonne apple to achieve this amount. In case of

they do not achieve this amount from their own orchard; they buy organic certified apples from the other production areas close to theirs.

Seven hundred kilograms vinegar can be produced from one tonne apple. Transforming apple juice into vinegar takes about seven or ten months minimally.

Strawberry vinegar is also a famous product with the feature that the first place it is produced is Bayrak Farm. It can be said that the inventor of the strawberry vinegar is İbrahim Bayrak according to him. One and a half tonnes strawberry is grew in a year and one tonne of vinegar is obtained from it. Transforming to vinegar from strawberry takes days between forty and sixty.

Bottling, packaging and labelling of vinegar are made in the facility. The cost of only one bottling is 3 Turkish liras excluding label and cap cost. Middleman pays 7 Turkish liras for one bottle of apple vinegar (0.5 Litre). He sells it to organic shops for 12 TL. Sale price of the same product is 17 TL as minimally in an organic shop or internet shop.

If the customer had contact with the farm directly the sale price of one litre of apple vinegar is 11 TL, one litre of mayflower (alıç) vinegar is 12.5 TL and prices of all of the other bottles of vinegar is 11 TL per 250 millilitre bottle.

4.1.3 Evaluation the case in terms of rural frugal innovation

Rural frugal innovation is defined as all of the affordable, sustainable, well-performed processes based on the criteria which are the need and the idea of people live in rural, the production in rural areas and marketing for benefit of the rural.

4.1.3.1 Need/problem

Firstly, when we examine the case in terms of processes of innovation which consist of need or problem, idea, production and marketing we will see that the emergence of this innovation idea bases on the need and problems of rural people. Needs and problems of this family can be defined as shortages of livelihood, being wasted of the fruits falling to the ground or spotted and not being sold of the organic apples with the value they deserve in the market.

4.1.3.2 Idea

These problems have caused to emerging of the new innovation idea which is transforming the fruits (especially apples) to vinegar. This idea is based on the problems and needs of the producer. This feature is one of the components which make this process rural frugal innovation.

4.1.3.3 Production

Production phase is organised in family's own orchard located in Gümüşhacıköy's rural where the need occurs. They grow most of their raw materials in their farm however some of these materials are gathered from nature. Turning the fruits into vinegar and jam is also organising in their facility located near their farm.

4.1.3.4 Marketing

Bayraks is marketing most of their products via a middleman. They are marketing only some of the products directly to the customer. They have some troubles about marketing phase such as the payment of middleman for vinegars is low in terms of the sustainability of enterprise.

4.1.3.5 Sustainability

As it specified previously, all of these phases must be organised in accordance with frugality criterias which are sustainable, affordable, well-performed. Sustainability which is the first criteria of frugality generates the most important part of all of production processes. Bayrak family does ecological agriculture. It means they do not use any of the chemical pesticides in order to produce more and more. They use their apple vinegar and some organic mixes made by themselves as pesticide. They produce most of the raw materials organically in their own farm. They are gathering some raw materials that they cannot produce there from the nature or buy from organic producers near the farm. Bayraks have two machines in their facility. One of them is press machine which is used for pressing to the pulp well (Figure 4.7). The other machine is used for making tomato paste and rosehip. They can separate tomato and rosehip from their shells and cores easily thanks to the machine. Both of these two machines were designed in line with their requirements in industrial zone of Gümüşhacıköy. Pulp, shells and cores of fruits are also turning into the organic fertilizer via compost in this farm. These wastes are piled somewhere in orchard and

waited for a year or more. Then wastes become available to using as plant food (Figure 4.8). Some of the wastes are also used for feed the chickens and fishes. It can be said that there is no trash in this farm. In sum up all of the production processes in Bayrak Farm is sustainable because of the using of local materials, producing and consuming locally, agriculture depending on climate in an abstemious way without chemical pesticide.

Figure 4.7 : Old system to press fruits before machine and the new press machine in Bayrak Farm (Personal collection).

Figure 4.8 : Wastes of pulp, shells and cores and the compost which is ready to use in Bayrak Farm (Personal collection).

4.1.3.6 Affordability

Second criteria is affordability and it is difficult to make absolute judgements about it. Because there is an intense human labour that evaluating it and estimating the price is very difficult background of the agricultural production. These farmers spend money less for the production but time and labour are also include to the cost. Fruits

is gathered from the trees and ground, it takes six months to achieve vinegar minimally. Though estimating a price for the process is difficult, it is not difficult to understand that the farmer family does not determine the price in market. If the consumer accesses to the producer directly one bottle of the organic apple vinegar (0.5 lt) is 11 Turkish lira and if buy the same vinegar from the shop or internet the fee is 21 Turkish lira minimally according to the results of search on Google Shopping. To say that the vinegar is affordable or not, we need to compare it with the others in the market. According to the results of searching with the keyword of "organic apple vinegar" in n11-famous shopping website, there are 19 different brands of apple vinegar with organic certification. Prices of them aligned like below (Table 4.3).

Table 4.3 : Prices of vinegar with different brand[1].

Brand	Price (TL)
Tardaş	32.26
Talkım	35
Hünnap	50
Kemal Kükrer	34.90
Eğriçayır	28.99
Doğal Doktorum	25
Mecit Efendi	24.95
Ots	28.8
Nahita	16.5
Sazlıca	24.5
Happy Life	27.9
Naturelya	25
Harmanyeri	40
Raya	34.90
Baktat	29.9
Baktat	29.9
Grünn	23.5
Arifoğlu	34
Ralila	32.5
Bayrak	25

Average of these results is 30.18 TL. Bayrak organic apple vinegar is under the average value. On the other hand if the customer access to the farmer directly, the price is 11 TL for one bottle. So it can be said that this production is affordable easily.

[1] The results base on the search in n11.com in 20.12.2018.

4.1.3.7 Well-performed

Third criteria is that the products which is produced in frugal way must be well-performed. User satisfaction is important for understanding whether the products are well-performed. There are too many feedbacks of users to Bayraks according to İbrahim Bayrak's statements. İbrahim Bayrak has defined the features of various types of vinegars toward with these feedbacks. For example apple vinegar is useful in increasing of the metabolic rate and hair problems when the mayflower vinegar is useful in cardiovascular disease and strawberry vinegar is also useful in dermatologic disorders. On the other hand all of the products of the farm have organic certification. So it will be not wrong to state that the products of Bayrak Farm are well-performed.

4.2 Fig Chips in Kuyucak

4.2.1 General information about Kuyucak

Kuyucak is one of the districts located in the east of Aydın province of Aegean geographical region in Turkey. It locates in the east of Büyükmenderes River which lay among Aydın Mountains and Menteşe region. Surface of district is 49.600 hectares totally and most of total area consists of fertile agricultural lands which are arable for many kind of planting. The altitude changes between 80 meter and 180 meter.

Mediterranean climate is seen in the region because of this situation there is diversity in agricultural products. Mainly cotton is grown in plain of Büyük Menderes when citrus, plum, olive, fig is grown in slops.

Kuyucak is ranked 376th and in the third degree developed districts according to the survey about 872 districts of Turkey by DPT (2004). Also it is among the traditional economy centres according to the classification of settlement and economic geography by South Aegean Development Agency (GEKA). Traditional economy centres are described that the districts which have economy depending on agriculture and natural resources, underdeveloped industry and out migration (GEKA, 2014).

Municipality borders of Aydın overlaid with borders of province in 2012. Thus, Aydın Municipality has been Aydın Metropolitan Municipality since 2012. According to the Turkish Statistical Office there is no rural population in metropolitan municipalities by year 2013. But a rural population has calculated with population data of Kuyucak's neighbourhood for years between 2013 and 2017 too (Figure 4.9). Kuyucak had already been a rural district and this situation has been continuing even though rural population tends to decrease considering these results. Total population of district has also decreased in last ten years. Urban population change is more stable than rural population change. This is a proof of out migration of the district.

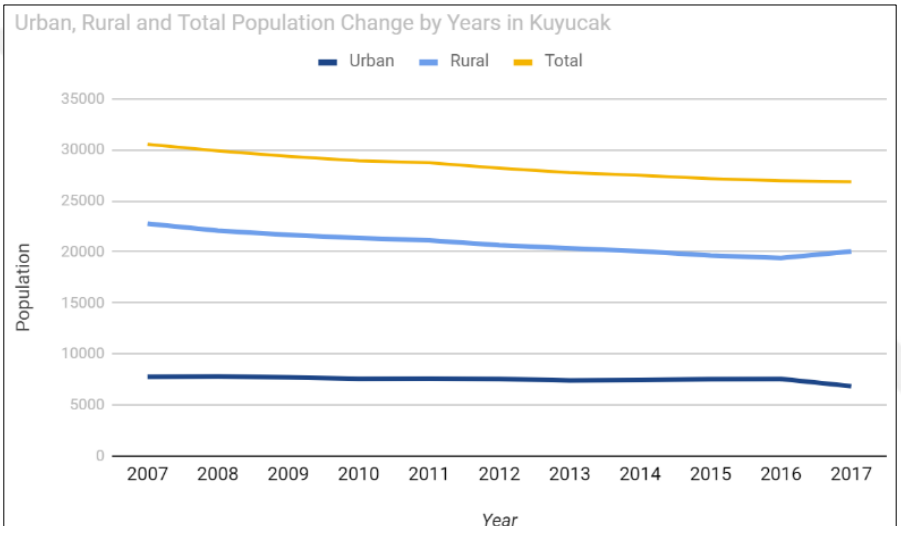

Figure 4.9 : Urban, rural and total population change by year in Kuyucak.

According to the survey by DPT (2004) ratios of employment by sectors in Kuyucak are 79% in agriculture, 5% in industry and 16% in services. In the same survey these ratios are 48% in agriculture, 14% in industry and 38% in services sectors in Turkey's average. It can be said that Kuyucak is an agriculture district (Figure 4.10).

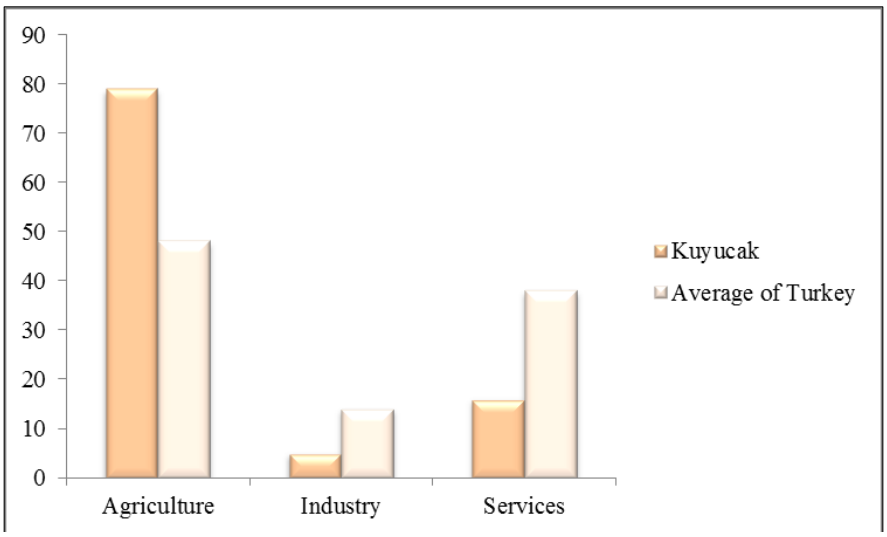

Figure 4.10 : Employment rates by sectors in Kuyucak.

51% of total agricultural area is orchard, 1% of is fallowing, 1% of it is vegetable area and 47% of it is cereals (Figure 4.11).

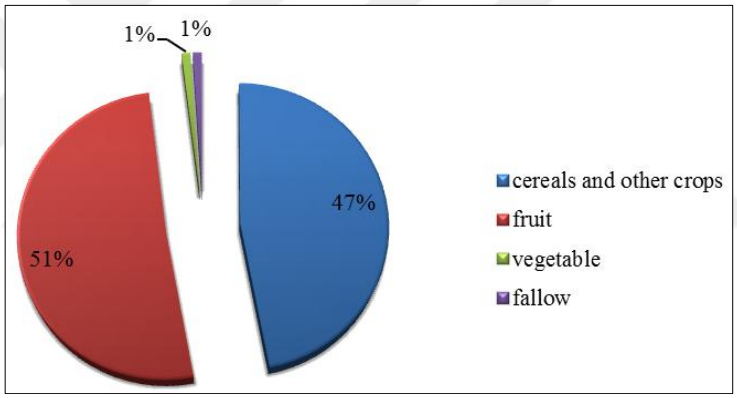

Figure 4.11 : Distribution of agricultural land types in Kuyucak (TURKSTAT, 2018).

Main cereal products are alfafa, corn silage, turnip (forage), vetch, wheat and barley, triticale, oat and cotton follow them (Table 4.4). Most important part of production is for husbandry.

Table 4.4 : Ratios of cerial production produced in Kuyucak (TURKSTAT, 2018).

Cereal	Ratio in total production (%)
Wheat	2,5
Barley (other)	0,7
Cotton	0,3
Vetch	2,5
Alfafa	62,5
Oat	0,8
Triticale	1,4

Corn (silage)	24,7
Turnip (forage)	2,7
Barley (green herbaceous)	1,6

Orchard products which are produced in area cover 51% of total agricultural area are mainly orange, olive, fig, persimmon, apple, and pomegranate (TURKSTAT, 2018). Mandarin, cherry, strawberry, plum, chestnut and lemon follow them (Table 4.5).

Orcharding is an important economic activity in Kuyucak as in whole Aegean region. Main fruits produced in Kuyucak and also in Aydın are olive, orange, fig. Production of these fruits in Aydın plays an important role in total production in Turkey. 305689 tonne of fresh fig was produced in Turkey in 2017 and 185412 tone of it was produced in Aydın. In other words Aydın province has share of 60% of total fig production in Turkey (TURKSTAT, 2018). Identifiability of "Sari Lop" fig as "Aydın Fig" has increased countrywide since 2006 which is year that this kind of fig registered as geographical mark.

Table 4.5 : Ratios of fruit production produced in Kuyucak.

Fruit	Ratio in total production (%)
Fig	15,8
Lemon	0,3
Orange	42,9
Mandarin	0,8
Apple	5,8
Cherry	0,8
Plum	0,7
Strawberry	0,7
Chestnut	0,6
Pomegranate	2,7
Olive	28,9

4.2.2 Fig chips production of Ünal Family

Semra Ünal was born in Kurtuluş (a village in Kuyucak) as girl of a farmer family in 1976. Although she has been concentric with the farmery since she born, she expresses that she doesn't love farmery. She married with Ali Ünal who was born as a child of another farmer family when they young. They trades of the olives, olive products, figs which are grew by themselves.

Fig was not a product which has an economic value at high level until 2005. People used to cut fig trees and to plant olive trees instead of fig. Fig was registered by

Chamber of Aydın Trade in 2006 and it started to be known as Aydın fig in the country.

Fresh figs started to be putrefacient if they are not sold during the day that they gathered from trees. Therefore, large amount of fig wastes used to occur in the region every year. These wastes used to use for feeding animals or try to turning into jam. But preparing fig jam is a hard work and its value in the market is not directly proportional with its cost. It could not find a solution to problem of being waste of figs which are not sold after they gathered from trees until Semra Ünal's entrepreneurship.

Ali Ünal who is husband of Semra Ünal used to sell fresh figs on his stall and as it was stated previously huge amount of figs which are not being sold used to be wasted every day. Semra Ünal tried to make these figs dry after she sliced them thinly as be a solution to the fig waste problem in 2013. Slicing way was changed and developed in time for minimum loss of fig. She decided to lengthwise slicing is better according to their triyings. Figs which are dried in this way started to be liked by Ünal's immediate vicinity. Semra Ünal intended to increase her production for growing demand and turning it into economic gain. She give name "fig chips" to this product because of its shape and tissue and in order to attract children's and youngs' attention and directing their tendency through the healthy food. This product has been started to be popular in both region and country after it was selected as the best product in a competition staged by Provincial Directorate of Ministry of Food, Agriculture and Livestock.

There was another fruit which has the same misfortune with fig; kaki persimmon. It has also a few times for selling in a fresh way after it gathered from the trees. Fresh kaki persimmon trees were cut because of their economic value is low when compared with their costs until the last few years. Ünal thought to do the same thing and tried to make dry this fruits too. She put her new product into fig chips pocket in order to understand the reaction of customers to this new product. Dried persimmon was also liked by all the consumers and demand for this product started to increase quickly. A cold storage was established with 30.000 TL paid by Ministry of Food, Agriculture and Livestock as supporting for the project of "Flavours from Heaven" (Cennetten Gelen Tatlar) which was prepared by Semra and her 22 years daughter Gizem in 2017. This producer family has started to be famous in all the country with

news about them after that date. And now the family could not even carter to the increasing demand.

Chips are made from the family's own orchard which has five hundred fig trees (Figure 4.12). In this orchard about thirty tonne fresh fig is achieved every year. One kilo of dried fig chips is achieved from five kilo of fresh fig. Five tonne fig was turned into one tonne chips instead of being wasted in 2018. Fresh figs are dried on special porous panels after they were gathered from trees and sliced finely by women (Figure 4.13 and 4.14). Figs which are waited on these panels become chips in two days. Price of this product is 40 Turkish liras for 2018. The most difficult phase of process is dividing figs into thin slices. This phase is occurred by seven or eight women. Ünals want to design and have a special slicing machine.

Figure 4.12 : Fig orchard of Ünal Family (Personal collection).

Figure 4.13 : Semra Ünal, while she was going to her facility from the orchard (Photo archive of Semra Ünal).

Figure 4.14 : Figs are sliced and became ready to dry by women (Photo archive of Semra Ünal).

Kaki persimmon is not grown in the orchard of Ünals. They buy this fruit from the other producers. Growing persimmon now is attractive as an economic activity according to region population. Persimmon is bought from producers and became ready for drying after it is peeled off. It takes fifteen or twenty days for drying. One kilo of dried persimmon is achieved from four kilo of fresh persimmon. Price of one kilo of fresh persimmon is 3 TL when dried persimmon's is 35 TL. Fifteen tonne fresh persimmon was tuned into three tonne of dried persimmon.

20 women have got a job through this production. Five tonne of fresh fig was saved from being wasted and turned into dried fig chips. Economic values of fig and persimmon started to increase and people started to fig and persimmon trees started to be harvested instead of cut.

Target of Ünal is to be able to produce five tonne chips in year. and to be able to produce to export. The family wants to receive a grant to their new project about drying tunnel again. If they can receive 500.000 TL, they will turn into an operation which has got a drying tunnel.

4.2.3 Evaluation the case in terms of rural frugal innovation

4.2.3.1 Need/problem

Idea of turning figs into chips is based on a problem belongs to rural. This problem is being wasted of fresh figs which cannot be sold at bazaar. Fresh fig has a little time

for selling after it gathered from trees. Fig and olive trade is the only economic activity of this family. If all the figs gathered from trees cannot be sold at bazaar most of them are wasted and this situation affects the economic gain of the family directly. Problem which caused to an innovative idea can be defined as shortages of livelihood because of fresh figs not being sold in one or two days become wasted.

4.2.3.2 Idea

This problem caused to occurrence of the new innovative idea which is drying figs after slicing in the shape of chips. Innovative idea of producing fig chips bases on the problem and need of the producers own. The case meets "idea" criteria which is one of the most important components of rural frugal innovation.

4.2.3.3 Production

There is need of an orchard and slicing-drying facility for producing fig chips. Ünals has got their own orchard near their house in Kurtuluş where the problem emerged. Their raw materials are fresh fig and fresh persimmon. Fresh figs are grown in their own orchard and fresh persimmon is grew in the other producer's orchard in Kurtuluş or Kuyucak. Figs and persimmons gathered from the trees come to garden of house and are peeled off and slicing there. Then the fruits are brought to drying yard somewhere near the house and laid on panels one by one (Figure 4.15). Dried fruits are put in the cold storage after they were packed for sale (Figure 4.16). All of the production phase is came true in the family's orchard, house and facility except growing fresh persimmon. Production has to come true in rural area where the problem which causes it emerged for being an example to rural frugal innovation. So the case meets this criteria.

Figure 4.15 : Persimmons waiting for to be dried (Personal collection).

Figure 4.16 : Packed fig chips in the cold storage (Personal collection).

4.2.3.4 Marketing

Producer is marketing all of products to consumers directly without a middleman. People heard about the products are reaching the family via telephone or social media to order. Customers generally orders huge amount of product every year and the family could sell all of the products until now. They wanted to utilise from their orchard maximally to meet increasing demand.

4.2.3.5 Sustainability

Ünal family does not use chemical fertilizer in order to achieve more agricultural product. Fig is already a fruitful tree and ten kilo of fresh fig can be achieved from only one fig tree minimally. This amount can change according to sappy and pruning system. Producers haven't got an organic certificate for their product because of olive trees and fig trees are generally close to the each others and the family use pesticide for olives. They have not too much information about ecological agriculture. They both grow and buy their raw materials but in each two types the family contributes to agricultural production in Kurtuluş. In slicing and drying phase the family employes villager women as workers (Figure 4.17). Thus ecological sustainability is supplied with using lands for agriculture, social sustainability is supplied with social cooperation, producing healthy food, woman employment and last economic sustainability is supplied with increasing of the employment and income growth. After all in Ünal's production most of the production phase meets the criterias of sustainability except not doing ecological agriculture all.

Figure 4.17 : Workers peeling the persimmons off (Photo archive of Semra Ünal).

4.2.3.6 Affordability

There are two kinds of production which ensure economic gain to the family mainly and these are fig chips and kaki persimmon. In this study case of fig chips production is considered because of it is the first frugal innovative idea invented by the family. Fig chips is also a labour-intensive agricultural production with its gathering, slicing and drying phases. Ünals determine a price for their production taking account off gathering labour, daily wage paid to the workers during slicing, drying and packaging. This price is 40 Turkish liras for 2018. After Semra Ünal's invention fig chips has started to spread in Aydın region. Now there are different fig chips with different brand in the market. We need to book to price of the other fig chips in the market and compare with the price of Ünal's fig chips. There are three different brands for fig chips except Ünals according to the result of search "fig chips" in Google Shopping. These are Kuru Yeşil, Mlife and Freeze. Results of search are like in the table below (Table 4.6).

Table 4.6 : Prices of fig chips with different brand.[2]

Brand	Price of a pocket (TL)	Price of kilo (TL)
Kuru Yeşil	13 (100 grams)	130
Mlife	4 (30 grams)	120
Freeze	14 (20 grams)	700
Ünal	12,5 (250 grams)	50

Average of the results is 250 TL. Ünals fig chips is under the average value with 50 TL. It can be said that the product of Ünal family is affordable when it compared with the other brands. Its price for 250 grams packed is 12,5 TL but 40 TL to consumers wanted to buy 1 kilo.

4.2.3.7 Well-performed

Fig chips is made from Sari Lop which has geographical mark in Aydın and all the districts of Aydın. Sari Lop fig is registered and famous in country and at international level with its quality. Semra Ünal guarantees that her product is good quality and she says that she doesn't get paid from consumer if they don't like the

[2] The results base on the search in Google Shopping in 28.01.2019

chips. Fig chips was liked by all the country in a short time and now Semra Ünal commercialises her product to very different regions of Turkey. In sum up Ünal family's fig chips is well-performed when user satisfaction is considered.

4.3 Fuel Production from Agricultural Wastes in Bismil

4.3.1 General information about Bismil

Bismil is one of the districts located in the south east of Diyarbakır province of Southeast Anatolia region in Turkey. Dicle River generates fertile agricultural lands via accumulating large alluvial materials. Bismil settled on alluvial plain through this river and most of its geographical conditions were shaped by Dicre River. The district covers 1745 km^2 and 95% of this area consists of all agricultural lands (Özgen, 2007).

Bismil territory has characters of transition climate between Mediterranean and Continental climate. Climate conditions and fertile lands the district has got enable to do many kinds of agricultural activities such as fruit-vegetable agriculture, viticulture and cereals. It is third city among all of the districts of Diyarbakır in terms of population density due to it has suitable climate and natural conditions to settle (Özgen, 2007).

Bismil is among sixth degree developed districts according to the survey which divided 872 districts into six groups by their development level by DPT (2004). The districts in this group give migration to the other groups. Extended family structure and so high fertility rate, high level of employment in agriculture sector seem in this group of districts. Four group of settlement was determined in Environmental Plan of Diyarbakır-Şanlıurfa-Adıyaman which is prepared by Ministry of Environment and Urbanization in 2012. Bismil is in third group, according to the analysis of the plan. This group of settlement was described as the attraction centres which have high growing potential, strong interaction with province centres and come after province centres (ÇŞB, 2012).

Municipality borders of Diyarbakır overlaid with borders of the province in 2012 and Diyarbakır Municipality has been Diyarbakır Metropolitan Municipality since 2012. According to the Turkish Statistical Office, there is no rural population in metropolitan municipalities by year 2013. There were 108 villages and 17

neighbourhoods in Bismil according to population data in 2012. There are now 122 neighbourhoods totally according to the data of 2013 and 2017. This means that the borders of some of neighbourhood and villages were changed and it is not possible to calculate the rural population of Bismil after 2012. When the change was considered, it seems that total population of Bismil is continuing to increasing although rural population is decreasing (Figure 4.18).

The sector which has highest employment rate in total employment is agriculture sector. This means people are occupied with agriculture even they live in city centre in Bismil. Employment rate in agriculture is 83,07%, in industry is 1,63 and in services sector the rate is 15,30 according to the survey of DPT (2004). In the same survey these ratios are 48% in agriculture, 14% in industry and 38% in services sectors in Turkey's average (Figure 4.19). It can be said that Bismil is an agriculture district.

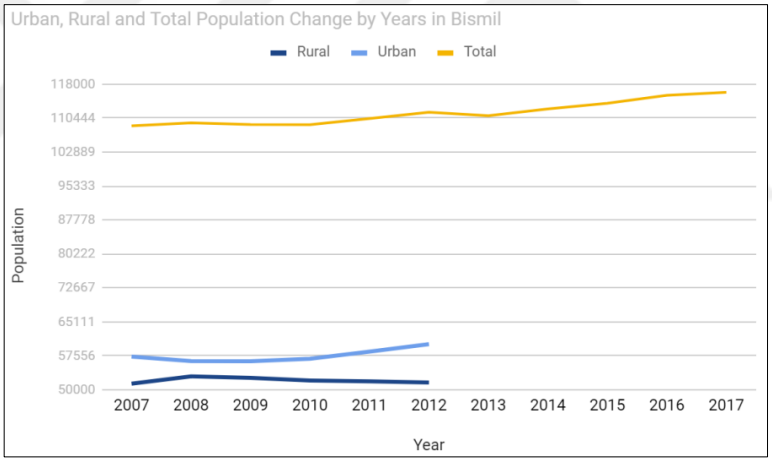

Figure 4.18 : Urban, rural and total population change by year in Bismil.

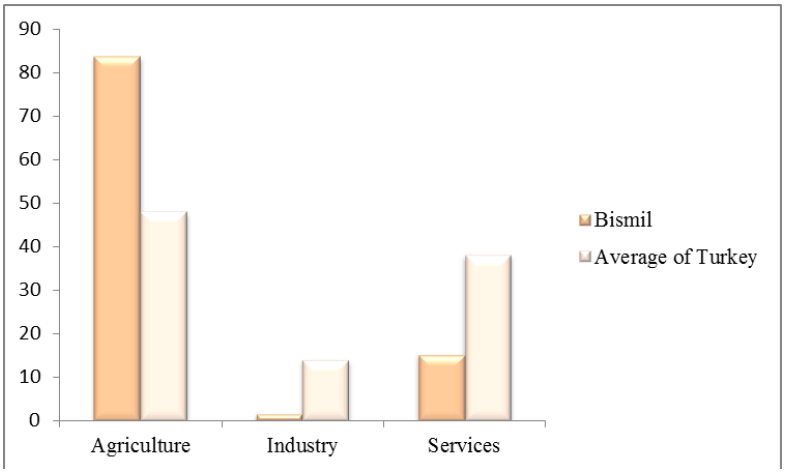

Figure 4.19 : Employment rates by sector in Bismil.

98,9% of total agricultural area is cereal, 0,8% of it is vegetable area, 0,1% of it is orchard (Figure 4.20). Main cereal product is cotton and wheat and corn follow it ordinarily (Table 4.7).

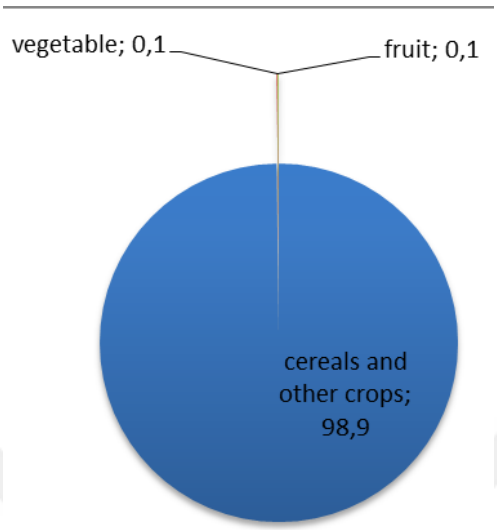

Figure 4.20 : Distribution of agricultural land types in Bismil (TURKSTAT, 2018).

Table 4.7 : Ratios of cerial production produced in Bismil (TURKSTAT, 2018).

Cereal	Ratio in total production (%)
Wheat	25,0
Corn	19,7
Barley	3,7
Chickpea	0,4
Masoor	4,6
Cotton	45,7
Vetch	0,9

According to a survey by Başçetinçelik et al. (2005) waste amounts of cotton, corn and wheat are like below in Turkey averagely (Table 4.8).

Table 4.8 : Calculation of usable waste amaunt in Turkey.

Product	Production amount (tonne)	Waste amount (tonne)	Rate of usability (%)	Usable waste amount (tonne)
Wheat	22439042	23429907	15	3514486
Corn	2209601	4970259	60	2982155
Cotton	2292988	2520281 (straw)+ 732220 (gin)	for straw 60, for gin 80	1512169+585776

If we view this table we see that we can calculate the approximate waste amounts of wheat, corn and cotton in Bismil too. According to this calculation waste amounts of the main cereal products in Bismil are like below (Table 4.9).

Table 4.9 : Calculation of usable weste amaunt in Bismil.

Product	Production amount (tonne)	Waste amount (tonne)	Rate of usability (%)	Usable waste amount (tonne)
Wheat	171624	179202	15	26880
Corn	135041	303744	60	182246
Cotton	313373	344436 (straw)	60	206661

It is understood that huge amount of agricultural waste emerges in Bismil every year when cereal production amount is considered. Farmers generally burn these wastes on the land after harvesting. This situation damages to air and useful microorganisms in land.

4.3.2 Fuel production from agricultural wastes of Server Vural

Server Vural who is the first one produced energy from agricultural wastes was born as a child of a farmer family in Bismil in 1969. He is occupied with farmery although his job is Biology teaching. He was educated about damaging of burning agricultural wastes to agricultural lands while he was studying at Science Faculty. When he shared this information with his family his father said that staying wastes on field is damaging to plants and decreasing the productivity. He recognised that theory he learnt is not applied to reality. He had started to think about how the wastes can be removed from lands after harvesting and how the cost of this activity can be turned into an economic and environmental gain. He realized that this profession has already been in abroad for many years as his internet accessibility increased. He learnt that corn was turned into fuel first time in Canada. Then cornstalk was also used in the same way. Woody wastes have been also turned into fuel he learnt. Vural took courage about turning agricultural wastes to good account in his own region-Bismil. Firstly he established a cooperative which with name of Bismil Agricultural Pellet Production and Marketing Cooperative then local produced machines was bought. He heard about supportings of UNDP in this field and established a facility supported by UNDP.

Server Vural made a feasibility study about agricultural waste potential within the scope of Utilization of Renewable Energy Resources and Increasing Energy Efficiency in Southeastern Anatolia Region Project. His idea that is using wastes as raw material for fuel was worked up into a project and his project accepted and supported in 2013. Then the facility was established in the same year (Figure 4.21).

Pellet production has been realized since 2016 actively. Land in which the facility established was Vural's own property. Supporting was 730000 dollar supported by UNDP and 500000 dollar which is Vural's own capital was spent for the facility. And the operation amortised itself in one year. It is very close to agricultural lands so to raw materials. Agricultural wastes of farmer members of cooperative reach to facility via cooperative. There are seven members of cooperative and all of them are owner of agricultural lands at big scale.

Agricultural wastes which are removed from the fields of members or brought from ginnery factories come to the facility, put through the grinding mill, dehumidified and pressed (Figure 4.22 and 4.23). Primary input product which turns into fuel is cornstalk and cotton wastes, wheat straw and various stems follow it ordinarily. The best product which ensures high level productivity is cornstalk. The reason is cinder rate of cornstalk is less when it compares with the others and consequently a more comfortable fuel can be achieved from it. There are seventeen ginneries in the region and materials like boll and some wastes in the cotton that is brought to these ginneries are got from there and turned into fuel in the facility. Because collecting cotton wastes from the lands is difficult and costly. Wheat straw is also an effective product but it is used as animal feed mostly. Because of these reasons cornstalk is commonly used in the facility and cotton gin comes second.

Figure 4.21 : The facility established by Server Vural with UNDP supporting (Url-7).

Figure 4.22 : Corn straws which are brought to facility and the press machines (Personal collection).

Figure 4.23 : Pressed pellets (Personal collection).

Six or seven thousands tonne of cotton gin occurs in the region in a year averagely. This amount can reach to ten tonne in a year due to increasing of cotton production

in the region last years. Five hundred kilo of wastes occurs also in one decare of cornfield averagely. Members of cooperative have fielded covered about fifty thousand decare area. Accordingly about twenty five thousand tonne of agricultural wastes totally can be achieved by facility. But all of these wastes cannot be turned into pellet because the supply is shaped by the demand. The demand reduplicated in 2018 when it compared with amount of 2017. If natural gas had not been ensured to Bismil increasing of demand would be quadruple. Natural gas came to the district in 2018 but Vural says that they'll see the people who prefer pellet instead of natural gas in time.

First using of pellet was in Vural's own apartment in Bismil and it has been used for five years. Neighbours of them and then the other neighbours who heard pellet wanted to use it in their own apartments too. Thus using of pellet started to be used in houses and continuing to spread day by day. Approach to this new kind of fuel of local people has bias. They don't believe in fuel made from wastes can heat as much as natural gas or coal unless they try and see. But they satisfied and continued to use when they try to use pellet. Pellet is preferred especially by industry facilities since it is more economical and affordable than coal. Boils in steam machines on washing and ironing in textile factories in Batman, milk factory in Diyarbakır, bulgur factory in Şanlıurfa are some of pellet users. Besides that demands to pellet of bakeries oven and apartment boilers also are started to increase. So production of the facility increases progressively.

The facility has 10.000 m^2 areas consist of its 1000 m^2 building area. Seven farmers are member of the cooperative and six workers are employed in the facility. In addition that some seasonal workers are employed in time of gathering and transmitting of raw materials.

10-15% of wastes are humid so it takes one thousand one hundred fifty kilo of cornstalk to produce one tonne of pellet. Production capacity of facility is three tones in one hour but the production amount changes by raw materials. If the firm grows, it will start to gather wastes from lands professionally. Thus, the firm can access to the raw material in an easier way. One tonne of pellet is 1000 TL when one tonne of coal is 285 $. The price with the special automatic device is 1250 TL for people who want to try it (Figure 4.24).

Figure 4.24 : Automatic burning device (Personal collection).

The biggest cost item in the operation is electricity. Vural says that they suffer from the increasing electricity prices intended for industries. It is one and a half of according to the price of houses'. For instance the bill of October was 23.000 TL when the bill of September was 11.000 TL. The other issue about difficulties that the operation meets with is related with removing the cornstalk and cotton straw from the lands. Cornstalk should be stay on the ground a few days after harvesting ideally. But farmers want to sow another product quickly and they sow new product fifteen days after harvesting. So gathering time is only fifteen days and all the wastes must be removed from the ground in fifteen days. Pellets also have to be keep dry because wet decreasing productivity. Technologies about this process need to be developed.

Ultimate target of the firm is being able to produce also electricity from agricultural wastes. Primary target is increasing of personnel and house using especially in rural areas and districts in which natural gas doesn't exist instead of industrial using.

4.3.3 Evaluation the case in terms of rural frugal innovation

4.3.3.1 Need/problem

Server Vural who is an entrepreneur besides that he is a teacher also a farmer thought over how agricultural wastes used in a useful way for years. Because, there was a problem which he saw in his own region. This problem is the damaging of burning wastes in fields to environment like air pollution and to useful microorganisms and

insects. Firstly the problem must belong to rural area or rural population to call an innovation as rural frugal innovation. In this case problem of damaging of burning wastes revealed the need of removing wastes from lands and turning cost of this process into an economic gain. So, this problem indicates the need of agricultural area which is the most important part of rural areas.

4.3.3.2 Idea

Need which was caused by problem occur the innovative idea of achieving fuel from agricultural wastes after removing them from grounds. This new idea bases on the problem of agricultural areas so on the rural areas.

4.3.3.3 Production

Turning agricultural wastes into fuel required to an industrial process and a facility. The facility established by Server Vural is located in Bismil and it is surrounded by huge agricultural areas. This industrial facility contributes to sustain agricultural production via recycling of agricultural wastes. Although agricultural production is not done in this example, a production which supports and sustains agricultural production in Bismil and its surroundings is done. In addition to that, there are six people who are employed as workers in the facility and also there are too many workers are employed in gathering raw material process after harvesting. Production process contributes both agricultural production and increasing employment in the rural areas.

4.3.3.4 Marketing

Server Vural is marketing the packed and labelled pellets to customers directly (Figure 4.25). His customers are houses and bakeries in Bismil, factories both in Bismil and other surrounding cities. Producer enables people to try this fuel and people, commercial establishment or factories which try to use pellet want to continue to use it instead of coal. Users of this product are not from only urban areas but also from rural areas. Houses in rural areas around Bismil which has not natural gas prefer to use this agricultural fuel because of it is more economic. Thus rural population is among beneficiaries of this innovative product.

Figure 4.25 : Packed and labelled pellets which are ready to be sold (Personal collection).

4.3.3.5 Sustainability

Burning agricultural wastes such as cornstalk, cotton straw and various stem was causing both to air pollution and damaging useful insects, microorganisms. If farmers want to remove them from the land this process would require an economic, labour and time cost. On the other hand it is seen to pellet is an ecologically friendly fuel when it compared with coal or other fossil fuels. Pellet heating systems have value of carbon dioxide emission under threshold that is acceptable according to Kyoto Protocol. The sources of pellet are agricultural wastes and this source is renewable and one of our own sources so cost of pellet depends on our agricultural production not on the external economy. The idea of Server Vural which is transforming agricultural wastes to fuel enables economic, ecological and social sustainability. Ecological sustainability is ensured with preventing to burning wastes that cause air pollution and damaging to land and contributing agricultural production on agricultural lands, economic sustainability is ensured with turning gathering cost into an economic gain due to final product and increasing employment, social sustainability is also ensured with sustaining rural population in rural areas via increasing of rural employment. Because of these reasons thin case meet the criteria of sustainability for rural frugal innovation.

4.3.3.6 Affordability

We need to compare pellet with the other commonly used heating choose in order to understand whether pellet is affordable or not. There are too many methods to make this comparison and this is a technical issue but in this study it is tried to understand how much amount of fuel a standard flat (100 m^2) used in a year averagely. According to a survey by GAZBİR (2017) average consume amount of natural gas is 1032 m3. Price of 1 m3 natural gas is 1.5 TL in Diyarbakır according to website of Diyargaz A.Ş which is the company to distribute natural gas in Diyarbakır. Therefore the expenditure for natural gas in a year for a house is 1.548 TL. When the coal was considered in the same way a standard flat consumes 1,5 tonne of coal in a year averagely and price of it is 2.223 TL because of one tonne of coal is 285 $ and 1$ is 5,3 TL according to current exchange[3]. The same amount of agricultural pellet can heat the same house in terms of the energy they release. One tonne of pellet is 1.000 TL. So, 1,5 tonne of pellet is 1500 TL. Pellet is cheaper when it compares with coal and it is affordable as much as natural gas (Table 4.10).

Table 4.10 : Price comparison among the heating types.

Type of heating material	Price (TL)
Natural gas (1032 m^3)	1548
Coal (1,5 tonne)	2265
Pellet (1,5 tonne)	1500

As it is understood from the table pellet which is produced from agricultural wastes such as cornstalk and wheat straw is affordable for heating a house when it compares with the other heating tools coal and natural gas.

4.3.3.7 Well-performed

An ecologically-friendly, high quality product is produced in Server Vural's facility. None of the users who tried this product did not back to use coal again because of its advantages. So well-performed production is done and user satisfaction is at high level in this case too.

[3] The average value of dollar is 5,3 TL in November of 2018.

4.4 Fertilizer Production from Sheep's Wool in Uşak

4.4.1 General information about Uşak

Uşak is the capital of province of Uşak located in Inner Western Aegean Anotolian geographical region of Turkey. Its land consists of generally plateaus and it is surrounded by Murat, Bulkaz and Ahır Mountains as its natural boundaries. 64% is agricultural land, 29% is forest, 2% is meadows and rangers and 5% of total land (136.647 hecrates) is lands except agriculture. Altitude is 906 m in the centre.

Uşak locates in the transition from Mediterranean climate to continental climate; therefore the vegetation shows similarity with this situation. The weather is snowy but warm comparing with inner Anatolia in winters and hot and dry in summers.

According to the survey of DPT (2004) district of Uşak is ranked 52nd and it is among in the second degree developed districts. Indicators of socio-economic development are over the average of Turkey according to the results of the survey. Uşak province on the other hand is ranked 25th province between 81 province of Turkey and it is among third level developed provinces among six different development levels according to the survey of Ministry of Development (2011).

When urban, rural and total population change of Uşak was examined, it seems that the population has been decreased in rural although increasing in urban. On the other hand total population of Uşak has been increased. City of Uşak is both a city which immigrate-receiving and also sending (Figure 4.26).

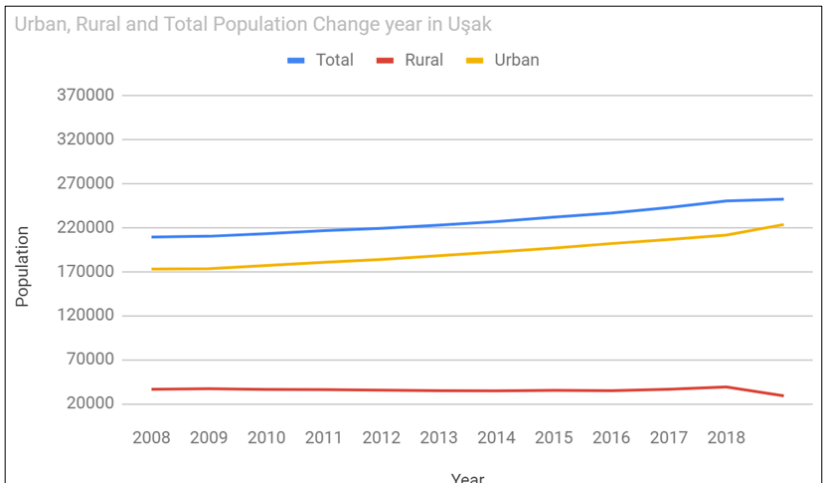

Figure 4.26 : Urban, rural and total population change by year in Uşak.

According to the survey of DPT (2004) ratios of employment by sectors in Uşak are 37% in agriculture 26% in industry and 27% in services. The same survey indicates that the averages of these ratios in Turkey are 48% in agriculture, 14% in industry and 38% in services (Figure 4.27).

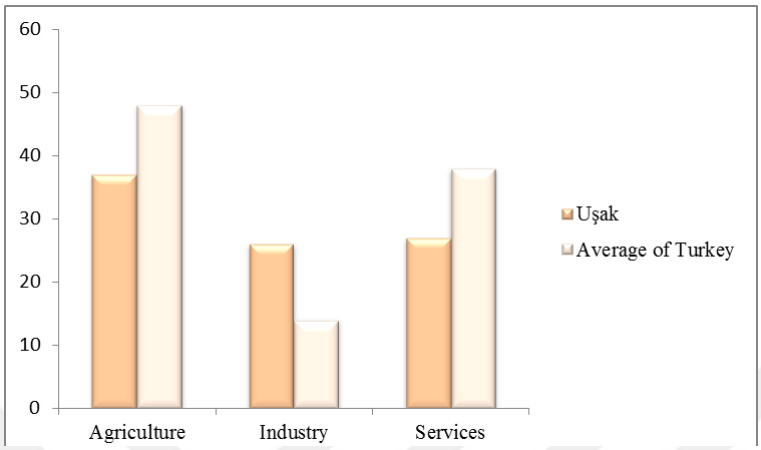

Figure 4.27 : Employment rates by sectors in Uşak.

And according to the report of Zafer Development Agency (2016) with the data of 2011, these ratios in Uşak province are 39% in agriculture, 26% in industry and 35% in services. Accordingly Uşak is a district which has decreasing agriculture sector with rural population and increasing industry and services sector with its increasing urban population.

Its agricultural lands consist of 95% cereal lands, 3% vegetable lands and 2% fruit production lands (Figure 4.28). Agricultural products produces in cereal lands are mainly sugar beet, barley, alfalfa, wheat, corn, grasspea (Table 4.11). When the table viewed it is seen that forage plants are on the foreground in total cereal production so it can be said that animal husbandry is an important activity in Uşak.

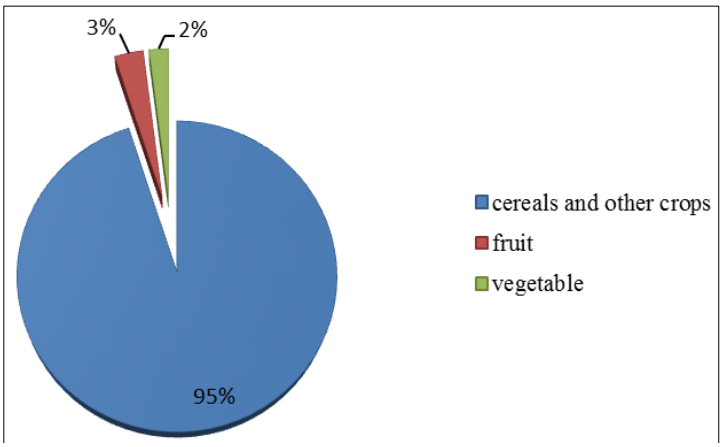

Figure 4.28 : Distribution of agricultural land types in Uşak (TURKSTAT, 2018).

Table 4.11 : Ratios of cereal production produced in Uşak (TURKSTAT, 2018).

Cereal	Ratio in total production (%)
Wheat	13
Barley	14
Potato	2
Sugar beet	18
Vetch	8
Alfalfa	14
Oat	3
Grasspea	7
Corn	9
Fodder beet	2
Green pea (forage)	2
Chick pea	2
Tobacco	4
Others	2

According to the report published by ZKA (2015), Uşak is back of surrounding cities in terms of plant production, animal production although agricultural and meadows lands it has. Also the city is in the foreground with its viticulture areas in its region.

The city has a developing industry sector and textile products compose the half of the total production in manufacturing. Food production, non-metallic products production, leather production and metallic production follow it orderly (ZKA, 2015).

Ovine breeding has been an important activity in Uşak since for centuries that carpet, rug, blanket and then spinning production have developed in industry sector (Kaygalak, 2013). Sheep's wool is main raw material to well-developed spinning production and this raw material comes Uşak from various regions of Turkey to be processed. Wasted wool has been occurred substantially every year in Uşak because of all of the wool cannot be turned into product.

4.4.2 Fertilizer production from sheep's wool of Abdullah Furtana

Abdullah Furtana who was born in 1982 had started to work in İstanbul after his computer engineering formation. He established a textile firm and production process had been in textile factories in Uşak, hence he decided to move Uşak where is his homeland. He also has been occupied with wool business. Wool comes to Uşak from various regions of Turkey even from east of Europe and north of Africa to be process

and turned into products such as worst, stripe and blanket. And all of the wool cannot be used in production because a part of it not suitable for textile sector. Therefore a significant amount of wool had been wasted. Furtana started to think about how he can put to good use of this raw wasted wool. He has too many customers from Europe and he learnt about organic agriculture and organic fertilizer. He started to produce organic fertilizer from wasted wool after his research and development process which last about three years. He could not make any application because of there was no call which is suitable for organic fertilizer area in that period. He established a factory which has 3000 m^2 covered area and designed all of the press machines himself and spent about 1.000.000 TL until he starts to production.

Season of achieving wool starts in March and continues until August. It has planned how the raw materials were used in whole year. Raw materials come to the facility in a natural way but the establishment also can get wool gathered from the lands via associations of sheep and goat breeding. His firm produces and sells organic fertilizer to the customers who are related with organic agriculture; accordingly all of the customers are from Europe. Places where organic agriculture is made in had been choice as market and research and development process had been carried out mostly in Europe. But demands to this product started to increase in also Turkey. Due to this production idea, five thousand of wool turns into fertilizer instead of being wasted.

4.4.3 Evaluation the case in terms of rural frugal innovation

4.4.3.1 Need/problem

Thousands of wool had been wasted every year and there was a need about how the wasted wool can be used and escaped from being wasted. According to the data of Ministry of Agriculture, 70.000 tone of wool is processed every year and 61.600 tone of total wool is used in textile sector but 8.400 tone of it was being wasted (88%). This problem is not about rural directly but it is indirectly. Using of wools which are not suitable for textile in another area ensures both increasing value of wool and supporting sheep breeding.

4.4.3.2 Idea

Idea of turning wasted wools into fertilizer belongs to person who has the problem of being wasted of wools which cannot be used in textile industry.

4.4.3.3 Production

Production phase is carried out at industrial zone of Uşak where the problem emerged. Wasted wool is thinning first and then it is became fertilizer in the form of capsules with heat treatment and thermo mechanical system. All of the machines in the facility were designed by producer own with local raw materials in industrial zone of Uşak.

4.4.3.4 Marketing

The producer exports all of the products directly to countries where organic agriculture is done commonly such as Germany, Netherlands, Austria and China. Marketing phase is for benefit of the producer own.

4.4.3.5 Sustainability

All of the innovation process is suit with the sustainability criteria. Recycling is an important element in sustainability and turning wool into fertilizer is also a recycling idea. This innovation helps to sustain sheep breeding and also it serves organic agriculture. Demand to this product has increased in also Turkey. Product has also a feature that is encouraging for ecological agriculture. When wool fertilizer compared with the chemical fertilizer, it ensures to feed soil and produce healthy food. The objective of this innovation is supporting to national economy and agriculture sector according to the statements of Furtana.

4.4.3.6 Affordability

Wool fertilizer is remarkably low cost in contrast with chemical fertilizer. It is affordable with the feature of reducing the cost of fertilisation for farmers. Plants can be feed during ten months with only one fertilisation. According to Furtana the his fertilizer contains nitrogen, phosphorus, potassium, minerals, 3,5 times water retention and soil regulating properties are more economic and efficient than many kinds of fertilizer.

4.4.3.7 Well-performance

Famous firms from Europe put the product to analyse and it was found successful and high-quality according to the results. The product has also organic certificated and demands to it have been increasing from both Turkey and abroad day by day.

4.5 Cheesemaking in Boğatepe, Kars

4.5.1 General information about Boğatepe

Bogatepe is one of the villages of central Kars located in North-East Anatolia geographical region of Turkey. It is 75 kilometre far from the city center of Kars. There are two villages which are very close to each other. These are Boğatepe and Küçükboğatepe and they were considered together in this case. The old name of the village is Zavot which menas “dairy farm” in Russian. This name is also the name of a local kind of cow in the region. The villages that cover 56.000 hectares land totally had settled on the strait with averagely 2344 altitude. Because of this high level altitude the weather is cold even in summers (Arınç, 2018).

Continental climate is dominant in Kars so the winters are very cold when the summers are rainy and -45 centigrade degree can seem as air temperature in winters. Due to the rain in end of spring and beginner of summer the village has rich and special pasture lands. Natural environmental conditions constitute potentials for cattle farming on Kars-Ardahan-Erzurum platoes. As a consequence of this conditions milk and dairies production has developed in the region (Atış & Çelikoğlu, 2017).

Central Kars to which Boğatepe village connected is ranked as 189th district among the 872 district of Turkey in terms of socio-economic development level and it is located in third level developed districts. Districts in this group have an agriculture-intense economic structure, under the average of Turkey urbanization rate, speed of population increase. Household numbers are also high in third group of districts according to the survey of DPT (2004).

It can be insufficient to evaluate population change of Boğatepe village alone. Because, population generally changes depending on seasons in the villages. Thus population change of central Kars was also examined. According to general census data and address based registered system achieved from Turkish Statistical Institute are shown on the graphic. (Figure 4.29).

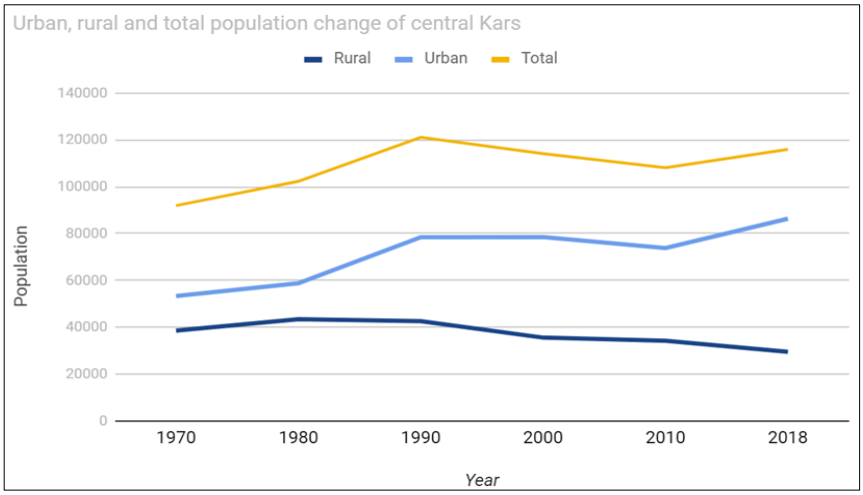

Figure 4.29 : Urban, rural and total population change by year in central Kars

As it can be understood from the graphic, rural population of central Kars has decreased since the first census when urban and total population have increased. Accordingly a migration from rural area to urban area seems in central Kars. Boğatepe is one of the villages of such as district which loses its rural population.

Now population change of Boğatepe villlage can be tried to understand with considering of change of central Kars's. General population census and address based population registration of Bogatepe villages results are like in the graphic below (Figure 4.30).

While the population had been decreasing speedly, it can be understood that the rate of decrease has decreased since 2000 from the graphic. But these datas were achieved from Turkish Statistical Institute and as it mentioned before population of the village can change depends on seasons. According to in-depth interviews with the villagers there are 113 houses on winters and 133 houses on summers.

Employment rate in agriculture is 47,5%, in industry is 4,7 and in services sector the rate is 47,8 according to the survey of DPT (2004). In the same survey these ratios are 48% in agriculture, 14% in industry and 38% in services sectors in Turkey's average (Figure 4.31). It can be said that Kars is also an agriculture district.

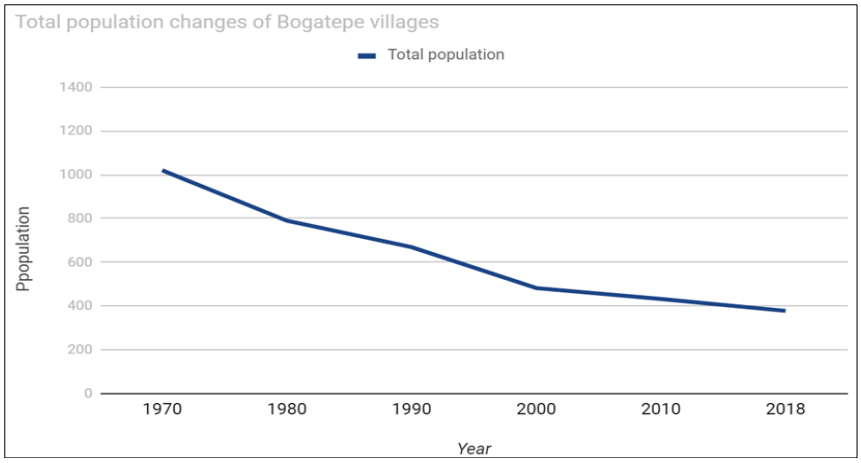

Figure 4.30 : Total population change by year in Bogatepe.

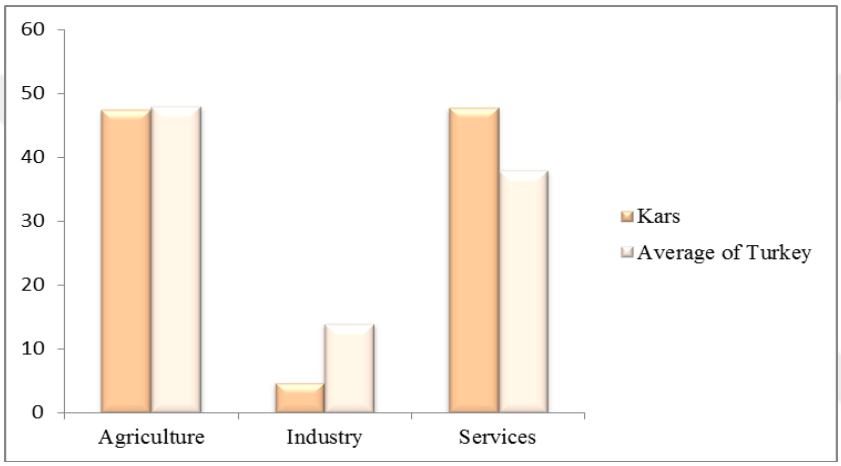

Figure 4.31 : Employment rates by sectors in Kars.

As it specified previously, due to climate and spring rains, geography of Kars and so Bogatepe has sufficient land for both forage plant breeding and medows-ranger (Figure 4.32). Because of this reason cattle farming and cheesemaking potential is at high level in the village. TRA2 statistical region which consist of Kars, Ardahan, Iğdır and Ağrı have 10% of total number of alive bovine of Turkey according to the data of Turkish Statistical Institute (TURKSTAT, 2018). 83% of total agricultural area is cereal area in central Kars and 87% of total production amount in these lands are forage plants (Figure 4.33).

Figure 4.32 : Meadows-ranger areas of Boğatepe (Url-8).

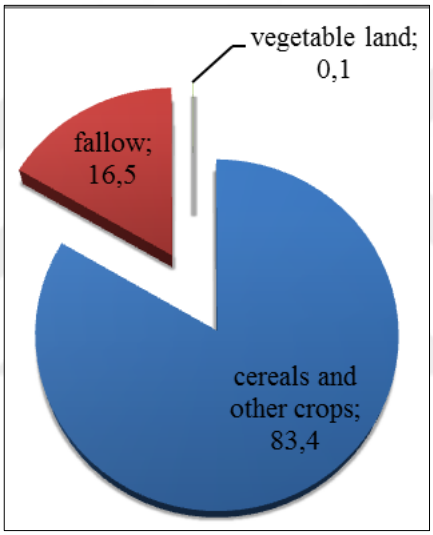

Figure 4.33 : Distribution of agricultural land types in Kars (TURKSTAT, 2018).

Cheesemaking -especially gruyere- in Bogatepe started in Caucasus in 1850s which is the period of coming of Swiss people as workers to Borçalı-Georgia as a result of the changes in industrial process of the world. David Mosser who was a Swiss cheesemaker in Georgia recognized that leas were very suitable to make good gruyere in Boğate during his travel from Georgia to Switzerland in 1880s. Gruyere is originally a Swiss cheese which is produced in Emental Valley of Switzerland. Russians, Malakans and Doukhobors had lived in Bogatepe in that period. Mosser got these societies settled and started cheesemaking with permission of governor. 32 dairy farm was established in Kars during the Russian hegemony and first of those was established in Bogatepe village with the partnership of Koçulu family in 1887. Kars was got to Turks again in 1918 and the village had stayed vacant during two

years. Kıpçak Turks migrated to Boğatepe in 1920 and they started to cheese production again. Mustafa Kemal Atatürk sends Filibeli Fehmi to Kars in order to let him to learn and produce kashkaval (kashar) cheese 1930s. Kashkaval cheese actually a Balcan cheese. Kars kashaar cheese was started to be produced in Kars in that period. Gruyere and kashar production has been continuing since those times. Today 22000 families in Kars and 8000 family in Ardahan live off cheesemaking.

4.5.2 Cheesemaking in Bogatepe

İlhan Koçulu who was born in 1958 in Boğatepe which is a village of central Kars had been working in textile sector in Istanbul freely until 2000. There was a traffic accident that caused twenty three people including brother of İlhan Koçulu to die in 2000. So İlhan Koçulu went to his village because of the funeral. He found his hometown different from the village his knew. The number of household was 61 when it was more than 200 during his childhood and the number of animal was 620 when it was more than 10000 during his childhood. People were buying bread instead of making it themselves.

Koçulu started to think about this decrease and change and try to prevent it and he decided to come his village back after the accident. The reason why people were not making bread is that the flour they bought from markets was not available to cook in tandoori -a special oven. In other words they were not growing their own wheat and producing their own flour. Hence, Koçulu started to work firstly with wheat. Kavılca -a local kind of wheat stayed only last 50 kilograms was gathered from villages in order to reproduce it in region and cultivation was started even though in small lands such as 500 m^2 or 1 decare. An agriculture machine was bought with UNDP supports and villager's own payment. This machine was used in 15 villages jointly and ordinarily. Also a project about local seeds made firm by supporting of UNDP in 2006. Today it is possible to make even noodle from kavılca wheat. Local seed barter is done in the village and between the village and surrounding villages today.

It was tried to be understood that causes of migration from rural areas to urban areas and metropolitan cities. There were psychological reasons of this situation beside economic reasons. One of the most important psychological reasons was that villager people emulate to live like urban people with the influence of perception management by media according to views of İlhan Koçulu. Therefore, it was able to

experience urban life for villager people especially women. Villager women who made use of this opportunity could see that there are too many disadvantages of urban life in addition to advantages. They recognized that life in their own village is better than urban life in case of averting economic difficulties in rural areas.

Another psychological base to affect people in terms of willing of continuing to stay in their villages is sense of belonging. Bogatepe covers 56000 decar area totally and it has 650 different kinds of plant on its lands. Botanic and ethnobotanical studies were carried out and 35 kinds of total plant were made firm and people were educated about how they can use and utilise them. 38 different kinds of traditional cheese also was determined and workings on produce them again were started. The first cheese museum in Turkey was established in Boğatepe with supporting of UNDP Millennium Development Goals. The first dairy farm building established in Kars in 1987 was selected as museum building (Figure 4.34). Kars kashar cheese was registered as geographical marked product in 2015 with the works carried out with Serhat Development Agency. Also presidium that is a project carried out by Slow Food was created for gruyere cheese. People learnt about specific features differ their village from the others have started to gain sense of belonging more.

All of these studies were done via an association called as "Bogatepe Environment and Life Association" established in 2002. There are 45 women and 15 men members of this association. Villager people benefited from educations organised by this association. Educations mainly focused on cheesemaking, healing herbs, health and self-expression. People educated about even what kind of seed is available for which parts of agricultural lands. There are educations also about methods of drying herbs, oil extraction of herbs and producing various creams from these herbal oils. There was need of a drying machine and cost of it was 63000 £. All of the engineers and herb experts came together and investigated the machine. Another machine with the same performance was produced by local people spending only 3000 £. Today the herbs are dried by the heat of turds. Products have organic certification.

Figure 4.34 : Cheese ecomuseum in Bogatepe (Arınç, 2018).

Villagers learnt that the people who live in cold climate conditions need to consume vegetables beside meat. Thus vegetable growing have increased in Boğatepe in last years. Arthralgia frequently seem among women occupied with animal husbandry in cold weather. So these women started to practise yoga. There is a sister association of this association and it is Tamadi Association from France. Villager people was educated about French language in order to host tourists which come from France via Tamadi. Due to increasing of tourist number, participation to employment of villager women has been increased.

Cheese production which was started by David Mosser and continued by Filibeli Ahmed Hilmi has tried to be sustained with the same methods by local people of Boğatepe led by İlhan Koçulu since 2000. Milk producer in Kars generally are not included to cheese production and sale process. Milk production and cheese production (dairy farming) are two different subject of activity. Milk producers only sell their milk to dairy farmers. But in dairy farm established led by Koçulu milk producers are also parts of cheese production process. They are partners of profit achieved from cheese and outgoings of dairy farm at the rate of their milk. İlhan Koçulu pays 1.65 TL for one litre of milk when this price is generally 1.10 TL in Kars. This production model ensures first producers of process to gain deservedly and promote them to produce. The dairy farm has 17 producer family and employees 13 people in summer, 5 people in winter.

Gruyere, kashar and the other kinds of cheese (totally 32 kinds) are produced still with the traditional methods but the methods was adapted to today's technical potentials and developed in order to produce in an easier way. Copper boilers remaining from Russian times were turned into steam engines. Cheese producers

played a part in designing process. Pressing was doing by hand at old times and hydraulic system was developed for pressing. İlhan Koçulu in person studied with the engineers during two years in the process of machine designing in case of hydraulic oil do not mix into cheese. Thus all of the machines used in making cheese was designed and customized by local people who produce cheese in as possible as cheap way (Figure 4.35 and 4.36).

Figure 4.35 : Old and modernised milk boiler in Boğatepe (Aydın, 2013).

Figure 4.36 : Old and modernised gruyere machine in Boğatepe (Aydın, 2013).

Production amount is adequate for livelihood of the village. There can be such as animals maximally on the lands of village. Because of that there is not any goal about increasing the amount of production. But the goal is to spread this development model to the other surroundings villages.

Consequently after all of these works today (2018) household number is averagely 70 and animal number is over 5000 in Bogatepe. There are 7 dairy farms and 300 tone of cheese is produced in Bogatepe when there were 2 dairy farms and 50 tone of cheese was produced before. On the other hand today 7000 tourists visit the village where 500 people live in every year averagely (Table 4.12).

Table 4.12 : Reflections on some indicators of studies carried out in Boğatepe.[4]

1970	1999	2000
230 houses	63 houses	113 houses in winter, 133 houses in summer
10000 cattles	650 cattles	4300 cattles
30 dairy farm	2 dairy farms	7 dairy farms
-	50 tone of cheese production	300 tone of cheese production

4.5.3 Evaluation the case in terms of rural frugal innovation

There are three main economic activity which consist of cheesemaking, growing plant (crop field, vegetables and healing herbs) and tourism in Bogatepe village. All of these activities were examined in terms of complying with rural frugal innovation in this section.

4.5.3.1 Need/problem

There was a problem recognized by İlhan Koçulu and it is population decreasing of Bogatepe depending on livelihood difficulties and various reasons. There were only 61 households and 2 dairy farms in 2000 the year of İlhan Koçulu came to Bogatepe again with the occasion of the big accident. Koçulu was started to think about this problem and to work in order to prevent migration from village, increasing the population.

4.5.3.2 Idea

In this case it can be said that the idea is revealing all of the potentials of village in order to prevent out migration. These potentials are local product agriculture such as Kavılca wheat, healing herbs, vegetables, cheesemaking and tourism. If we call an innovation as rural frugal innovation the idea phase should be carried out by one who has the need and problem. Originator of the idea of figuring out the potentials of village is İlhan Koçulu who was thinking about his hometown's negatively changed situation. He is originally a villager, had lived in a metropolitan city along time and when he saw the change of his village he decided to come back and do best for preventing population decrease of the village even increases it. Main idea is reminding local agricultural product and cheesemaking to villagers.

[4] The table was prepared according to the interview with İlhan Koçulu.

4.5.3.3 Production

All of the production processes of these innovative idea's occur in Bogatepe village where has the problem. Growing kavılca wheat and turning it into bulgur and flour, gathering and processing healing herbs, animal husbandry and cheesemaking are organised in rural areas of Kars. The most important raw materials which is milk is achieved from local kind of cow and processed in the dairy farm in the village to turn it into cheeses. It can be said that activities which is came true in order to be developed Boğatepe are organised in where the problem emerged (Figure 4.37 and 4.38).

Figure 4.37 : Cheese production process in dairy farm in Boğatepe (Arınç, 2018).

Figure 4.38 : Herb drying place and products made from them in Boğatepe (Arınç, 2018).

4.5.3.4 Marketing

All of the products produced in Boğatepe are sold without any middleman. Main goal is to sell the entire product in their places Boğatepe village. But there are different ways to sell surplus production such as internet. Products are sold in the village and in a shop in central Kars. Surplus products are sold on internet. Marketing process ensures benefit to rural people because of the products reach to consumers directly from producers.

4.5.3.5 Sustainability

All of these phases must be organised in accordance with sustainability criteria first. Local seeds like kavılca wheat were increased with ecological agriculture. Any chemical pesticide was not used in agricultural process. Many studies and projects about ecological agriculture and local seeds are carried out with UNDP and slow food. Development studies have always sustainability concerns. Local production and local consumption are important in this case. People try to sell all of the products in local. Local raw materials were used in all of the production process such as production of machine used in cheesemaking. Also villager people have not concerns about produce more and more. They know to do with less.

4.5.3.6 Affordability

There is a certain cost of cheese production process depends on milk amount, labour, time. A fair amount of profit put on this cost and a price was determined for cheese. Prices of products of Bogatepe village are affordable when they compared with the other producers' in Kars. The most famous two products are kashar and gruyere

cheeses. One kilo of kashar cheese is 35 TL when one kilo of gruyere cheese is 70 TL if they are bought from their places Kars. It seems that these prices are near to the other producers' prices in Kars during case survey. There is an average price for each product in Kars and generally all of the local products are sold with this average price.

4.5.3.7 Well-performed

Products which are produced in traditional ways are liked by everyone who tried them. Each kind of cheese can be made in a certain period. For example gruyere cheese can be made in only May, June and July. Because, the plants that the cows eat are different in each month. So milks achieved from cows are also different depends on the plants. Each cheese is made in a certain period not be produced in every season in order to produce more and more. Generally in Kars producers use coloring to make kashar yellow. But normally kashar can be yellow only when it is made from milks that milked in spring. Any coloring or other additive agents were not used in cheese in Bogatepe. Gruyere cheese has presidium and kashar cheese has geographical mark. And all of the other products like healing herbs, oils and creams produced from them have also organic certificated. So it can be said that products with high-quality and well-performance are produced in this case.

4.6 Rethinking on the Cases as Part of Frugal Society

Five selected case studies were examined and evaluated in terms of rural frugal innovation in the previous sections. Criteria of rural frugal innovation were determined in the light of frugality background but there is a concept that is an issue itself; frugal society described detail by Latouche (2011). Frugal abundance society is a political goal to escape from the consume society. "Another society is possible", Latouche says. He emphasizes locality, eco-friendly, reducing the energy consume and necessity, altruism, cooperation, social life and autonomy in frugal society description. When we rethink the cases from this point of view, it can be seen that these emphasizes in all of the cases. All of the points mentioned in the sustainability criteria matches with the keywords of frugal abundance society with their ecological solutions, ensuring eco-friendly employment, cooperation in production self-reliance consciousness. Sharing, simplicity, conviviality, care, commons are primarily

features of frugal society (Kallis et al., 2015; Gomiero, 2018). In this section it will be thought the possibilities of emerging a frugal society with the case studies examined in this study.

First entrepreneur İbrahim Bayrak is a person who has devoted himself to an ecological lifestyle. He has tried to spread its production approaches especially ecological agriculture to the surrounding producers near his farm. He has two children and four grandchildren that he tries to share his experiments with them every day.

Semra Ünal who is an apploudable entrepreneur has also not only ensured a new employment to her neighbourhood she also promote her surround to be productive. Her daughter is a student at university but she decided to use her information in the agricultural an intermediate technological business of her mother.

Server Vural who is the only representative of agricultural waste fuel in his own region, has aimed to ensure cheap end eco-friendly heating system for rural population. This is a good example for altruism in description of frugal society. His sphere of influence covers a wide area on the other hand. His relationship with the farmers in region is also an example for the cooperation between producers.

Being the centre of wool process of the location of Abdullah Frutana's production contributes with a wide range population occupied with animal husbandry. Also increasing demand to his eco-friendly product from domestic is another successful influence of him.

Last, Boğatepe village is a perfect example for frugal abundance society. People's consciously choice to live in a frugal way, with cooperation and self-reliance consciousness and also the affirmative change of the village in last 19 years make the case a very good reflection of frugal society. Starting to increase of the population again also and spreading the activities to surrounding villages are proofs for possibility of emerging frugal society.

4.7 Summary of Chapter 5

First case which is production in Bayrak farm sets an example for rural frugal innovation. Because of it meets criteria of rural frugal innovation. Need, problem and idea of innovation come from the rural people. Product of innovation also matches

with sustainability, affordability and being well-performed. But marketing phase is not all for the benefit of rural people or producer. Producers conceded the offer of middleman for accessing to the market in first years. Now the family has economic troubles again because of they earn less per bottle. Supply chain is long according to the production style.

The case of fig chips production also serves as a model for rural frugal innovation with its suitability to seven criteria. Innovative idea of turning fresh figs into chips after slicing and drying, bases on need and problem of rural people which is about livelihood because of being wasted of fresh figs after gathered and not being sold in the same day. Production stage occurs rural Kurtuluş where problem and need belong. This production gains favor to sustain agricultural areas and rural's social structure. In marketing stage there is any middleman to reach products to consumers. Consumer accesses to producer directly and producer could determine a moderate and an affordable price for their products. But there is no local consumption in this case and local production-local consumption is an important component for sustainable food system. Local consuming can increase with ecological agricultural tourism if the family pass to ecological agriculture. Product has also good performance by reason of consumer satisfaction is at high level.

Turning agricultural wastes into fuel meet all of the criteria for rural frugal innovation. Idea of producing fuel from agricultural wastes bases on the need of removing wastes from the ground that arises problem of environmental damaging. Production process contributes to agricultural production which is the most important activity in rural areas. One of main goals of producer is ensuring cheap heating to rural areas of Bismil and its surroundings. So, marketing phase is also occurred for both the benefit of rural people. Production phases and the product is also sustainable because of it sustains agricultural production, product bases on the renewable sources. It is also affordable when it compares with natural gas and coal. It can be said that it is also well-performed when considering of user satisfaction.

Abdullah Furtana's innovation, sheep's wool fertilization is a rural frugal innovation because of being wasted of wools is a problem related with both rural areas and also urban areas. Reevaluation of the wasted wool as fertilizer contributes to both ovine breeding, recycling and ecological agriculture also. Production process also contributes with sustaining urban areas with an industry which ensures employment

for urban people. Entrepreneur puts on market its high-quality and affordable organic fertilizer as against chemical one without any middleman.

All of the development studies with the leading of İlhan Koçulu set an example for rural frugal innovation with its all of the processes which are about both idea of reminding people cheesemaking and potentials of the village again and while doing these organising studies with limited economic resources in a frugal way. Achieving agriculture machine of villagers via contributing from their budget and communal using of this machine among villages are all frugal methods. Modernisation of machines used in drying herbs and cheesemaking is also carried out with frugal methods. Many studies on producing them in a cheaper way were done with participation of villagers so users. All of these processes were implemented regarding sustainability criteria. Products produced at the end of process are well-performed affordable and for everybody and they are marketing regarding the benefits of rural population (Figure 4.39).

Results of evaluation which determines the shortcomings and the suitabilities in terms of rural frugal innovation criteria defined in the previous chapter are shown in the table (Table 4.13). Case 1 has some shortcomings about marketing phase because the rate of direct accessing to the customers is low. Middleman earns more than rural producer. Producer should use more innovative ways to access to the market. Case 2 has also shortcoming about ecological agriculture and local consumption beside that it has much features which can match with sustainability. Most of its customers order big amount of products wholesale. Case 4 includes the need bases on an industrial production, not on the rural areas exceptionally. But it is related also animal husbandry i.e. rurality indirectly. Actually, this is not its shortcoming completely; but it is shown as the symbol of (X) with the reason of its difference from the other cases.

Case Study	*Need or problem*	*Solution idea*	*Production*	*Marketing*	*Sustainability*	*Affordability*	*Good Performance*
Organic vinegar production	Shortages of livelihood, being wasted of the fruits falling to the ground or spotted, not being sold of the organic apples with the value they deserve in the market	Turning the fruits into vinegar	Vinegar is produced in the farm of family located in Gümüşhacıköy rural	Marketing at both local, regional and national scale via middleman. Local consumption via ecological agriculture tourism without middleman.	Ecological agriculture, Ecological agriculture tourism, Local production, and consumption Local raw materials, Compost	Prices are under the average of the market.	User satisfaction is at high level. Products have the certification.
Dried fig chips production	Being wasted of fresh figs not being sold in a day after they gathered, necessity of recycling the fresh figs, livelihood problems	Turning the fresh figs into fig chips	Chips is produced in the orchard and facility of the family in Kurtuluş	Marketing at both local and regional and national scale. Marketing of products to consumers without a middleman directly. There is no local consumption.	Prevention of cutting fig and persimmon trees in the region, using of local raw materials, employing rural people, rural social cooperation	Moderate valuation to the product when it compared with the others	High level consumer satisfaction, using of geographical marked agricultural product
Turning agricultural wastes into fuel	Damaging of burning agricultural wastes to environment, Need of finding a solution to removing wastes from the lands	Turning the agricultural wastes into fuel (pellet)	The fuel is produced in an industrial facility but it is surrounded by agricultural areas and contributes to agricultural production	Marketing products to consumers without a middleman directly. Rural population is one of beneficiaries of innovation	Production prevented air pollution and ecology. Final product is an eco-friendly fuel, a renewable energy source. Reducing foreign dependency.	It is a cheap product when it compared with the other kinds of fuel	High level consumer satisfaction
Woll fertilizer production	Being wasted of over wool and need of reevaluation of it	Turning wool wasted into organic fertilizer	Production in wool industrial cluster of Tukey where most of the wool of country is gathered	All al the products are put on the international market. National demand also have been emerging nowadays.	Contributing and promoting to ecological agriculture, Recyclying of organic wastes	Organic fertilizer is a low-cost fertilizer when it is compared with chemical ones.	Product has various certification and passed some testing successfully
Development studies in Bogatepe	Population decrease of Bogatepe village and need of boost the village	Emergence all of the potentials of Bogatepe and reminding cheesemaking to the villagers again	All of the agricultural products and milk products processes are organised in Bogatepe	Products are sold to consumers directly by producers. Most of the products are consumed locally due to the ecological tourism	Ecological agriculture Local production and consumption Local raw materials Goal of protection rural areas	Prices of all of the products are affordable according to market of Kars	Products at high-quality and various certificated

Figure 4.39 : Summary of the entire evaluation.

Table 4.13 : Results of evalution of all cases

Case Study	Need of rural	Solution idea from need owner	Production in rural on in a way contributes with rural	Marketing for the nenefit of rural	Sustainability	Affordability	Good performance
Organic vinegar production (Gümüşhacıköy)	✓	✓	✓	✗	✓	✓	✓
Dried fig chips production (Kuyucak)	✓	✓	✓	✓	✗	✓	✓
Turning agricultural wastes into fuel (Bismil)	✓	✓	✓	✓	✓	✓	✓
Wool fertilizer production (Uşak)	✗	✓	✓	✓	✓	✓	✓
Development studies in Bogatepe (Kars)	✓	✓	✓	✓	✓	✓	✓

5. CONCLUSION

This chapter presents whether the thesis achieved its objectives or not via clear answer of the research questions, summary of the findings, recommendations for policy makers and also for future researchers. Before answering the question, to clearly understand the meaning of the concept is needed. Second chapter, because of this necessity defines the concept of rural frugal innovation.

According to the examples given in the second chapter, frugal innovation which basically means optimal using of limited resources has been popular in both developed and developing countries. Limited resources, problems which need urgent solutions play a trigger role for innovation in developing countries. Frugal innovation is considered as using the resources of the planet which are both economic and ecological at minimum level by firms in order to sustain their existence instinctually. At the same time, innovative and creative activities of individuals in order to sustain their life are considered as frugal innovation. Firms and individuals, both of them try to sustain their existence instinctually. But, when it is considered that the base of conscious and volunteering to choose a simple, small, plain, compatible with nature lifestyle which is explained in frugal abundance society of de-growth thought, rural frugal innovation in the context of this study required such a conscious choice. Following questions will be answered in the light of this assumption.

Research question 1: Are there any implementations which can set an example for rural frugal innovation in Turkey?

When considering that rural frugal innovation examples in the world are mostly a rural entrepreneurship story, there are rural frugal entrepreneurs confronts in each story. Hence, rural entrepreneurs who attempted with an innovative idea in a frugal way can be pioneer of the rural frugal innovation in Turkey. There are forty innovative rural entrepreneurs in Turkey according to the results of the research carried out within the scope of this thesis. Because of that it is not possible to in-depth examine all of the examples, in the light of the criteria of rural frugal

innovation it is decided that 10 of them rural frugal innovation with its contributions to rural areas via frugal solutions to their problems. So, there are some implements which can set an example for rural frugal innovation in Turkey.

Research question 2: If so; to what extent are these implementations frugal and innovative?

Five of the rural frugal innovation implementations were selected as case study in order to understand their frugality, innovativeness and contributions to their environ. These implementations were evaluated by the criteria which consist of need, idea, production, marketing, sustainability, affordability and well-performance come from academic literature of innovation, frugal innvation and frugality. The most important criteria is idea when it considered that the importance of locality which placed in the thinking of frugality. The most important thing that makes these implementations successful in terms of rural frugal innovation explained in this study is that all of the entrepreneurs found a solution for their own problems.

First entrepreneur, İbrahim Bayrak matches with the seven criteria of rural frugal innovation. On the other hand, it has some lack of innovative and frugal marketing phase. Middleman gets the process longer and prevents producer to earn money as he deserves. Middlemen, long marketing phase and supply chain are not suitable for rural frugal innovation (Francois et al., 2018) Entrepreneur needs some support about an innovative marketing system. Nowadays the family has economic livelihood troubles. Second entrepreneur, Semra Ünal's innovation also ensures the criteria of rural frugal innovation although it shows some deficiencies in terms of sustainability such as agricultural method and equilibrium of production-consumption. The family hasn't got much information about ecological agriculture. They use pesticides in olive cultivation although they don't use in fig cultivation. Because of olive trees and fig trees are very close to each other, fig trees have been affected from this situation. Another lack related with sustainability is that the producer sells her product as wholesale to the consumers from metropolitan cities who reach her via internet or telephone. There is no local consumption and equilibrium of local production and consumption is an important issue in sustainable food network (Schönart et al., 2009). This method is not so sustainable in long term producer will not be able to meet increasing demand herself. Third case, innovation of Server Vural, producing alternative fuel meets all of the criteria of rural frugal innovation with each stages of

it. Though it has an industrial production process, it contributes with to sustain rural area. It is also a perfect example for tool for conviviality of Illich (1974) and intermediate technology described by Schumacher (1973). Wool fertilizer which is the fourth innovation in the study by Abdullah Furtana differently from the other examples includes a problem and need of an industrial issue. But the idea of innovation is both frugal and also affirmative for sustaining rural via supporting husbandry and ecological agriculture. It is a good example for rural frugal innovation. Development studies in Kars led by İlhan Koçulu with participation of each person from village in time voluntarily is also a successful implementation of rural frugal innovation with all of its dimensions such as sharing, emphasize of locality. So, clear answer of the question is that all of the examples are successful rural frugal innovations in addition that two of them has some lack about innovativeness and sustainability.

Research question 3: Can these rural frugal innovation implementations be constituents of 'frugal abundance society' described by Latouche?

Rural frugal innovation is considered in the light of frugal abundance society in de-growth thought in this thesis. Therefore the criteria of rural frugal innovation were also determined in the context of frugal society. When we think frugal abundance society alone, we see that it is related with the significances of the concepts such as sharing, simplicity, conviviality culture of collective work, limiting needs and desires, averseness to capitalism and consume society, commons, consciousness of self-reliance, voluntarily and conscious choice of all of these lifestyles. In a de-growth society, work is expected to become more self-managed, more care-intensive and resulting in the creation of more durable goods (Sekulova et al., 2013). De-growth as a social movement started in Lyon (France) via meals in streets, car-free cities and food cooperative then the movement has spread to groups and activities in different countries in Europe (Demaria et al., 2013). Possibility of turning individuals into such a communities and societies depends on the possibility of spread of the movement. As it is detail considered in the section of "Rethinking on the Cases as Part of Frugal Society" each innovation examined in this study has possibilities to spread their surroundings and to transform itself a frugal society. All of the entrepreneurs have aimed to choose a frugal lifestyle and made a different with their frugal approach. They have close relations with their rural environment such as

relations between İbrahim Bayrak and other surrounding farmers or the visitors who come to his farm every year; Semra Ünal and her family, villager neighbours who are employed or promoted about doing innovation; Server Vural and farmers who gave up burning the wastes, villagers passed using eco-friendly fuel instead of coal; Abdullah Furtana and bovine breeders, ecological farmers; İlhan Koçulu's inspiration to all of the world due to the news, his TEDTalk etc. Accordingly, the clear answer of question is yes. Yes, they can be constituent for emerging a frugal abundance society. If these implements spread through their surroundings in time with the same conscious and voluntary, the movement of de-growth can emerge a frugal abundance society.

Our world has been changing rapidly since both agricultural and particularly industrial revolution. Accumulation of capital has been shaped the structure of economies and societies since industrial revolution. When demand was the determinant one in times before capitalism, today it is shaped by demand. And the approach which argues that necessities of human are unlimited has spread to all of the world. Human started to exist by consuming instead of producing Human's power on deciding and choosing has decreased because of he/she is getting further away from being in the production process of the consumed things. Although this trend is questioned from time to time, the de-growth movement advocates, which base their roots on the 1960s, are increasing day by day. In addition to that it is not clear whether a frugal point of view can change the world and save our planet or not, it was clearly understood and accepted that the economic trend of the previous century was not sustainable. Human was obliged to return back to many instincts. One of them these instincts is being frugal that it had already been a lifestyle before. Being frugal was emerged as an obligation after speading of capitalism to all of the world. Frugal innovations done by big firms such as Renault are placed in this situation. They have to be frugal for sustaining their existance. It is important and worthwhile that evolution of being frugal from an obligated reaction through a concious action. Practices of indiviuals and local operations considered and evaluated in this study are also in current capitalist economic system but they sustains their lifes in a more capable way with frugality reflex like in times before capitalism and they are the exceptions of the trend of current capitalist system. They are also bussiness so, they have some targets that they want to achive about their

production relating with growing. In addition, they may become a compatible part of current capitalist system over time. The important point advocated in this thesis is frugal practices that cause problem for current economic system and be an alternative for it. These implementations need to be developed, progressed and spread theorically and also practically and powered by possibility of being an alternative of them.

It is still a controversial issue whether the solution is a sustainable development or de-growth. This study shows that remembering frugal point of view to life in rural like in the past can cope with many problems and be the key which can open a new social system. Individuals don't need too many economic sources and high technology to make such a different in rural. They are talent, creative and frugal and they can be constituent a frugal abundance society. To see this current situation in rural can required rethinking on rural development policies again. To achieve the targets of development plans may required long time and high level budget but the money is also one of the limited resources like time. Rural population doesn't have got big budget and their necessities such as earning one's keep need urgent solution. They are able to find solutions to their problems. And the solutions are not related with advenced agricultural technology or high cost. In addition, our ecological and economic resources have been decreasing. Using of them like they will not deplate has been damaged to our planet irrevocably. All of these reason oblige approaching to rural policies with frugal thinking.

- Rural policies should include realist and need-oriented policies instead of long-term policies which are difficult to make them real.
- Policy makers should rightly understand what people need to make realize their idea and support them in this context.
- Policies should be made in a way that making easier their using style of talents of the rural population instead of trying to change them.
- Awareness studies about ecological environment should consist of creative and frugal methods which ensure more experiment to rural people.
- Numbers and scope of supportings to project-based entrepreneurship should be increased in rural areas.

- Advanced technology in agriculture may not be suitable for everywhere. Feasibility studies for using the intermediate technologies in agriculture should be progressed.

In this study considered frugal innovation in the context of rural and in the light of de-growth thought. Both frugal innovation and de-growth thought are considerable contemporary issues and they need more research about them. There are too many reflection of de-growth movements in all around the world. And it needs to examine this reflections to understand what are the contributions or useless to changing world system. Social researches are related with societies i.e. humans so, they have to base to qualitative methods such as survey, interview, examining and observing on-site. Because of that, researches will able to have troubles about time dimension. Reaching to the entrepreneurs and their acceptance for interview can take time. This is the limitation of this study. In addition, the entrepreneurs in this study are so-called entrepreneurship examples in Turkey. Probably there are more frugal entrepreneurs who did not be mentioned in news, magazines or social media in Turkey and they also need to be searched.

REFERENCES

Adıgüzel, B. (2012). İnovasyon ve İnovasyon yönetimi: Steve Jobs Öğrneği. *Master disseration*. Gazi Üniversitesi.

Agarwal, N., Grottke, M., Mishra, S., & Brem, A. (2017). A systematic literature review of constrait-based innovations: State of the art and future perspectives. *IEEE Transactions on Engineering Management, 64*(1), 3-15.

Agnihotri, A. (2015). Low-cost innovation in emerging markets. *Journal of Strategic Marketing, 64*(1), 3-15.

Annala, L., Sarin, A., & Green, J. (2018). Co-production of frugal innovation: Case of low cost reverse osmosis water filters in India. *Journal of Cleaner Production, 171*, 110-118.

Arınç, K. (2018). Boğatepe Köyü'nde Gravyer peyniri üretimi ve sürdürülebilir gelişme bakımından önemi. *Türk Coğrafya Dergisi, 70*, 7-18.

Atış, E., & Çelikoğlu, Ş. (2017). Boğatepe Köyünde Geleneksel Kars Gravyer ve Kaşar Peyniri Üretiminin Yöre Ekonomisi ve Tanıtımına Katkısı. *International Congress on the 75th Anniversary of TGS.*

Bambach, L. J., Earls, M., Fiandaca, D., & Morrison, S. (2018). *Creative Supervisors: equip yourself for the age of creativity.* London: Unbound.

Bansal, P., Smitt, W. K., & Vaara, E. (2018). New ways of seeing through qualitative research. *Academy of Management Journal, 61*(4), 1189-1195.

Baskarada, S. (2014). Qualitative Case Study Guidelines. *The Qualitative Report, 19*(40), 1-18.

Basu, R. R., Banerjee, P., & Sweeny, E. (2013). Frugal innovation: core competencies to address global sustainability. *Journal of Management for Global Sustainability, 1*(2), 63-82.

Başçetinçelik, A., Karaca, C., Öztürk, H., Ekici, K., & Kaçıra, M. (2005). Agricultural biomass potential in Turkey. *)th International Congress on Mechanization and Energy in Agriculture.* İzmir.

Beers, C. v., Knorringa, P., & Leliveld, A. (2014). Frugal innovation in Africa: Tracking Unilever's washing-powder sachets. J.-B. Gewald içinde, *Transfprming innovations in Africa: Explorative studies on appropriation in African societies* (s. 59-77). BRILL.

Bhatti, Y., Khilji, S., & Basu, R. (2013). Frugal Innovation. *In Globalization, change and learning in south Asia* (s. 123-145). içinde Candos Publishing.

Bianchi, C., Ardanche, M. M., & Schenck, M. (2017). Healthcare frugal innovation: A solving problem rationale under scarcity conditions. *Technology in Society, 51*, 74-80.

Bocutoğlu, E. (2012). *Karşılaştırmalı makrı iktisat: teoriler ve politikalar.* Murathan Yayınevi.

Boyce, D. (2003). A short history of the field of regional science. *Papers in Regional Science , 83*(1), 31-57.

Crossan, M., & Apaydin, M. (2010). A multi-dimensional framework of organizational innovation: A systematic review of the literature. *Journal of management studies, 47*(6), 1154-1191.

Cunha, M. P., Rego, A., Oliveira, P., Rosado, P., & Habib, N. (2014). Product innovation in resource-poor environments: three research streams. *Journal of Product Innovation Management, 31*(2), 202-210.

Çevre ve Şehircilik Bakanlığı. (2012). Adıyaman-Şanlıurfa-Diyarbakır Planlama Bölgesi 1/100.000 Ölçekli Çevre Düzeni Planı Plan Açıklama Raporu.

Dabson, B. (2001). Supporting rural entrepreneurship. *Rural and Agricultural Conferences, Federal Reserve Bank of Kansas City Proceedings.*

Daly, H. E. (1996). *Beyond growth: the economist of sustainable development.* Boston: Beacon Press.

Demaria, F., Schneider, F., Sekulova, F., & Martinez-Alier, J. (2013). What is degrowth? From an activist slogan to a social movement. *Environmental Values, 22*(2), 191-215.

Demir, O. Ö. (2009). Nitel Araştırma Yöntemleri. K. Böke içinde, *Sosyal Bilimlerde Araştırma Yöntemleri* (s. 287-316). İstanbul: Alfa Yayınları.

Demirci, S., & Köseli, M. (2009). İkincil Veri ve İçerik Analizi. K. Böke içinde, *Sosyal Bilimlerde Araştırma Yöntemleri* (s. 320-365). İstanbul: Alfa Yayınları.

Devlet Planlama Teşkilatı. (2004). *İlçelerin Sosyo-Ekonomik Gelişmişlik Sıralaması Araştırması.*

Ellul, J. (1964). *The technological society.* New York: Vintage books.

Fulconis, F., Pache, G., & Reynaud, E. (2018). Frugal supply chains: a managerial and societal perspective. *Society and Business Review*.

Georgescu-Roegen, N. (1975). Energy and economic myths. *Southern Economic Journal*, 347-381.

Gomiero, T. (2018). Agriculture and degrowth: State of the art and assessment of organic and biotech-based agriculture from a degrowth perspestive. *Journal of Cleaner Production, 197*, 1823-1839.

Gorz, A. (1989). *Critique of economic reason.* London: Verso.

Güney Gge Kalkınma Ajansı. (2014). *TR32 Düzey 2 Bölgesi 2014-2023 Bölge Planı.*

Hossain, M., Simula, H., & Halme, M. (2016). Can frugal go global? diffusion patterns of frugal innovation. *Technology in Society, 46*, 132-139.

Hussain, M. (2017). Mapping the frugal innovation phenomenon. *Technology in society, 51*, 199-208.

Illich, I. (1974). *Energy and equality*.

Kachru, U. (2011). *India: Land of a billion entrepreneurs.* New Delhi: Dorling Kindersley.

Kaygalak, İ. (2013). Türkiye Sanayi Coğrafyasında Endüstriyel Kümelenme ve Bölgesel Yoğunlaşma Eğilimi. *Beşeri Coğrafya Dergisi, 1*(1), 67-81.

Khan, R. (2016). how frugal innovation promotes social sustainability. *Journal of Sustainability, 8*.

Knorringa, P., Pesa, I., Leliveld, A., & Beers, C. V. (2016). Frugal innovation and development: Aides or adversaries? *European Journal of Development Research, 28*, 143-153.

Köprülü, O. (2006). TKV Gümüşhacıköy Kırsal Kalkınma Projesinin Çiftçiler Üzerindeki Etkilerinin Sürdürülebilirliğinin Saptanması. *Master's thesis*. Ondokuz Mayıs Üniverstesi Fen Bilimleri Enstitüsü.

Latouche, S. (2003). Sustainable development as a paradox. *Symposium Baltic Sea.*

Latouche, S. (2011). *Vers une société d'abondance frugale: Contresens et controverses sur la décroissance.* Paris: Mille et une nuits.

Leadbeater, C. (2014). *The Frugal Innovators.* London: Palgrave Macmillan.

Levanen, J., Hossain, M., Lyytinen, T., Hyvarinen, A., Numminen, S., & Halme, M. (2015). Implications of Frugal Innavtions on Sustainable Development: Evaluating Water and Energy Innovations. *Journal of Sustainability, 8*(4).

Maddison, A. (2007). *The world economy volume 1: A millennial perspective volume 2: Historical statistics.* Academic Foundation.

Maxfield, M., & Babbie, E. (2005). *Research methods for criminal justice and criminology.* Wadsworth.

Meadows, D. H., Meadows, D. L., Randers, J., & Behrens, W. W. (1972). *The limits to growth.* New York: Universe Books.

Moser, A., & Korstjens, I. (2017). Series: Practical guidance to qualitative research Part:1 . *European Journal of General Practicce, 23*(1), 271-273.

Nachmias, F., & Nachmias, D. (2000). *Research Methods in the Social Science.* New York: Worth Publishers.

Neuman, L., & Wiegand, B. (2000). *Criminal justice research methods: Qualitative and quantitative approaches.* Allyn & Bacon.

Özgen, N. (2007). Bismil İlçesinin Coğrafyası. *Phd thesis*. Ankara Üniversitesi Sosyal Bilimler Enstitüsü.

Pansera, M., & Sarkar, S. (2016). Crafting sustainable development solutions: frugal innovations of grassroots entrepreneurs. *Sustainability, 8*(1).

Patel, B., & Chavda, K. (2013). Rural entrepreneurship in India: Challenge and problems. *International Journal of Advance Research in Computer Science and Management Studies, 1*(2), 28-37.

Pisoni, A., Michelin, L., & Martigoni, G. (2017). Frugal approach to innovation: State of the art and fıtıre perspect,ves. *Journal of Clear Production, 171,* 107-126.

Radjou, N., & Prabhu, J. (2015). *Frugal Innovation: How to do better with less.* The Economist.

Radjou, N., Prabhu, J., & Ahuja, S. (2012). *Jugaad Innovation: Think frugal, be flexible, generate breakthrough growth.* John Wiley & Sons.

Rao, B. C. (2013). How distruptive is frugal? *Technology in society, 35*(1), 65-73.

Sahlins, M. (1972). *Stone age economy.* Chicago: Adline-Atheron.

Schönart, M., Penker, M., & Schmid, E. (2009). Sustainable local food production and consumption- Challenges for implementation and research. *Outlook in Agriculture, 38*(2), 175-182.

Schumacher, E. (1973). *Small is beautiful.*

Sekulova, F., Kallis, G., Rodriguez-Labajos, B., & Schneider, F. (2013). Degrowth: from theory to practice. *Journal of Cleaner Production, 38,* 1-6.

T.C. Kalkınma Bakanlığı. (2011). *İllerin Sosyo-Ekonomik Gelişmişlik Sıralaması*

Tiwari, R., & Herstatt, C. (2012). Frugal innovation: a global networks's perspective. *Die Unternehmung, 66*(3), 245-274.

Turkish Statistical Institute (TURKSAT). *1970 General Population Cencus*
Turkish Statistical Institute (TURKSAT). *1980 General Population Cencus*
Turkish Statistical Institute (TURKSAT). *1990 General Population Cencus*
Turkish Statistical Institute (TURKSAT). *2000 General Population Cencus*
Turkish Statistical Institute (TURKSAT). *2007-2018 Address Based Registered*
Turkish Statistical Institute (TURKSAT). *2018 Agricultural Statistics*
Turkish Statistical Institute (TURKSAT). *2018 Animal Husbandry Statistics*

Weyrauch, T., & Herstatt, C. (2016). What is frugal innovation? Three defining criteria. *Journal of Frugal Innovation, 2*(1).

Woods, M. (2005). *Rural Geography.* SAGE Publications.

Zafer Kalkınma Ajansı. (2015). *Uşak Sanayi Mevcut Durum Raporu.*

Zafer Kalkınma Ajansı. (2015). *Uşak Tarım Mevcut Durumu.*

Zeschky, M. B., Winterhalter, S., & Gassmann, O. (2014). From cost to frugal and reverse innovation: mapping the field and implications for global competitiveness. *research-Technology Management, 57*(4), 20-27.

Url-1< http://www.mediaclubsouthafrica.com> , data retrieved 15.03.2019

Url-2<http://nif.org.in/innovation/mitti-cool-refrigerator/751>, data retrieved 15.03.2019

Url-3<http://nif.org.in/upload/innovation/5th/3-a-farm-implement-without-steering.pdf>, data retrieved 15.03.2019

Url-4<http://nif.org.in/innovation/Onion_Transplanter/1>, data retrieved 15.03.2019

Url-5<https://www.designother90.org/>, data retrieved 15.03.2019

Url-6<https://steemit.com/juggad/>, data retrieved 15.03.2019

Url-7<https://undpturkiye.exposure.co/atiktan-yakita>, data retrieved 20.02.2019

Url-8|<http://www.hurriyet.com.tr/kelebek/hayat/orada-bir-mucize-koy-var-uzakta-40500731>, data retrieved 20.03.2019

APPENDICES

APPENDIX A: Locations of rural entrepreneurs in Turkey.

APPENDIX B: Interview questions

APPENDIX A

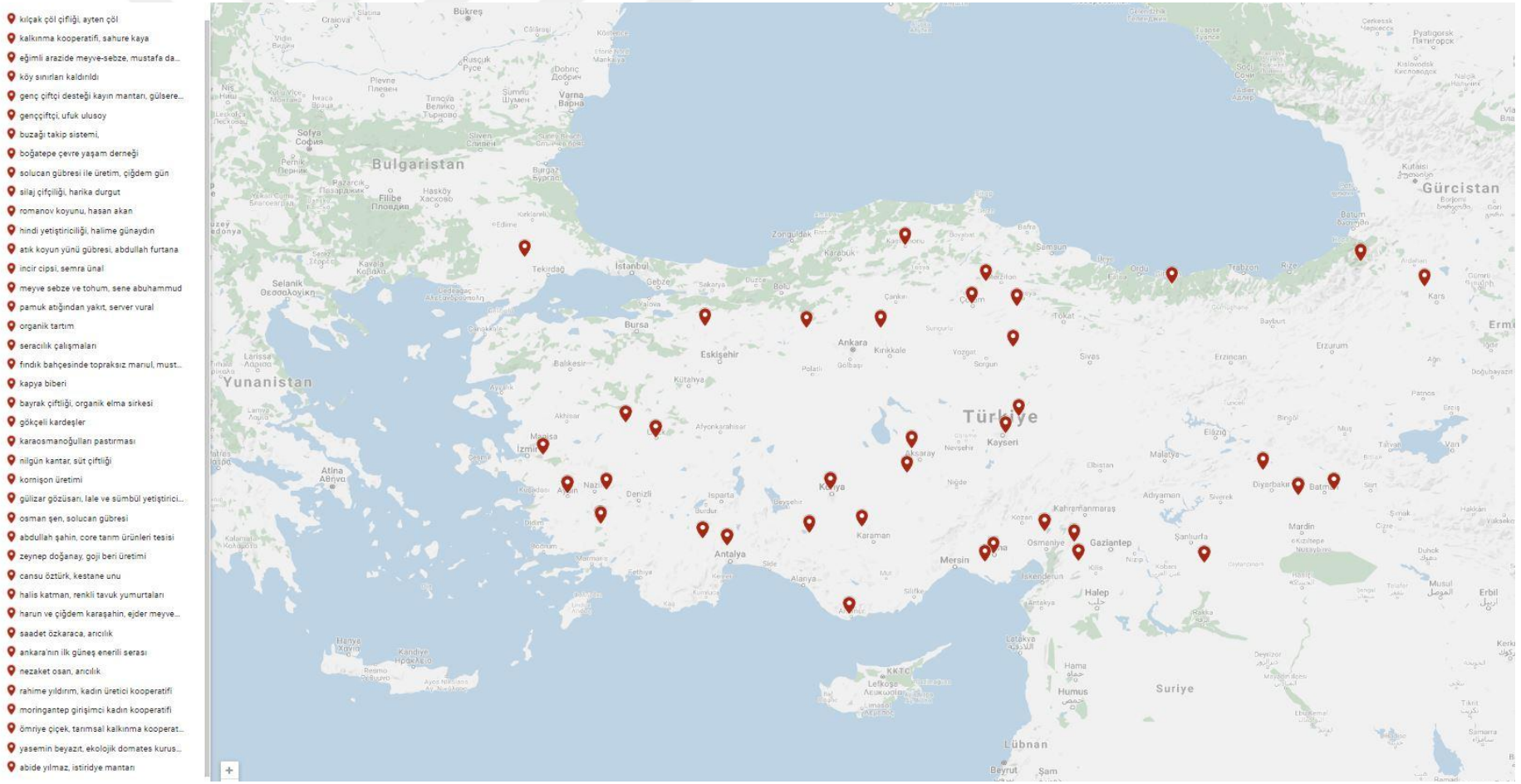

Figure A.1 : Locations of rural entrepreneurs in Turkey.

APPENDIX B

1. What is your full name, date of birth, occupation, educational background?
2. What was your occupation before you started to this work?
3. How did your enterprise start?
4. What was your necessity and problem?
5. Can you explain detailed your story?
6. How did you make real your idea?
7. Did you apply any project for supporting?
8. How much was your total capital at the begining and what are they?
9. What kind of difficulties did you have during the process?
10. When did you start your production?
11. When did you establish your facility?
12. What is the scope of your production?
13. How many square meters is the area of your facility?
14. What kind of products do you produce?
15. What are the prices of your products?
16. Do you have any target customer group?
17. How do you determine the prices of your products?
18. How is your production process?
19. Do you have any stroage to keep your products?
20. How do you transmit your products to the customers?
21. What kind of difficulties about marketing process do you have?
22. Do you have any certificated of your products?
23. Do you do organic agriculture?
24. Do you use any pesticide in the scope of your agricultural production?
25. How did you start doing organic agriculture?
26. What was the reason of you to do organic agriculture?
27. Do you have targets about your production capacity?
28. Do you have targets about your production style?
29. Is your family related to the production?
30. What was the main purposes of your work?
31. What kind of relationships do you have with your environ, other producers in your surroundings?

32. How do you carry out your packaging process? Do you have any standart?
33. What kind of difficulties do you have in your whole process?
34. Where are the main sales areas?
35. What is your cost of production?
36. What kind of efforts do you perform to keep your production cost at minimum level?
37. What are the contributions that you could determine of your enterprise to your environ?
38. How many tonne of apple is saved from being wasted due to your production in each year?
39. How many tonne of fig is saved from being wasted due to your idea in each year?
40. How many tonne of agricultural waste do you use in each year?
41. How many tonne of wool is brong to production due to your idea?
42. What are the reflections of your studies to the village in terms of population, economy, social structure?

CURRICULUM VITAE

Name Surname **:** Hatice Hâle BAYSAN ARU

Place and Date of Birth **:** İstanbul, 28.01.1994

E-Mail **:** halebaysan@gmail.com

EDUCATION **:**

- **B.Sc.** **:** 2015, Selcuk University, Faculty of Architecture, Urban and Regional Planning

PROFESSIONAL EXPERIENCE AND REWARDS:

- July and August 2012: Asistant Urban Planner in "Agricultural Planning Studies of Trakya Ergene Basin" – Ankara.
- July and August 2013: Intern-Urban Planner at Ministry of Environment and Urbanization Spatial Planning Department – Ankara.
- July and August 2014: Intern-Urban Planner at İmar Planlama Proje Müş. A.Ş.
- November 2014: Workshop Coordinator of ICONARCH-2 INTERNATIONAL CONGRESS OF ARCHITECTURE/Urban Renewal and/or Revitalization in the Historical City Center of KONYA.
- January 2016- still continue: Urban Planner at Istanbul Metropolitan Municipalty.

OTHER PUBLICATIONS, PRESENTATIONS AND PATENTS:

- Gezer B., **Aru H.H.,** (2018). "Türkiye'de İbbs Düzey-3 Bölgelerine göre 'Yaratıcılık Endeksi hesaplaması ve Bölgelerin Yaratıcılık Durumlarının İncelenmesi", Bölgesel Kalkınma ve bölge Bilimi Üzerine Yazılar, Prof. Dr. Mehmet Karagül, Prof. Dr. Latif Kaya, Dr. Onur Sungur, Nobel Yayın Dağıtım, Ankara, ss. 106-117.